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Service Export Sophistication and Economic Growth

Saurabh Mishra
Susanna Lundstrom
Rahul Anand

Abstract

Can increasing sophistication in service exports lead to economic growth? Although services were historically produced primarily for domestic consumption, they are gradually becoming more productive, tradable and unbundled. The authors construct an index of "service exports sophistication" to document this phenomenon. Panel data estimations indicate a positive association between growth in per capita income and higher sophistication of service exports. The results also suggest that this phenomenon is growing in importance over time. Considering the limits of traditional industrialization in igniting global growth, the results provide an alternative channel.

Service Export Sophistication and Economic Growth

By Saurabh Mishra, Susanna Lundstrom and Rahul Anand *

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"Ever since Adam Smith and David Ricardo, economists have explained and extolled the gains in living standards that derive from international trade. Those arguments are just as valid for trade in services as for trade in goods."

Alan Blinder, 2006

1. Introduction

What drives growth has been a perennial question of enquiry in economic literature, and recent rapid growth of China and India has rekindled this debate. These two countries have taken two different routes to achieve growth rates of nearly 7 percent per annum. While China has followed a more traditional manufacturing led growth strategy, India's growth has been driven by growth in the services sector. The Indian experience has led researchers to challenge the conventional notion that industrialization is the only plausible route to rapid economic development (Ghani and Kharas, 2010; Felipe et al., 2007; UNCTAD, 2003). Services have grown as a share of the world's GDP in the last decade accounting for 70 percent of global GDP, and service exports in developing countries have almost tripled between 1997 and 2007.[1] Even though manufacturing continues to be a dominant driver of growth, recent developments suggest that we must include the service sector in the debate. Services are no longer exclusively an input for trade in goods but have become a "final export" for direct consumption. In view of these changes in the nature of services and their growing importance, the objective of this paper is to examine whether growth in service exports and its sophistication can provide an additional route for rapid economic growth in developing countries. Sophistication has a multitude of interpretations but it broadly aims to capture the productivity level associated with a country's production, empirically mirrored in exports data. We develop a new index of "service exports sophistication" and examine its relation with growth.

As countries develop, they undergo structural transformation. Traditional theories have focused on growth as transition from agricultural to industrial production, with manufacturing being the prime "engine of growth" (Kaldor 1966, 1967). This has led to a large body of empirical research that has focused on manufacturing export led growth and related industrial policy. This was further motivated by the growth experience of the East Asian Tigers (Rodrik, 1999, 2004; Hausmann et al., 2005; Pack et al., 2003, 2006; UNIDO 2009; Schott, Peter, 2008).

However, as per capita income increases, most countries witness a rising share of services in the total output. The exact cause of this shift and its implications for future growth is still not very well researched. The negligence of services as drivers of growth in the policy and research debate stems from the notion that services are associated with low productivity and are merely inputs in the production of goods. However, the mid 1990s saw two seemingly separate but related developments. First was the revolution in information and communication technology (ICT) and, second, rapid growth in the global forces often referred to as the 3Ts – technology, transportability, and tradability – with the advent of internet age. Both events had a profound impact on the nature, productivity, and tradability of services (Ghani and Kharas, 2010; Baumol,

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[1] The global value cross-border services exports in 2007 was $3.3 trillion, (20 percent of total world trade). However, the share of services rises to almost 50 percent if transactions are measured in terms of direct and indirect value added content—that is if measured in terms of processing of imported components into final products for export (Hubert Escaith 2008). Adding the sales of services by foreign affiliates of multinational firms, then the value of trade in services rises further. Data for fifteen OECD countries puts the value of such sales at some $1.5 trillion in 2007 (WTO 2009, Hoekman et al., 2010).

1967).[2] This has resulted in rapid growth of what can be called *modern impersonal progressive services*, such as communication, banking, insurance, business-related services, remote access services, transcribing medical records, call centers, education, etc. These services differ significantly from the *traditional personal services,* which demand face-to-face interaction. A rising number of services can now be stored and traded digitally, and are not subject to many of the trade barriers that physical exports have to overcome. They have become similar to manufacturing goods in the sense that they benefit from technological advancement, and their costs depend on economies of scale, agglomeration, networks, and division of labor. More importantly, these sophisticated services mostly require digital labor mobility that provides an opportunity for relatively innovative, high-tech job creation in low and middle-income economies.

Service activities have not only become tradable, but also unbundled due to these changes. A single service task or an activity in the global supply chain can now be fragmented and done separately at different geographical locations. Fragmentation in service exports activities has also provided prospects for specialization, which did not exist previously. Factors such as relatively low transportation costs (sometimes even negligible), less susceptibility to trade barriers, lower capital intensity, and a mix of regulations may drive competitiveness amongst service exporting countries. This in turn may drive specialization and sophistication in service exports.

There are two aspects of this new channel to growth – specialization within service exports, and the sophistication of service exports. Whereas, increasing trade volumes in niche products or services fuel growth, the more interesting question is whether growth can be achieved by improving the sophistication of service exports. This is in line with the existing literature on how sophistication of goods exports affects growth. Hausmann, Hwang and Rodrik (2007, hereinafter referred to as HHR) have shown that it is not the specialization alone, but the sophistication of goods export that matter for growth. In order to examine this phenomenon for service exports, we create an index, which we call "service exports sophistication". A major contribution of this paper is to bring service exports channel of growth to the fore of discussion on the drivers of growth, and to show that it may be an alternative route for developing countries. Even though many researchers have looked at service led growth, to the best of our knowledge this is a first attempt at exploring service exports sophistication as a possible driver of growth. Another contribution of this paper is to develop a dynamic index of service exports sophistication (subject to the constraints on data, which we discuss in subsequent sections), which can be used to explore these questions in detail, and to understand more country-specific growth patterns.

Our results show that exports' "quality" in services is positively associated with growth performance. The results hold even after controlling for income per capita, skills, the size of domestic service sector, goods sophistication, financial development, rule of law, and country time invariant factors. The results also suggest that this phenomenon is growing in importance over time. This may have important implications for countries that are stuck in a "middle-income trap," such as Malaysia, Vietnam, etc., or for countries that wish to sustain their rapid growth,

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[2] Triplett and Bosworth (2004 find that the services sector accounted for over 70 percent of the post-1995 surge in labor productivity in the United States.

such as India, Sri Lanka, etc.[3] It also highlights a need to refocus of policy debate on drivers of growth. Countries could potentially benefit by adopting policies that increase the value addition in service exports; improve productivity, eliminate obstacles to increasing sophistication in niche service activities; and promote export performance. Service exports and increasing its sophistication may be an additional channel for sustained high growth. We highlight a need to refocus policy debate on drivers of growth. Learning from this phenomenon in development policy practice will depend on country specific factors and is an area of our future work.

The paper starts with a literature review in Section 2, and we motivate our analysis by presenting some stylized facts in Section 3. In Section 4, we construct a dynamic service export sophistication index (Service EXPY) and present some descriptive statistics about both service EXPY and its PRODY components. Section 5 presents econometric model and discusses the results. Section 6 concludes with future research and policy considerations.

2. Literature Review

Trade in services has been an area of interest for very long, dating back to the works of Adam Smith, David Ricardo, and Karl Marx, who considered services as distinct from goods when defining labor productivity. Classical economists thought of services as inputs to agriculture and industry, and as such did not devote much attention to services trade or to services as drivers of growth. However, technological changes and globalization in the last decade have changed the traditional notions about services, and the way economists have looked at it. Traditionally, services as a sector were thought exclusively for domestic consumption requiring face-to-face transactions such as eating in restaurants, haircuts, and loans from a bank (Baumol, 1967). However with the technological changes, services have acquired the characteristics of goods and have become tradable (Bhagwati, 1984). Baumol (1985) has classified these services as modern impersonal progressive services, which can be thought of as the modern service exports such as financial services, insurance, business processing, and computer information services. Ghani and Kharas (2010) have argued that technology, tradability, and transportability have transformed the dynamism of service exports, as they can be produced and stored and traded in binary code globally, and unlike goods these high-productivity modern services are no longer restricted by time and space. Blinder (2006) has referred to this phenomenon of globalization of services as the "tip of the iceberg."

Growing importance of services in GDP growth and increased tradability of services have led to a spurt in research on various aspects of services, ranging from trade liberalization to outsourcing of services. Initial works have focused on job losses and labor market outcomes of globalization of services especially in the USA (Kletzer, 2008; Kletzer and Jensen, 2008, 2005; Mann, 2006; Panagariya et al., 2005; Mann, 2005). Realizing the importance of services in growth, a body of research has developed where researchers have explored how particular aspects of services affect growth. Mattoo, Rathindran and Subramanian (2007) have examined the openness in financial and telecommunication services to demonstrate that it is an important driver of long run

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[3] A middle income trap is when countries are squeezed between low cost producers in developing countries and high end producers in advanced economies.

economic growth. Fixler and Siegel (2004) have examined the specific services exports and productivity gains from outsourcing.

India's distinctive service led growth pattern has compelled researchers to explore the relationship between services and growth in greater detail. However, most of the work has tried to explain as to why India embarked on this unique growth path. India's growth pattern might have roots in its history of investment in tertiary education, telecommunication policy with a concoction of global economic environment, domestic regulations, soft infrastructure, English language heritage and democratic society that paved the way for service led growth strategy (Kochhar et al, 2006; Broadberry et al, 2008; Goopta; Eichengreen and Gupta, 2009, 2010). Other influential works include comparison of growth patterns of China and India, and growth accounting shows that the growth in the India's total factor productivity is coming from productivity in services (see Bosworth, Collins and Virmani, 2007; Bosworth et al., 2008).

However, most of these researches have focused on country specific and regional factors behind growth in services and their implications for growth. The role of service exports and its sophistication has not received much attention in this literature. Works of Lall, Weiss, and Zhang (2005) and Hausmann, Hwang and Rodrik (2007), are among the first to explore these questions. They have built their argument on the premise that the exports associated with higher average income are more sophisticated. However, they have focused solely on the goods sector. HHR have developed an index of goods export sophistication (EXPY) and shown that it is not the amount of exports but the sophistication of exports that matters for growth. They have also found that this index is a good predictor of subsequent growth. They have argued that rich countries are those that have latched on to "rich-country products," while countries that continue to produce "poor country goods" remain poor.

As services have grown in importance and their exports are increasing rapidly, in this paper we extend the idea of HHR. We construct a dynamic service exports sophistication index, and use it in panel growth regression to examine if service exports sophistication is associated with growth.

3. Stylized Facts

We motivate our analysis by presenting some stylized facts about the growing importance of services and the changing nature of services (services becoming more productive, tradable, and fragmented). Figure 1 plots GDP growth (controlling for initial income level and initial level of service value added as a share of GDP) for 125 countries over 2000-07 against service value added growth.[4] From the figure it appears that countries with higher service output growth experienced higher overall economic growth. From this we take a closer look at the growing importance of services in growth; increasing productivity of services; increasing tradability of services ; and evolution of services from traditional to modern.

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[4] The horizontal axis controls for initial income per capita and initial level of service value added (% of GDP). The coefficient of both service and manufacturing growth is statistically significant at the 5 percent level.

Figure 1. GDP growth and service output growth, 2000-2007
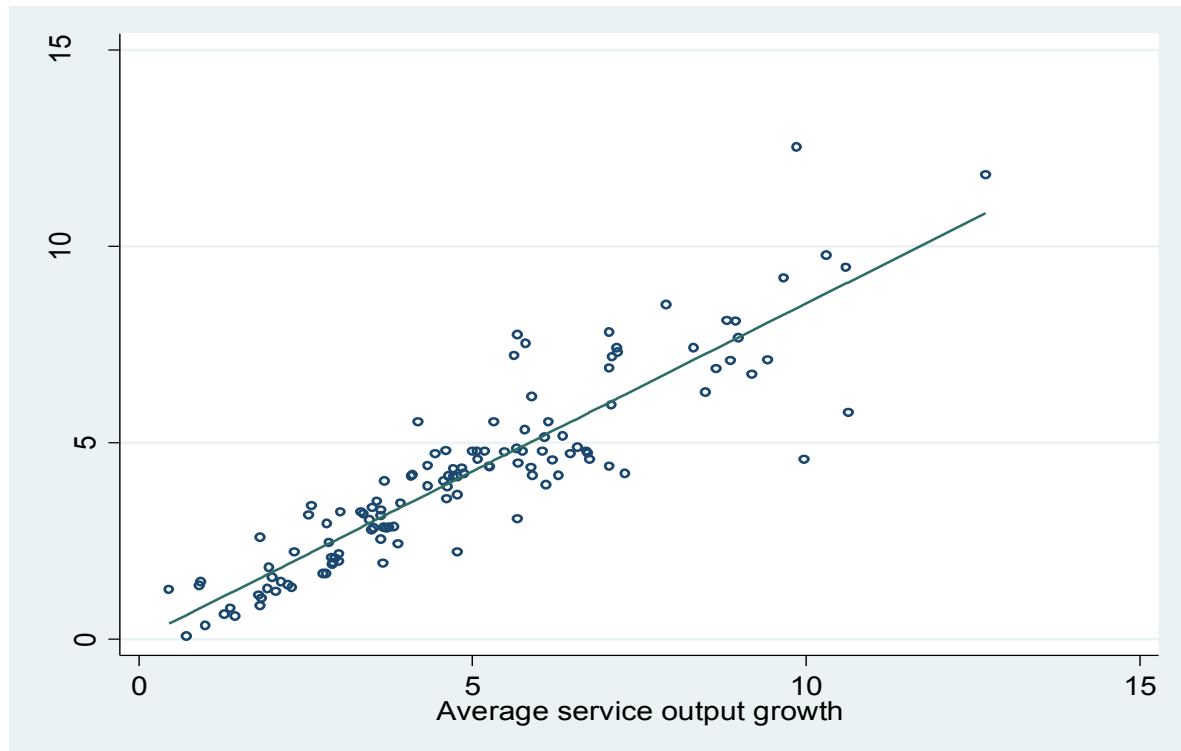
Source: World Development Indicators, World Bank, 2010 and authors' calculations. Note: Y axis is GDP growth controlling for initial income per capita and initial service value added (% of GDP).

3.1. Growing importance of services

In Figure 2 we show the sectoral contribution of different sectors in GDP growth. Sectoral contribution of services to GDP growth has risen for most countries in the world. Also, for some developing countries, services have become more important than industry in driving the GDP growth. Some developing countries have gone for service led growth at an earlier stage of economic development contrary to what is suggested by the traditional theories. Table A1 presents the sectoral shares and growth rates in GDP for the world and different regions. Figure A1 plots the contribution of sectors in GDP growth for the world and the developing economies. Services are a major contributor in global growth and their share in global production has increased considerably. For example, the contribution of service sector to growth in 2000-07 versus 1990-99 increased by two percent for developing countries (see Figure 3).

Figure 2. Contribution to GDP growth
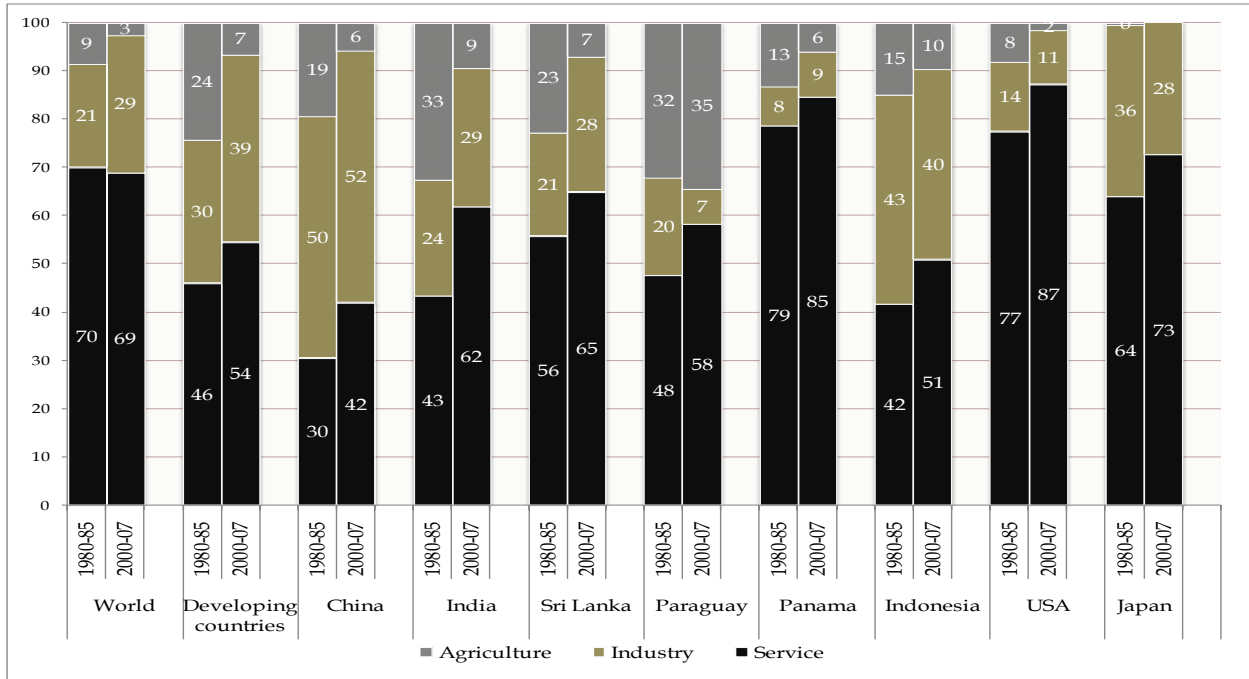
Source: World Development Indicators, World Bank, 2010 and authors' calculations.

Figure 3. Change in Growth Composition
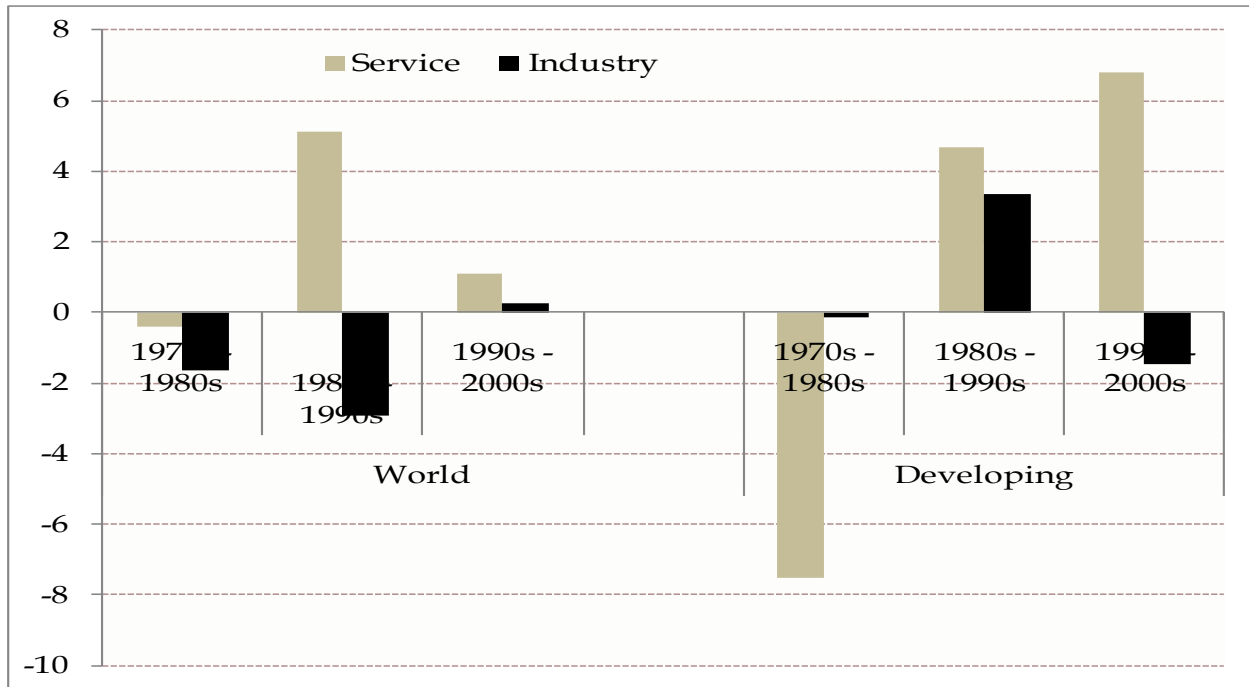
Source: World Development Indicators, World Bank, 2010 and authors' calculations.

3.2. Services have become more productive

Revolution in ICT technologies has made services more productive. In some countries, the real sources of growth in output per worker have emerged in services than manufacturing. Table 1 shows output per worker and total factor productivity growth sectorally over the period of 1990-2006 for India and China. Both countries have experienced relatively high TFP growth in services. However, India's growth experience has been leveraged by service TFP growth whereas China's in Industry. The two countries have taken different growth paths, and India's growth experience has shown that over 7 percent annual growth can be achieved by a developing country on the foundations of service productivity growth. With lack of disaggregated data on employment by sectors for developing countries, we plot the service output per worker for selected advanced economies in Figure 4 which suggests a rising trend.

Table 1. Sources of Growth in Output per Worker in India and China: Total Economy and Major Sectors, 1990-2006,(average annual percentage change).

	Total Economy		Agriculture		Industry		Services	
	1990-2000	2000-2006	1990-2000	2000-2006	1990-2000	2000-2006	1990-2000	2000-2006
India +								
Output Per Worker	4.1	4.5	1.3	1.4	3.3	2.7	4.9	4.6
TFP	1.8	2.1	0.7	0.9	0.6	1.6	3.1	1.9
China*								
Output per Worker	8.9	9.0	4.6	4.2	10.2	10.4	4.7	6.0
TFP	4.5	4.4	1.8	2.2	6.9	6.4	1.1	1.8

Source: + India from Bosworth, Maertens (2010). * China from Bosworth, Collins (2006).
Note: Latest time period for China is 2004.

Figure 4. Service output per worker (constant 2000 US$) for selected advanced countries
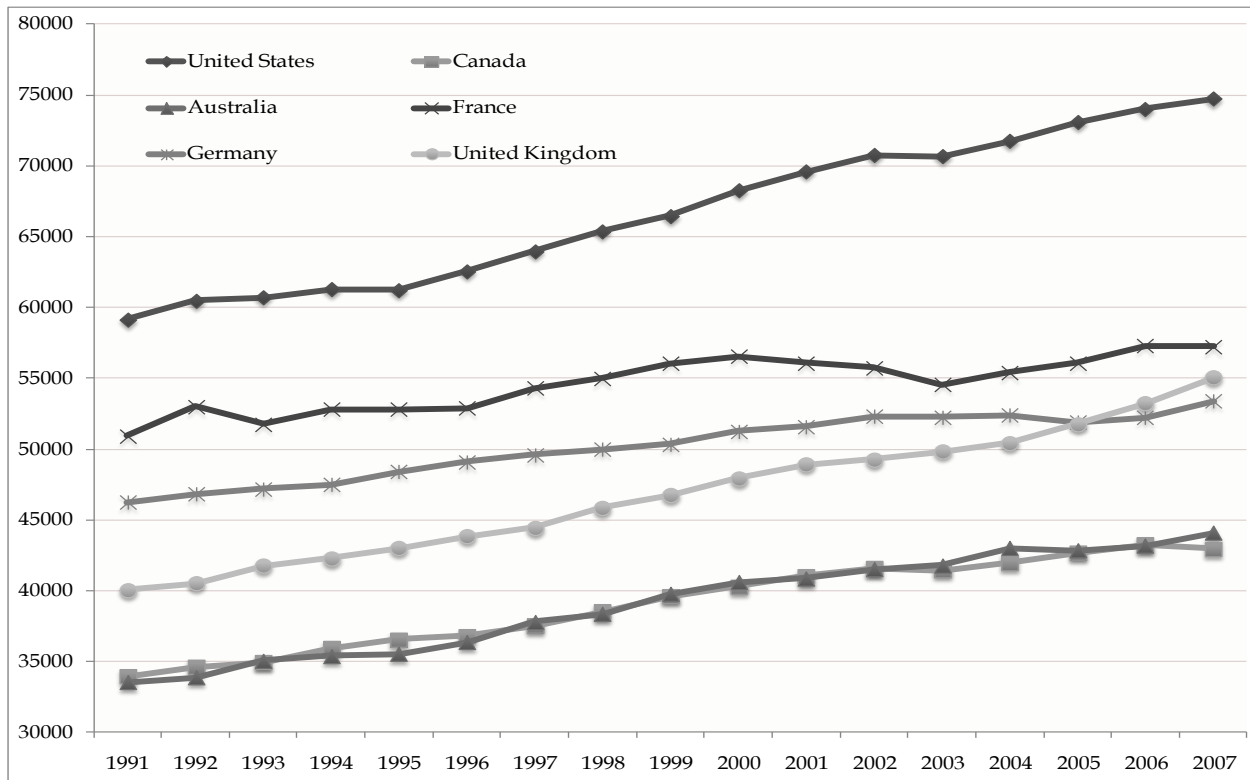
Source: World Development Indicators, World Bank, 2011 and authors' calculations.

3.3. Services are gradually becoming tradable

No more than 10 percent of service value added is currently exported, and a host of services are only beginning to become tradable (see Figure 5).[5] Service exports as a share of service value added are growing faster than goods export as a share of industry value added after 2000 (see Figure 6). The growth in the tradability of services is a recent phenomenon, and prospects for productivity gains from trade and fragmentation are potentially large.

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[5] Goods export in industrial value added is around 90 percent in 2007.

Figure 5. Services are gradually becoming tradable
(Service exports as a share of service value addition, 1980 - 2007)
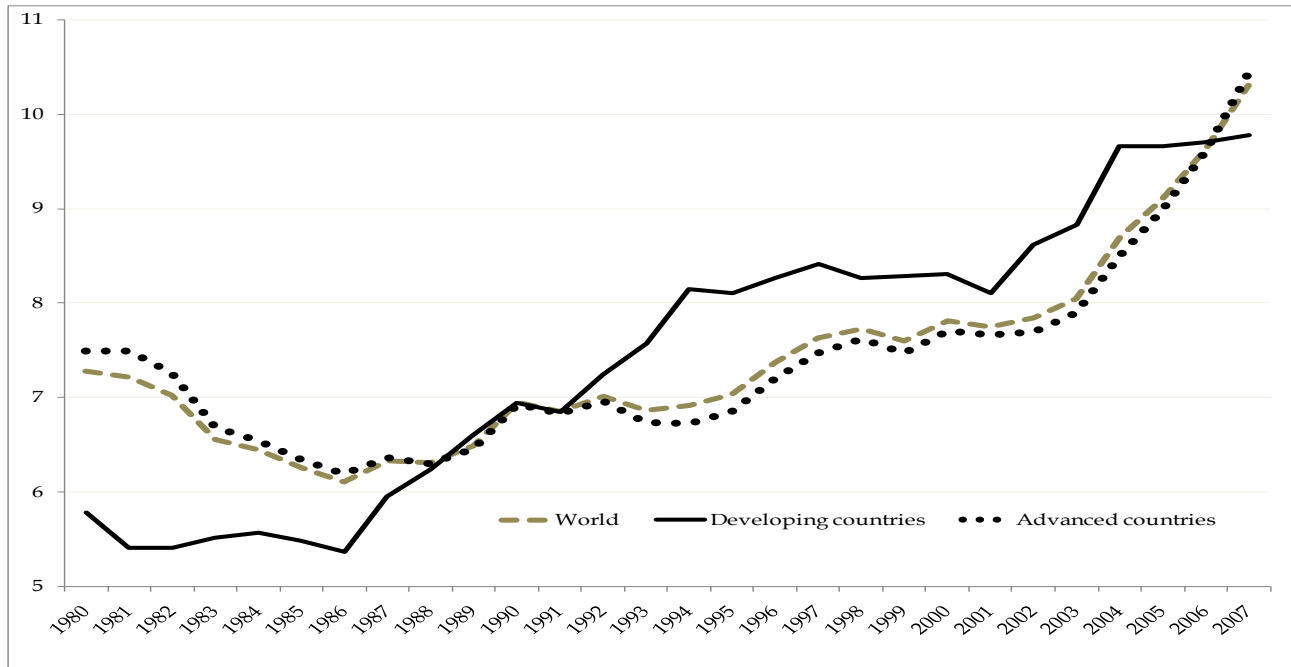
Source: World Development Indicators, World Bank, 2010 and authors' calculations.

Figure 6. Index of goods exports/industry value added and service exports/service value added
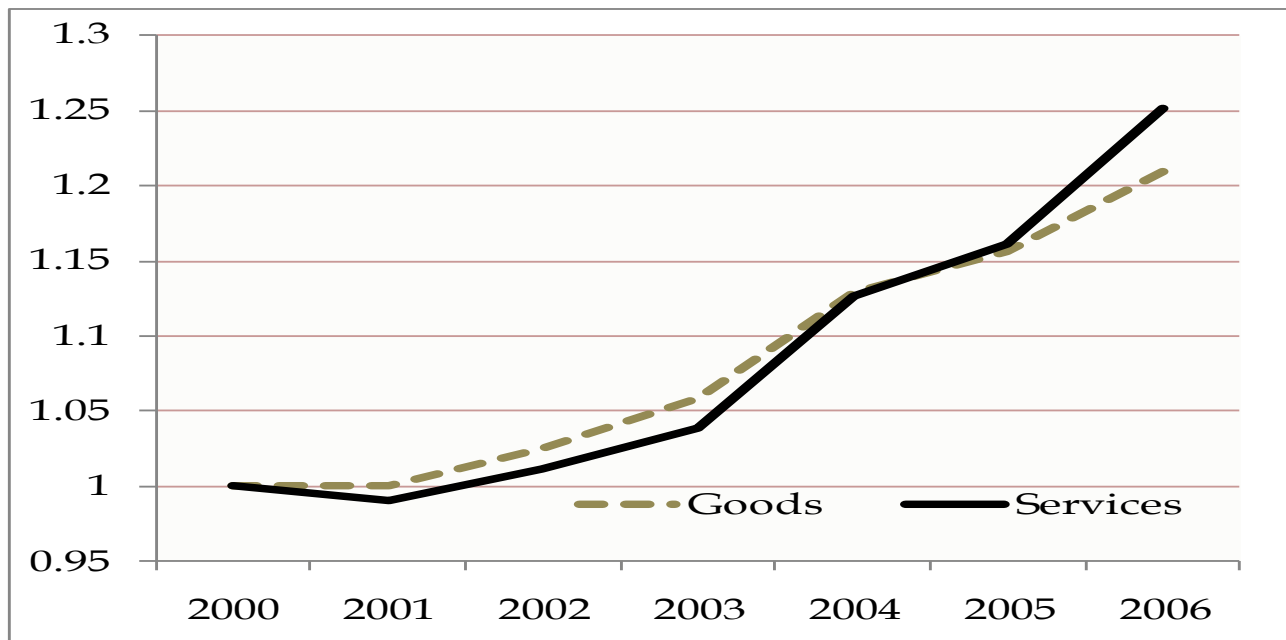
Source: World Development Indicators, World Bank, 2010 and authors' calculations
Note: 2000 is indexed to 1.

3.4. Evolution of services from traditional to modern

The 3T's have changed the very nature of services from traditional to modern. These modern services (such as financial services, information processing services etc.), which are tradable and impersonal, take advantage of ICT, globalization, and scale of economies; and benefit from higher productivity growth. Also, there is ample scope for traditional service (such as tourism, education, musicians, entertainment production media etc. which require face to face contact) to absorb productivity gains, knowledge spillovers, tradability and fragmentation from ICT. In the absence of disaggregated national accounts data on services, we use the IMF Balance of Payments service exports data to classify service exports into modern and traditional service exports. Figure 7 uses available categories in Balance of Payments and shows that modern services are growing faster after the turn of the century. Figure A2 confirms that measurable modern services are growing faster than traditional service exports only after 2000.[6]

Figure 7. Average annual growth in Modern and Traditional Services, World
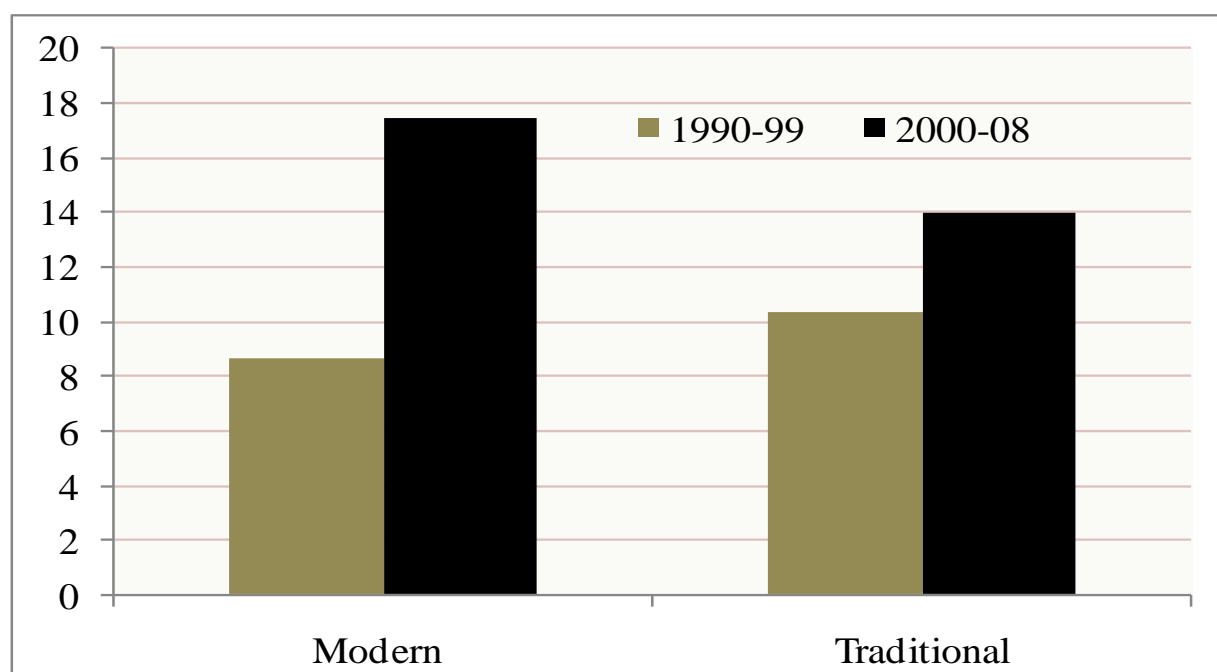
Source: Balance of Payments, IMF, 2010 and authors' calculations.
Notes: Modern Services include communication, insurance, finance, computer & information, royalties and license fees and other business services. Traditional service are Transport, Travel, Construction, Personal, cultural and recreational services.

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[6] Modern Services include communication, insurance, finance, computer & information, royalties and license fees and other business services. Traditional service are Transport, Travel, Construction, Personal, cultural and recreational services.

4. Data and Construction of Service Export Sophistication

We build upon the HHR framework, which uses a good export sophistication measure *Goods EXPY* as a proxy for the most productive set of goods the country can produce at a given time. They argue that export data is the best way to reveal this production frontier as we can expect countries to export those goods in which it is most productive. Along the same reasoning and as described below we will construct a *Service EXPY* to proxy the service production frontier of a country, by and large following the methodology developed by HHR.

We start by constructing so-called *PRODY*'s for each category of goods exports, reflecting the income/productivity level associated with each good, and we do the same for each category of services. $PRODY_j$ is the income value associated with the service *j*, and is constructed by using the service export (*x*) share of a country *i* in world's export of service *j*, divided by the sum of shares of *j* in world exports of *j* across all countries exporting that service.[7] These ratios are multiplied by the exporting countries' respective per capita income level (*Y*) and the result is summed up across all countries. In other words, the *PRODY* becomes the weighted average of per capita GDPs, where the weights represent the revealed comparative advantage in service *j* for each country.[8] *PRODY*s are constructed for each service category, for each year of available data, and are by construction the same for all countries.

$$PRODY_j = \sum_i \frac{x_{ij}/X_i}{\sum_i x_{ij}/X_i} Y_i$$

EXPY is then the weighted income value of services exported by a country, computed as the sum of *PRODY*s using as weights the share of the particular service in the country's total service export basket. *EXPY*s are constructed for each country and for each year with available data.

$$EXPY_i = \sum_j \frac{x_{ij}}{X_i} PRODY_j$$

The trade data come from the IMF Balance of Payments statistics which has data available for over 190 countries from 1990 to 2007. Due to data being reported inconsistently on service exports, we end up with a sample of approximately 100 countries 1990 to 2007. GDP per capita data is taken from the World Bank Indicators database. Before describing the service EXPY we would like to discuss two of its characteristics that differ from preexisting goods index – the need for dynamic PRODYs and the high level of aggregation.

First, the *Goods EXPY* were constructed using *static PRODY*s (the *PRODY* for each good is held constant at the average value 1999-2001). This means that any increase in *Goods EXPY* measures a country's jump from a low *PRODY* product to a high *PRODY* product (that is the share of high *PRODY* good in the export basket increased). However, in the case of *Service*

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[7] x_{ij}/X_i is hence the value-added share of commodity j in the country's overall export basket.
[8] The rational for using revealed comparative advantages as weights is to control for country size when ranking the services.

EXPY we will use what we call *dynamic PRODY*s, i.e. the *PRODY* values of a certain service export may vary year to year. Hence, an increase i*n dynamic EXPY* can be due to (i) an increase in the *PRODY* of a service and/or (ii) an increase in the share of high *PRODY* products in the export basket. This is important for two reasons. First, it gives us an opportunity to capture the effect of changes in PRODY on EXPY. We do not only want to measure the fact that countries are getting more and more engaged in higher value service export, but also that the service exports themselves are increasing in sophistication due to improvements in ICT and 3T's. In fact many richer and high-skilled countries are engaged in service exports boosting the *PRODY*s of some service export categories.[9] Secondly, since the data is much less disaggregated for services, using *static PRODY* fails to capture the movements to higher *PRODY* service exports that are only sub-categories of the broader categories captured by the Balance of Payments data.

A second characteristic, and just mentioned, is that service export data is not collected in the same detailed manner as goods export data. This means we will end up with only ten broad categories of service exports. They are different enough to make the analysis interesting, but it of course limits the extent to which we can understand the mechanisms in play. For example, if a country – within the same service export category - move from a sub-category of services with presumed low *PRODY*, to a sub-category of services with presumed high *PRODY* that would not show up at all in the *static EXPY*. As mentioned, the *dynamic EXPY* would however capture this as it allows for the *PRODY*s to change over time. Unfortunately though, even when comparing the *static EXPY* and the *dynamic EXPY*, due to the high aggregation of data it would be impossible to know if the increase in the *dynamic EXPY* was created by a higher share of high *PRODY* services in the basket or an increase in the *PRODY*s themselves as the *static EXPY* fails to capture changes in the subcategories of the export basket.

Table A3 shows that not only the mean *service EXPY* has increased over the years but also the standard deviation of *service EXPY*, i.e. countries are becoming increasingly diverse in their value of *service EXPY*, This indicates that the potential *service EXPY*, proxy for the "potential service production frontier", has increased and some countries have started to benefit from this higher potential.

The *PRODY*s for each service category over time is presented in Table 2. The left column present the traditional services (transportation, travel, communication and construction), while the right column present the modern services (insurance, financial, computer & information, royalties & license fees, other business services, and personal, cultural & recreational services). In general, the *PRODY* of the modern services are higher and their growth has been stronger, despite the higher initial levels. Our focus herein is on commercial service exports; therefore we do not include government services in our sample of measurement of *Service EXPY* (see Annex for a more details description of what is measured within each category).

Finally we would like to highlight limitations to the interpretation of service exports and *Service EXPY* due to the way data is registered. First, the level of aggregation due to broad categories already mentioned is sometimes exacerbated by the further aggregation in what the countries

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[9] One potential problem with the *dynamic PRODY* is that as developing countries starts getting engaged in the high *PRODY* services, the *PRODY*s themselves decreases due to the lower income of developing countries. However, at this point, the share of service exports of high *PRODY* value from developing countries is still too small to have an overall impact. The impact of a high *PRODY* service in the export basket of a small country can be significant for that country's *EXPY*, but the high *PRODY* export from that small country will not have an impact on the overall *PRODY* of that service, in the same sense that a small firm is a price taker in a large market.

report. Secondly, even though there have been no productivity improvements in a particular service that a country export, they may still register and increased *PRODY* for that export if the broader category it belongs to have made productivity improvements.[10]

Table 2. Global PRODY for service exports

Global PRODY by sub-services for the World

	Transportation	Travel	Communication	Construction	Insurance	Financial	Computer & Information	Royalties & License Fees	Other business services	Personal, cultural and recreational services
1990	7420	7372	7343	13073	6906	20649	16414	10040	7456	18054
1991	7936	7489	7307	16415	6956	17560	16073	7424	7342	16303
1992	7981	7193	6801	17275	7817	19216	14403	8656	7648	12058
1993	8164	7311	4934	14453	7823	17603	14644	8999	7856	6394
1994	8255	7542	5241	13066	8278	14871	11120	9407	8299	8695
1995	9214	7691	5937	12780	11222	21643	16844	17054	8698	11607
1996	9135	7828	6255	12840	11448	22384	17131	15034	8920	12783
1997	9263	7943	6174	8980	11498	23841	18015	11576	9107	13953
1998	9800	7684	6346	10104	11201	22416	22789	12153	9710	12344
1999	10319	7951	6503	10210	11075	23612	22433	14409	10013	13216
2000	10516	8082	6553	10422	10856	24409	19852	14973	10763	14282
2001	11213	8408	6552	9695	10496	25160	18058	15318	11132	14613
2002	11559	8696	6467	9185	13842	24862	17906	14828	11812	13442
2003	11870	8769	6926	8232	15187	22486	17961	14670	12725	13615
2004	12656	9086	7932	9494	14894	23871	19150	12611	13175	14491
2005	12575	9312	9205	11402	15725	25444	19226	14610	13940	15374
2006	12779	9653	9522	12691	14316	28546	19090	12488	15557	16490
2007	12751	9986	7518	12593	13721	31167	19129	18158	16191	16192
Mean	10,189	8,222	6,862	11,828	11,292	22,763	17,791	12,912	10,575	13,550
Standard Deviation	1,870	846	1,172	2,541	2,885	3,925	2,770	3,047	2,784	2,792

Source: Authors' calculations.

Our aim is to highlight these issues of measurement as the next generation of growth is being fueled by services and academics and policymakers should to be aware of these issues when they think about new strategies for economic development. While we acknowledge that the data on service exports is far from perfect, we would still argue that it is good enough to get a first picture of service export sophistication dynamics and its relation to growth, which is where we turn our attention now.

Figure 8 shows the evolution of *Service EXPY* over time for selected countries. The following two figures show log *Service EXPY* against log GDP per capita. The relationship is positive. In order to look at the evolution of service export sophistication over time, we contrast the level correlation in 1992 and 2007 in Figures 9 and 10 respectively. For both time periods, the scales have been kept constant as we want to bring the attention to the shifting paradigm of service exports globally. India and China started at similar income levels in 1992 but India jumped up by 2007. In accordance to Kaldor's law, as the world gets richer, services become an important driver of the global economy. In Figure 11 we show S*ervice EXPY* against *Goods EXPY*. The

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[10] For example, India's export of computer information services from 1990 till later in 1990's was 0. With the ICT boom, India's share of Computer & Information services rose to 0.43. This is almost half of Indian service exports. With PRODY for Computer & Information services (CIS) rising faster, a higher share of exporting CIS resulted in India's Service EXPY to match that of the UK by 2007 even though its income per capita was substantially lower. Another example is Saudi Arabia. The PRODY of the category other business services (OBS), which include management consulting, legal services, accounting, auditing and other professional and miscellaneous services is relatively high. Saudi Arabia has reported all of its services exports since 1990 to 2007 under OBS hence its share is 1. As the Global PRODY increased for OBS, Saudi Arabia's Service EXPY also rose and by 2007 its EXPY was at par with the United States.

chart draws attention to relative low variance in *Service EXPY* versus *Goods EXPY*. In the next section, we discuss our empirical methodology for testing the relation between growth and S*ervice EXPY*.

Figure 8. Service EXPY for selected countries
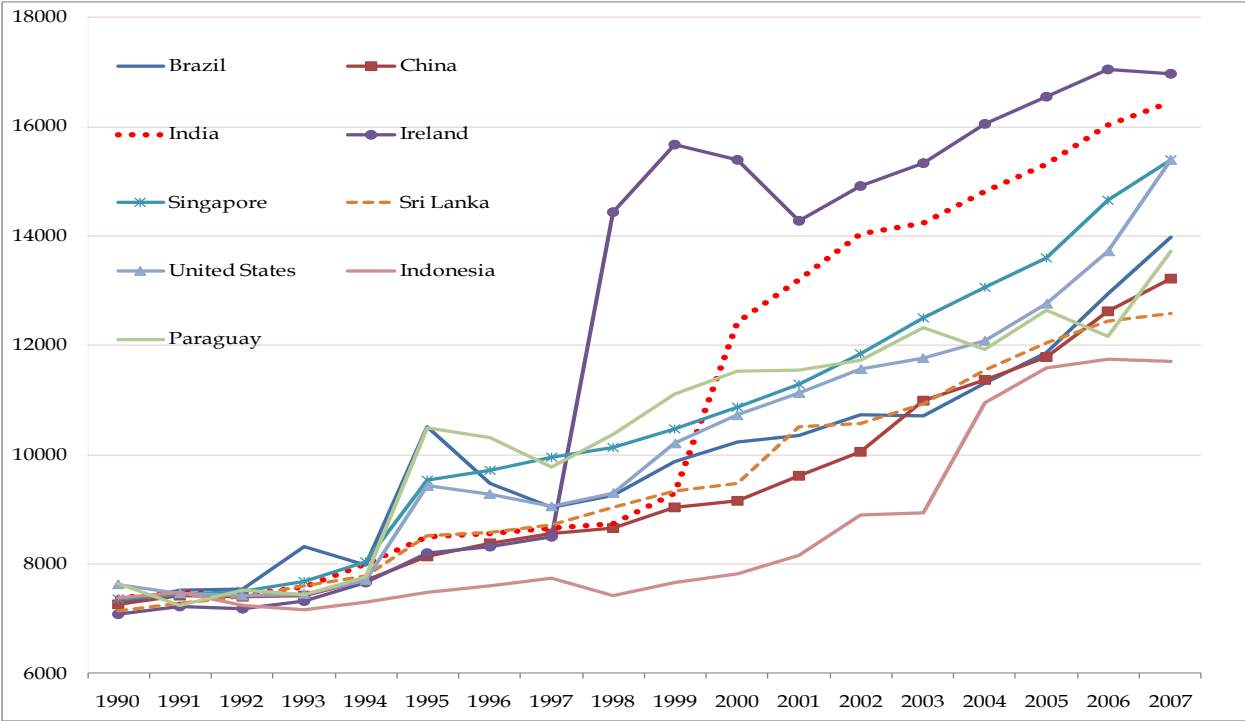
Source: Authors' calculations.

Figure 9. Commercial Service EXPY against GDP per capita, 1993-95
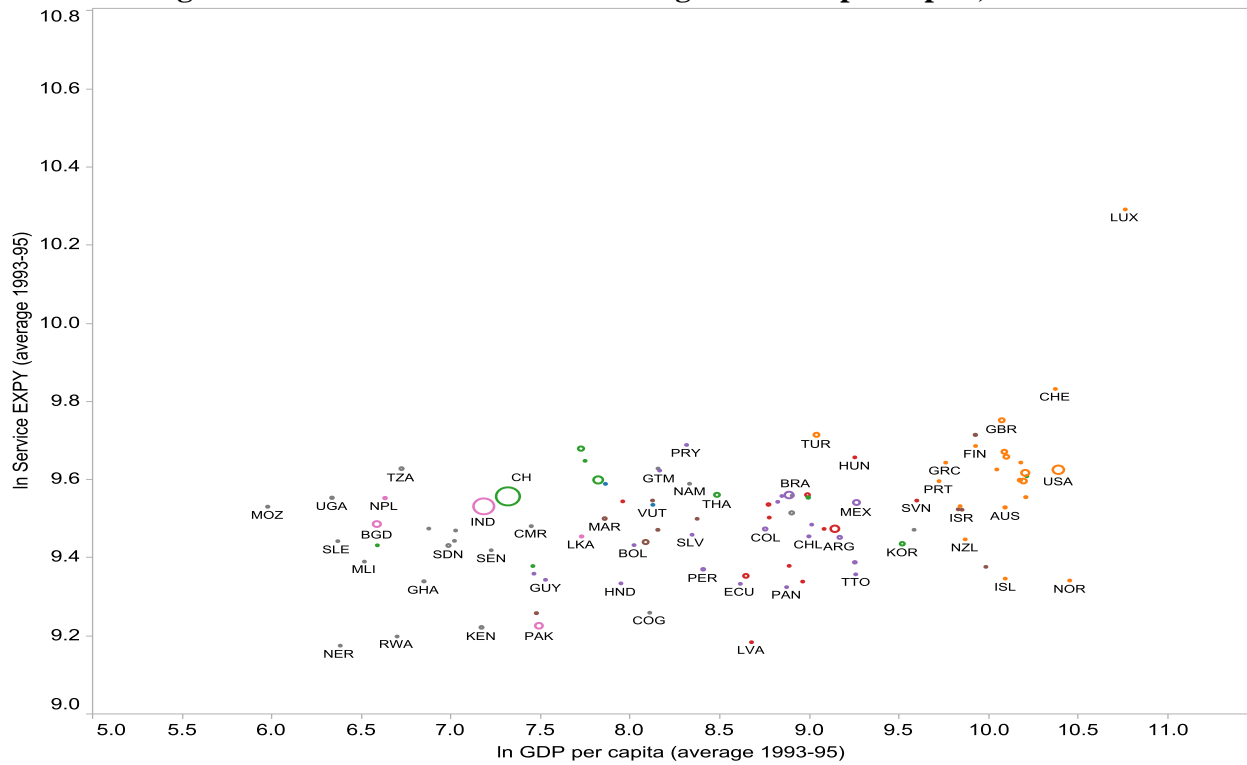
Figure 10. Commercial Service EXPY against GDP per capita, 2005-07
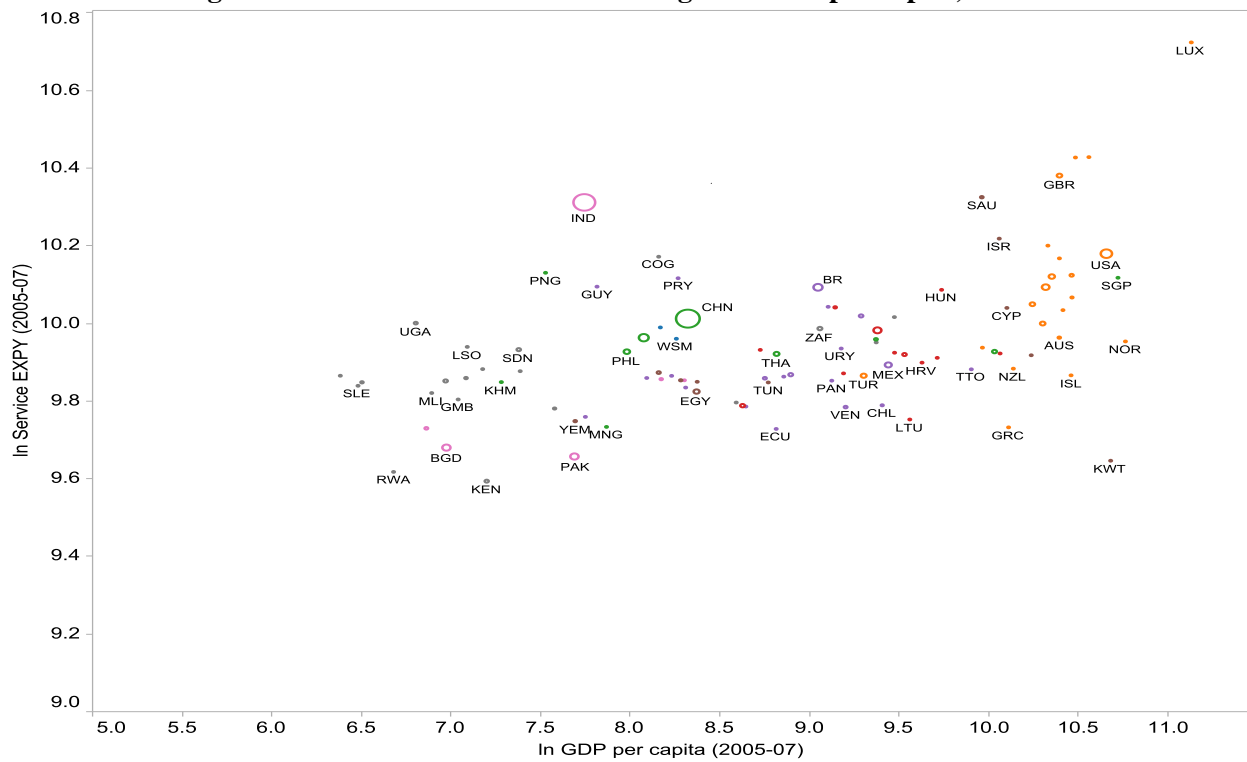
Source: Authors' calculation.
Note: Color shows details about the region code, size of bubble shows population size.

Figure 11. Service Export Sophistication & Goods Export Sophistication
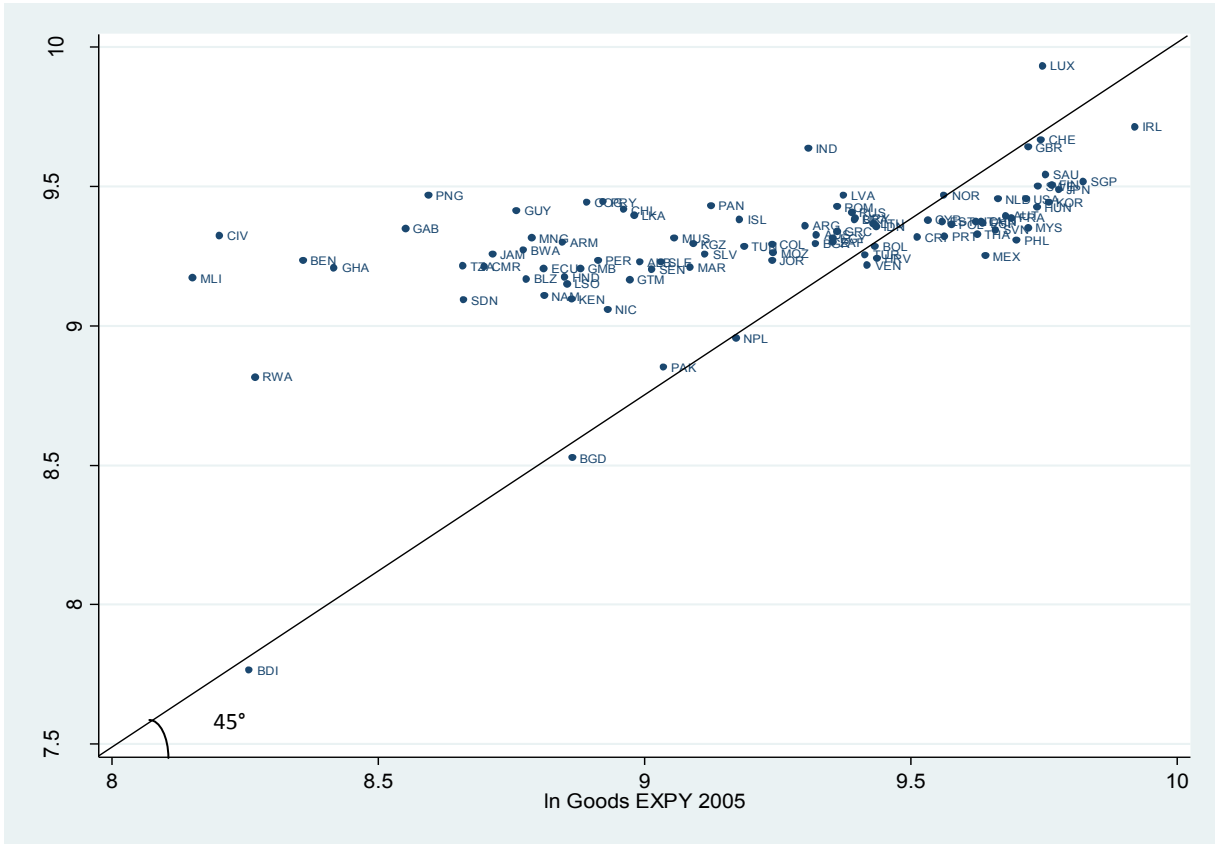
Source: Authors' calculations.

5. Empirical Methodology and Results

We now turn to the analysis of the relationship between the "dynamic commercial service EXPY", referred to as *Service EXPY* (*sEXPY*) and constructed as described in the previous section, and economic growth. We first present the results of the cross sectional analysis followed by various dynamic panel estimation techniques to capture the time series dimensions in the evolution of service export sophistication and its impact on growth. Since we are interested in investigating the empirical validity of a phenomenon that started in the mid nineties and its nature is changing rapidly, we choose three year panel for our analysis. The data includes up to 103 countries over the time span of 1990-2007. Choice of the time period is guided by two considerations- first, the consistent reporting of service exports in the Balance of Payments only started in the late 1980's and second, we are interested in capturing a phenomenon which gained momentum only in the 90s. We control for the standard determinants of growth in our reduced form regressions and include initial level of income per capita to control for the convergence effects.

The choice of explanatory variables in these growth regressions is never straightforward. A survey of empirical methodology by Durlauf et al (2005) acknowledged 43 distinct growth

theories and at least 145 proposed regressors as proxies. We turn to the standard growth literature to guide us in this regard and focus on a subset of well accepted growth determinants in our analysis (see annex tables and data description for details).

The baseline empirical growth model consists, in addition to the variable of interest, of four determinants of economic growth - initial income level, rates of physical and human capital accumulation, trade openness and institutional quality. We use data on income per capita from WDI. To account for differences in human capital accumulation we use latest available data on years of schooling from Barro and Lee (2010).[11] We use M2 (as percent of GDP) as a proxy for financial development from WDI. Finally, we use a measure of Rule of Law from World Governance indicators.[12]

We use dynamic panel regressions based on three year panel data for each country. The regression specification is the following:

$$y_{i,t} - y_{i,t-1} = \alpha y_{i,t-1} + \beta' SE_{i,t-1} + \varphi' GD_{i,t} + \mu_t + \vartheta_i + \varepsilon_{i,t} \tag{1}$$

where $y_{i,t}$ is the natural logarithm of GDP per capita, $y_{i,t-1}$ is the level of GDP per capita at the beginning of each three year period, $SE_{i,t-1}$ is the dynamic service export sophistication measure, $GD_{i,t}$ is the set of relevant control variables for growth determinants, μ_t represents time dummies, ϑ_i stands for country fixed effects and $\varepsilon_{i,t}$ is the error term.

Results of fixed effect and System GMM regression for three year periods are presented in Table 3.[13] The convergence effect, human capital, and service EXPY seem to matter for growth only in the last time period (2005-07). We add various controls for growth to our baseline regression for the period. Introduction of the controls does not change the significance of the co-efficient on SE.[14]

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[11] Neoclassical growth model, since the seminal work of Lucas (1988), the concept of capital since is usually broadened from physical capital to include human capital.

[12] For robustness checks we also tried institutionalized democracy measure from Integrated Network on Social Conflict Research which has a value between 0 and 10. This is a composite index which includes information on degree of participatory democracy, the existence of institutionalized constraints on the exercise of power by the executive, and other aspects of plural democracy, such as the rule of law, systems of checks and balances, and freedom of the press. Our results do not change.

[13] By using shorter time spans we are left with a sample of approximately 100 countries by 2007. We have excluded few countries where the data on service exports was reported haphazardly for a limited time period; hence we only keep reliable data for panel estimations.

[14] Initial, lagged levels are used to address potential endogeniety problems (see for example Barro and Lee (1994))

(dependent variable – GDP per capita growth)

	FE					System GMM				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
log lag initial GDP/cap	-0.03***	-0.03***	-0.04***	-0.04***	-0.04***	0.002	0.004	0.008	0.01	0.007
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
log lag initial service EXPY	**0.05***	**0.04***	**0.04***	**0.03***	**0.03***	**0.06***	**0.05***	**0.07***	**0.07****	**0.08****
	(0.01)	**(0.01)**	**(0.01)**	**(0.01)**	**(0.01)**	**(0.01)**	**(0.01)**	**(0.02)**	**(0.03)**	**(0.04)**
log human capital		0.05***	0.03	0.01	0.01		-0.005	-0.01	-0.02	-0.02
		(0.02)	(0.02)	(0.02)	(0.02)		(0.07)	(0.06)	(0.05)	(0.04)
log financial development			0.02***	0.01*	0.01*			-0.004	-0.008	-0.01
			(0.008)	(0.008)	(0.008)			(0.02)	(0.03)	(0.03)
Trade (% of GDP)				0.04***	0.04***				-0.002	-0.004
				(0.01)	(0.01)				(0.01)	(0.01)
Rule of Law					-0.006					0.01
					(0.007)					(0.03)
Constant	-0.23***	-0.15*	-0.18*	-0.22**	-0.22*	-0.58***	-0.49***	-0.71***	-0.75***	-0.78***
	(0.08)	(0.09)	(0.10)	(0.10)	(0.10)	(0.16)	(0.16)	(0.20)	(0.25)	(0.21)
R-squared	0.08	0.09	0.14	0.20	0.20					
observations	428	421	375	370	370	428	421	375	370	370
Countries	108	106	95	95	95	108	106	95	95	95
Rho	0.80	0.71	0.81	0.86	0.87					
Hansen J-statistic (p) value						0.24	0.32	0.49	0.38	0.23
Second-order serial correlation (p-value)						0.002	0.002	0.001	0.002	0.002
Number of Instruments						7	10	10	10	12

Note: All equations include period dummies. Fixed effects include dummies for countries. GMM is the Blundell-Bond System-GMM estimator using lagged growth rates and levels as instruments. The GMM estimation also uses log population and log area as additional instruments. * Significant at 10% level ** Significant at 5% level *** Significant at 1% level. Robust t-statistics are in parentheses.

As noted earlier a key constraint of the fixed effects regressions is that growth and export sophistication may be endogenous.[15] However, the results in the second panel of Table 3 show that dynamic *Service EXPY* matter for growth even when we control for endogeneity using a version of the Blundell-Bond system GMM estimator.

Table 4 presents the results of fixed effect and System GMM with robustness checks. First, we control for the size of the domestic service sector in the economy. Results are shown in columns (1-2) of Table 4. As evident, even after controlling for the size of the domestic service sector, *Service EXPY* continues to have a significant and positive association with economic growth. Second, we control for the sophistication of goods export (in column 3-4 of Table 4). Again, our

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[15] This is a key concern as witnessed in standard OLS regressions. The system GMM addresses this issue.

results go through.[16] One of the orthodoxy in service led growth is that it is an India specific story. Therefore, in column 5-6 of Table 4, we drop India, and as the results holds we can confirm that there are other sophisticated service exporters driving the results. Moreover, after controlling for initial income per capita, skills, financial development, polity, time invariant factors, export sophistication in services is a good indicator of growth performance globally.

In order to further exploit the time varying effect of sophistication in service exports and growth, we repeat the earlier exercise for the time period 1999-2007. Results are shown in Table 5. The coefficient on *sEXPY* is significant under all specifications and the size of the coefficient is by in large bigger.[17] The fixed effect panel estimation controls for time-invariant country specific characteristics and influence out the impact of *Service EXPY* within countries. The coefficient on *Service EXPY* in the first panel is positive and statistically significant, implying that higher dynamic export sophistication is associated with higher growth in GDP per capita. Adding growth determinants (in Panel I and Panel II) does not take away the explanatory power of *Service EXPY*, and it remains positively related to GDP per capita growth.[18]

We are in particular interested in whether service exports sophistication can provide an additional route to high economic growth in low-income countries. Therefore, in Table 6 we conduct sensitivity test by restricting our sample of countries to low and middle income countries (with income per capita in PPP terms below $10,000). The results are presented in Table 6. As previously, we use the above progression of adding growth determinants and robustness check controls. The results from fixed effect and System GMM show that *sEXPY* remains positively associated with growth. Again, controlling for initial *Goods EXPY* and the size of domestic service sector does not change the results. The regression results confirm the dynamism in export quality of services, and provide a statistical indication of the positive relation between service quality of exports and growth.

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[16] The System GMM but not our fixed effect in our specification predicts goods EXPY to be non-significant.Tthis result has also been documented in other studies (see Weiss, 2010). In our case, this could also exist due to the high multicollinearity between service sophistication and goods sophistication.

[17] We further try unconventional growth regression using annual panel data estimations to have a bigger sample and understand the evolution of service EXPY and growth. We conduct sensitivity tests by restricting the sample to period after 1998, 1999 and so on. As the period gets restricted to more and more recent years, the coefficient on Service EXPY becomes bigger (Results not shown in the paper).

[18] Since the trade statistics in services do not capture the inputs and processes under services, at best our estimation is on the lower side. If these were included we believe that the growth elasticity of service export sophistication could be substantially higher.

Table 4. Service EXPY and growth: 3 year panel data regressions, 1990-2007

(Controlling for Size of Service sector and Goods export sophistication)

(dependent variable – GDP per capita growth)

	FE	System GMM	FE	System GMM	FE	System GMM
	(1)	(2)	(3)	(4)	(5)	(6)
log lag initial GDP/cap	-0.04***	0.009	-0.04***	-0.05***	-0.05***	-0.05***
	(0.01)	(0.04)	(0.01)	(0.01)	(0.01)	(0.02)
log lag initial service EXPY	**0.03***	**0.10***	**0.03****	**0.05***	**0.03***	**0.06****
	(0.01)	**(0.05)**	**(0.01)**	**(0.03)**	**(0.01)**	**(0.03)**
log human capital	0.0003	-0.02	-0.01	0.02	-0.02	0.03
	(0.02)	(0.06)	(0.02)	(0.03)	(0.02)	(0.03)
log financial development	0.01**	-0.01	0.01	0.03	0.01	0.03*
	(0.009)	(0.04)	(0.008)	(0.01)	(0.009)	(0.01)
Trade (% of GDP)	0.04***	-0.006	0.04***	0.01	0.04***	0.007
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Rule of Law	-0.009	0.02	-0.006	0.03***	-0.01	0.04***
	(0.007)	(0.04)	(0.007)	(0.01)	(0.008)	(0.01)
log service value added (% of GDP)	0.02*	-0.06	0.02*	0.002	0.02*	-0.009
	(0.01)	(0.10)	(0.009)	(0.05)	(0.01)	(0.05)
log lag initial goods EXPY			0.02**	0.009	0.01**	0.007
			(0.009)	(0.01)	(0.009)	(0.01)
Drop India	No	No	No	No	Yes	Yes
Constant	-0.27**	-0.66	-0.28***	-0.38	-0.36	-0.38
	(0.12)	(0.46)	(0.11)	(0.26)	(0.13)	(0.27)
R-squared	0.21		0.22		0.24	
observations	357	357	362	349	345	345
Countries	93	93	95	93	92	92
Rho	0.90		0.90		0.92	
Hansen J-statistic (p) value		0.54		0.40		0.27
Second-order serial correlation (p-value)		0.02		0.004		0.005
Number of Instruments		12		38		38

Note: All equations include period dummies. Fixed effects include dummies for countries. GMM is the Blundell-Bond System-GMM estimator using lagged growth rates and levels as instruments. The GMM estimation also uses log population and log area as additional instruments. * Significant at 10% level ** Significant at 5% level *** Significant at 1% level. Robust t-statistics are given in parentheses.

Table 5. Dynamic service EXPY and growth: 3 year panel fixed effect and System GMM
(1999-2007)

(dependent variable – GDP per capita growth)

	FE							System GMM						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
log lag initial GDP/cap	-0.06***	-0.06***	-0.06***	-0.06***	-0.06***	-0.06***	-0.07***	-0.007	-0.003	-0.001	0.01	0.003	0.006	-0.07
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.002)	(0.04)	(0.03)
log lag initial service EXPY	0.10***	0.07***	0.08***	0.06***	0.06***	0.06***	0.07***	0.07***	0.05***	0.06***	0.07**	0.09**	0.10*	0.06*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.04)	(0.05)	(0.03)
log human capital		0.03***	0.03***	0.05*	0.05*	0.04	0.02		0.01	0.006	-0.02	-0.01	-0.01	0.06
		(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)		(0.06)	(0.05)	(0.05)	(0.04)	(0.06)	(0.05)
log financial development			0.008	0.006	0.005	0.008	0.005			0.003	-0.008	-0.01	-0.01	0.03
			(0.009)	(0.009)	(0.009)	(0.01)	(0.01)			(0.02)	(0.03)	(0.03)	(0.04)	(0.02)
Trade (% of GDP)				0.05***	0.05***	0.05***	0.05***				-0.007	-0.009	-0.01	0.006
				(0.01)	(0.01)	(0.01)	(0.01)				(0.01)	(0.01)	(0.01)	(0.01)
Rule of Law					0.004***	0.003	0.002					0.01	0.02	0.05**
					(0.009)	(0.009)	(0.009)					(0.03)	(0.04)	(0.02)
log service value added (% of GDP)						0.002	0.005						-0.07	0.03
						(0.01)	(0.01)						(0.10)	(0.06)
log lag initial goods EXPY							0.01							0.005
							(0.009)							(0.02)
Constant	-0.41***	-0.32***	-0.40***	-0.43***	-0.43	-0.42***	-0.51***	-0.67***	-0.47***	-0.63***	-0.75***	-0.87***	-0.64	-0.38
	(0.10)	(0.11)	(0.12)	(0.11)	(0.11)	(0.14)	(0.14)	(0.16)	(0.150)	(0.18)	(0.25)	(0.22)	(0.44)	(0.31)
R-squared	0.21	0.24	0.27	0.35	0.35	0.35	0.38							
observations	320	315	281	277	277	367	263	320	315	281	277	277	267	263
Countries	108	106	95	94	94	92	92	108	106	95	94	94	92	92
Rho	0.95	0.92	0.91	0.93	0.93	0.93	0.95							
Hansen J-statistic (p) value								0.37	0.319	0.40	0.40	0.26	0.58	0.275
Second-order serial correlation (p-value)								0.002	0.002	0.002	0.002	0.002	0.02	0.007
Number of Instruments								7	10	10	10	12	12	38

Note: All equations include period dummies. Fixed effects include dummies for countries. GMM is the Blundell-Bond System-GMM estimator using lagged growth rates and levels as log population and log area as additional instruments. * Significant at 10% level ** Significant at 5% level*** instruments. The GMM estimation also uses log population and log area as additional instruments.
* Significant at 10% level ** Significant at 5% level *** Significant at 1% level. Robust t-statistics are given in parentheses.

Table 6. Dynamic service EXPY and growth: 3 year panel fixed effect and System GMM
(Sample: Countries with income per capita below US $10,000)
(dependent variable – GDP per capita growth)

	FE							System GMM						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
log lag initial GDP/cap	-0.004	-0.001	-0.007	-0.01	-0.01	-0.02	-0.02	0.01	0.008	0.003	0.07	0.10	0.02	-0.03**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.04)	(0.06)	(0.10)	(0.10)	(0.01)
log lag initial service EXPY	0.03***	0.03***	0.03***	0.03***	0.03***	0.03***	0.04***	0.08***	0.09***	0.08***	0.16***	0.17	0.21**	0.05*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.03)	(0.05)	(0.11)	(0.09)	(0.03)
log human capital		-0.006	-0.007	-0.01	-0.01	-0.01	-0.02		0.03	0.04	-0.04	-0.10	-0.01	0.02
		(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)		(0.05)	(0.07)	(0.11)	(0.13)	(0.11)	(0.02)
log financial development			0.007	-0.001	-0.001	0.0001	-0.002			0.003	-0.05	-0.07	-0.09	0.01
			(0.009)	(0.009)	(0.009)	(0.009)	(0.01)			(0.02)	(0.04)	(0.06)	(0.07)	(0.01)
Trade (% of GDP)				0.03***	0.03***	0.03***	0.04***				-0.02	-0.03	-0.04	0.004
				(0.01)	(0.01)	(0.01)	(0.01)				(0.02)	(0.04)	(0.04)	(0.01)
Rule of Law					-0.006	-0.006	-0.009					0.006	0.01	0.01
					(0.007)	(0.007)	(0.008)					(0.08)	(0.07)	(0.01)
log service value added (% of GDP)						0.009	0.01						0.17	0.05
						(0.01)	(0.01)						(0.18)	(0.03)
log lag initial goods EXPY							0.007							0.01
							(0.008)							(0.01)
Constant	-0.29***	-0.32***	-0.28***	-0.30***	-0.30***	-0.31***	-0.40***	-0.87***	-0.97***	-0.92***	-1.73***	-1.98***	-2.27***	-0.69***
	(0.08)	(0.10)	(0.11)	(0.11)	(0.11)	(0.11)	(0.12)	(0.26)	(0.25)	(0.43)	(0.51)	(0.65)	(0.83)	(0.22)
R-squared	0.10	0.10	0.11	0.19	0.19	0.19	0.23							
observations	233	228	228	224	224	221	213	233	228	228	224	224	221	213
Countries	74	72	72	71	71	71	70	74	72	72	71	71	71	70
Rho	0.62	0.63	0.69	0.84	0.84	0.85	0.90							
Hansen J-statistic (p) value								0.07	0.05	0.07	0.56	0.77	0.88	0.13
Second-order serial correlation (p-value)								0.02	0.03	0.05	0.07	0.07	0.05	0.04
Number of Instruments								7	10	10	10	12	12	38

Note: All equations include period dummies. Fixed effects include dummies for countries. GMM is the Blundell-Bond System-GMM estimator using lagged growth rates and levels as log population and log area as additional instruments. * Significant at 10% level ** Significant at 5% level *** Significant at 1% level. The GMM estimation also uses log population and log area as additional instruments.
* Significant at 10% level ** Significant at 5% level *** Significant at 1% level. Robust t-statistics are given in parentheses.

6. Concluding Remarks

Technology has changed the very nature of the production frontier of services and in particular service exports, which has resulted in a rapid increase in the service exports and growing share of services in GDP growth. Our analysis suggests that increasing sophistication of services is positively related to growth. We specifically look at what countries export rather than how much and the results show that service exports sophistication is positively related to growth, even when controlling for a number of variables across different samples. Though we have not proved causality beyond doubt, there is an indication for a new channel for growth that may be of significance for developing countries, and especially countries that are trying to get out of the middle-income trap.

The distinctiveness of increasing service export sophistication and growth is twofold: i) traditional service activities gain in productivity from technology, transportability and tradability, and ii) there is a host of new service activities that have emerged (due to unbundling and new technological innovation). Thus, thinking about export led growth, diversification, the models of globalization and growth should include specialization and sophistication of services as well. Including services in growth considerations does not imply neglecting manufacturing exports and its benefits, just that services can be an additional channel for promoting high growth. Increasing sophistication in service exports has important implications for countries that are stuck in a "middle-income trap," such as Malaysia, Vietnam, etc., or for countries that wish to sustain their rapid growth, such as India, Sri Lanka, etc. Further, re-igniting growth in United States and G-20 economies will partially rely on innovation and competitiveness in sophisticated service exporting firms. It also offers a prospective route for growth in Africa. In the global rebalancing, service exports might be an imperative channel either through the lens of India-China, South-South Trade, Advanced-Emerging trade clusters or possible new trade networks.

As outlined above, to have a better understanding of how service sophistication affects growth, we need a better and more disaggregated data on service exports, treating them at par with data on goods exports. Considering that service exports sophistication is positively associated with economic growth, our paper set out the future research agenda. What are the determinants of sophistication of service exports and how do they differ from the determinants of good exports sophistication? What are the dynamics in the product space of different service activities? What structural, institutional and economic policies in country-specific context create value added within service exports, foster service productivity growth and export performance, i.e., what are the channels through which service export sophistication affects growth? What is the relation between local trade restrictions and global trade agreements and export of sophisticated services? What are countries doing to prevent sophistication in service exports? Is this nature of service growth inclusive?

There are many examples, but the Indian experience has shown that even when approximately 1 percent of its population is engaged in high productivity service exports, it has contributed to overall high growth. Various factors may drive competitiveness amongst countries exporting services, driving specialization and sophistication in service exports. Countries should continue to build on specialization, but also extend this idea to sophistication in service activities as a potential route to economic growth.

References

Barro, Robert, and Jong-Wha Lee, "Sources of Economic Growth," Carnegie-Rochester Conference series on Public Policy 40 (1994): 1-46.

Baumol, William, "Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis," *American Economic Review* LVII No. 3 (1967): 415-426.

Baumol, William, "Productivity Growth, Convergence and Welfare: What the Long-run Data Show," *American Economic Review* (1986): 1072-1085.

Baumol, William, "Productivity Policy and the Service Sector," In Managing the Service Economy: Prospects and Problems edited by Robert Inman, Cambridge: Cambridge University Press, 1985.

Bhagwati, Jagdish, "Splintering and Disembodiment of Services and Developing Nations," *The World Economy* 7 (1984): 133-144.

Bhagwati, Jagdish, "Why Are Services Cheaper in Poor Countries?" *The Economic Journal* (1984b): 279-86.

Bhagwati, Jagdish, Arvind Panagariya and T.N Srinivasan, "The Muddles Over Outsourcing," *Journal of Economic Perspectives* 18 (4) (2004): 93-114.

Blinder, Alan, "Offshoring: The Next Industrial Revolution?" *Foreign Affairs* 85 (2) (2006): 113-28.

Braomard, Lael and Susan M. Collins, "Off shoring White-Collar Work - The Issues and the Implications," Washington DC: Brookings Trade Forum (2006): 75-134.

Broadberry, Stephen and Bishnupriya Gupta, *"Historical Roots of India's Service-led Development: A Sectoral Analysis of Anglo-Indian Productivity Differences, 1870-2000,"* Warwick Economic Research Papers (2008).

Broadberry, Stephen, "Market Services and the Productivity Race: British Performance in International Perspective," Cambridge: Cambridge University Press (2006).

Bosworth, Barry and Susan M. Collins, "The Empirics of Growth: An Update," *Brookings Papers on Economic Activity* No. 2 (2003): 113-206.

Bosworth, Barry, and Susan M. Collins, "Accounting for Growth—Comparing China and India," *Journal of Economic Perspectives* 22 (1) (2008): 45-66.

Bosworth, Barry, and Annemie Maertens, "The Role of the Service Sector in South Asia in Economic Growth and Employment Generation." in The Service Revolution in South Asia, edited by Ejaz Ghani.(Oxford University Press, 2010).

Bosworth, Barry, Susan M. Collins, and Arvind Virmani, "Sources of Growth in the Indian Economy," in *India Policy Forum (*Washington, DC: Brookings Institution, 2007), accessed November 20, 2010. http://www.brookings.edu/papers/2006/0715globaleconomics_bosworth.asp

Durlauf, Steven, Andros Kourtellos, and Chih Ming Tan, "Empirics of Growth and Development," Discussions Papers Series 0520, Department of Economics, Tufts University (2005).

DeLong, Bradford, and Lawrence H. Summers, "Equipment Investment and Economic Growth," *Quarterly Journal of Economics* 106: 2 (1991): 445-502.

Felipe, Jesus, Miguel Leon-Ledesma, Matteo Lanzafame, and Gemma Estrada, "Sectoral Engines of Growth in Developing Asia: Stylized Facts and Implications," Asian Development Bank ERD Working Paper No. 107, Manila, Philippines (2007).

Francois, Jospeh, and Bernard Hoekman, "Services Trade and Policy," *Journal of Economic Literature* 48 (3) (2010): 642–92.

Fixler, Dennis, and Donald Siegel, "Outsourcing and Productivity Growth in Services," S*tructural Change and Economic Dynamics* 10 (1999): 177–94.

Gabriele, Alberto, "Exports of Services and Economic Growth in Developing Countries," United Nations Conference on Trade and Development, (2004).

Gordon, James, and Poonam Gupta, "Understanding India's Services Revolution," International Monetary Fund Working Paper WP/04/171 Washington, DC: IMF (2004).

Ghani, Ejaz, and Homi Kharas, "Overview in The Service Revolution in South Asia," edited by Ejaz Ghani, Oxford University Press, (2010).

Ghani, Ejaz ed., "The Service Revolution in South Asia," Oxford University Press, (2010).

Eichengreen, Barry and Poonam Gupta, "Two Waves of Services   Growth", NBER Working Paper no. w14968, (2009).

Barry Eichengreen and Poonam Gupta, "The Service Sector as India's Road to Economic Growth?," forthcoming NBER working paper, India Policy Forum, (2010).

Escaith, Hubert. "Measuring Trade in Value Added in the New Industrial Economy: Statistical Implications." Unpublished (2008).

Hausmann, Ricardo, Jason Hwang, and Dani Rodrik, "What You Export Matters," *Journal of Economic Growth*, 12:1 (2007): 1-25.

Hausmann, Ricardo, Dani Rodik, and Andres Velasco, "Growth Diagnostics," Working Paper, Kennedy School of Government, Harvard University, Cambridge, (2005).

Hoekman, Bernard, and Aaditya Mattoo, "Services Trade and Growth," World Bank Policy Research Working Paper No. 4461 (2008).

Jensen, Bradford, and Lori Kletzer, "Tradable Services: Understanding the Scope and Impact of Services Offshoring," in Brookings Trade Forum (2005).

Jensen, Bradford, and Lori Kletzer, "Fear and Offshoring: The Scope and Potential Impact of Imports and Exports of Services," Peterson Institute for International Economics, Policy Brief PB08-1 (2008).

Kletzer, Lori, "Globalization and Job Loss, from Manufacturing to Services," *Economic Perspectives*, Federal Reserve Bank of Chicago, Second Quarter (2005).

Kochhar Kalpana, Raghuram Rajan, Utsav Kumar, Arvind Surbamanian, and Ioannis Tokatlidis, "India's Pattern of Development: What Happened, What Follows," *Journal of Monetary Economics*, 53:5 (2006): 981-1019.

Lucas, Robert, "On the Mechanics of Economic Development," *Journal of Monetary Economics* 22 (1988): 3–42.

International Monetary Fund. Balance of Payments Yearbook. Washington, DC: IMF(2010).

Kaldor, Nicholas "Causes of the Slow Rate of Economic Growth of the United Kingdom," Cambridge: Cambridge University Press (1966).

Kaldor, Nicholas, "Strategic Factors in Economic Development," The Frank W. Pierce memorial lectures, New York State School of Industrial and Labor Relations, Cornell University (1966).

Lall, Sanjaya, John Weiss, Jinkang Zhang, "The 'Sophistication' of Exports: A New Measure of Product Characteristics," Queen Elizabeth House Working Paper Number 123, Oxford University (2005).

Mann, Catherine, "Accelerating the Globalization of America: The Role for Information Technology," Washington DC: Peterson Institute for International Economics (2006).

Mattoo, Aaditya , and Deepak Mishra, "Sustaining India's Services Revolution," Washington, DC: World Bank (2004).

Pack, Howard, and Marcus Noland, "Industrial Policy in an Era of Globalization: Lessons from Asia," Peterson Institute of International Economics. Washington, DC (2003).

Pack, Howard, and Kamal Saggi, "Is There a Case for Industrial Policy? A Critical Survey," World Bank Research Observer, Washington, DC (2006).

Polanyi, Karl, and Joseph Stiglitz, "The Great Transformation: The Political and Economic Origins of our time," Beacon Press (2001).

Rodrik, Dani, "Growth After the Crisis" mimeo Cambridge MA (2009), accessed November 20, 2010.   http://ksghome.harvard.edu/~drodrik/Growth%20after%20the%20crisis.pdf

Rodrik, Dani, "Normalizing Industrial Policy," paper prepared for the Commission on Growth and Development (2007).

Schott, Peter, "The relative sophistication of Chinese exports," *Economic Policy* 53:5-49 (2008).

Triplett, Jack, and Barry Bosworth, "Services Productivity in the United States: New Sources of Economic Growth, "Washington, D.C: Brookings Institution Press (2004).

United Nations Industrial Development Organization (UNIDO), "Breaking In and Moving Up: New Industrial Challenges for the Bottom Billion and the Middle-Income Countries," Industrial Development Report (2009).

Weiss, John, "Changing Trade Structure and Its Implications for Growth," World Economy November, (2010).

World Bank, World Development Indicators, The World Bank Group, Washington, D.C. (2010).

World Trade Organization. *International Trade Statistics 2009*. Geneva: World Trade Organization. (2009).

APPENDIX

Table A1. Services becoming a bigger share of global production

	1971–80			1981–90			1991–2000			2001–07		
Average annual growth	Agriculture	Industry	Services	Agriculture	Industry	Services	Agriculture	Industry	Services	Agriculture	Industry	Services
World	1.6	3.0	4.1	2.9	2.7	3.3	1.9	2.3	3.1	2.3	2.9	3.2
Low & middle income	2.5	5.2	6.3	3.5	3.3	3.4	2.3	4.5	4.4	3.5	7.0	6.2
East Asia & Pacific	2.7	9.1	8.8	5.3	8.0	9.0	3.4	11.0	8.4	3.9	10.0	9.5
South Asia	1.6	3.9	4.4	3.5	6.3	6.2	3.0	5.5	6.6	3.3	7.9	8.5
Euro area	1.6	2.6	4.2	1.9	1.6	2.9	1.5	1.3	2.6	–0.5	1.9	2.1
Latin America & Caribbean	3.4	5.3	6.3	2.1	0.7	1.6	2.0	2.9	3.8	3.6	2.9	3.6
Upper middle income	3.1	5.0	6.1	2.0	1.4	2.1	0.8	1.6	3.2	3.1	3.9	4.3
Brazil	4.8	9.9	8.5	2.7	0.5	2.4	3.2	1.8	3.9	4.5	2.8	3.6
China	2.1	9.2	11.5	6.2	9.6	12.4	3.8	13.6	10.9	4.1	11.6	10.9
Ireland							1.6	12.2	8.1	–2.5	5.8	6.1
Singapore	2.2	9.5	8.0	–4.4	6.7	8.2	–3.1	7.8	7.8	1.8	4.7	6.0
India	1.8	4.0	4.4	3.5	6.2	6.6	2.8	5.6	7.3	3.4	8.1	9.3
United States	0.1	1.3	3.3	4.4	2.3	3.0	4.8	3.2	3.2	1.8	0.8	2.9
Share in GDP												
World	7.9	37.4	54.7	5.9	34.8	59.3	4.4	30.4	65.3	3.3	27.8	68.9
Low & middle income	23.0	36.4	40.6	19.6	37.1	43.3	14.4	35.2	50.4	11.0	36.0	53.0
East Asia & Pacific	31.0	41.3	27.7	27.2	41.1	31.7	18.7	43.5	37.8	12.8	45.2	42.0
South Asia	37.6	23.0	39.4	31.1	25.3	43.5	26.9	25.9	47.1	20.4	27.4	52.3
Euro area	6.2	38.3	55.5	4.2	34.0	61.7	2.9	29.2	67.9	2.1	26.7	71.2
Latin America & Caribbean	12.0	37.9	50.2	10.0	38.9	51.2	7.1	31.2	61.6	6.4	32.0	61.5
Upper middle income	13.9	37.3	48.8	10.9	39.4	49.7	7.9	33.7	58.5	6.3	33.4	60.2
Brazil	12.6	39.9	47.6	10.2	44.0	45.8	6.6	31.5	61.8	6.3	28.3	65.4
China	31.8	45.3	22.9	29.1	43.6	27.3	19.3	45.9	34.9	12.7	46.7	40.6
Ireland	16.1	34.4	49.5	10.7	34.9	54.4	6.3	37.8	56.0	2.3	36.8	60.9
Singapore	1.9	35.1	62.9	0.9	36.9	62.2	0.2	35.2	64.6	0.1	32.4	67.5
India	38.2	23.0	38.7	31.3	26.2	42.5	27.0	26.4	46.6	19.9	27.7	52.4
United States	3.7	34.0	62.3	2.4	30.6	67.0	1.6	25.4	72.9	1.2	22.3	76.5

Source: World Development Indicators, World Bank, 2010 and authors' calculations

Figure A1. Decomposing GDP growth

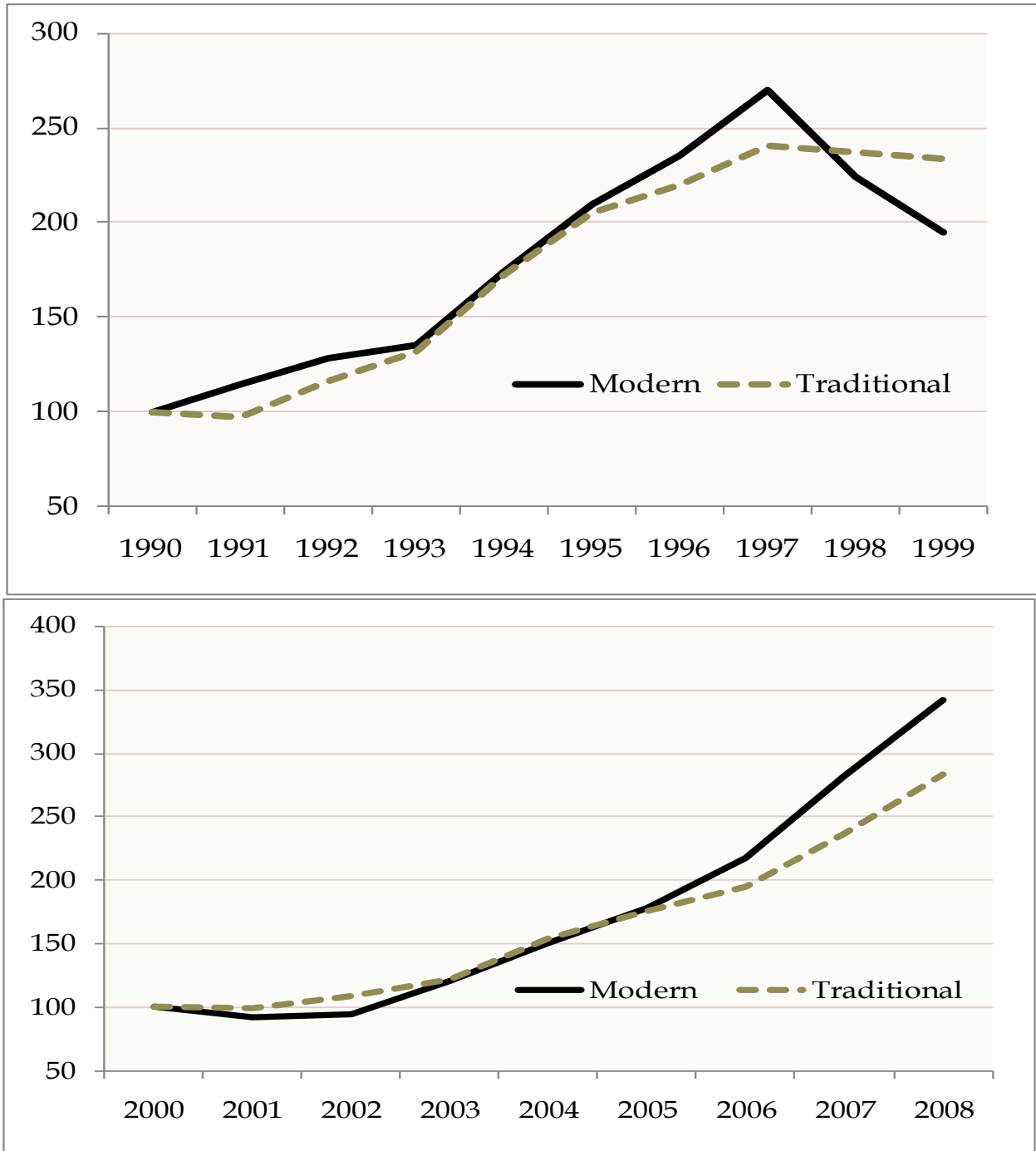*World*

Developing countries
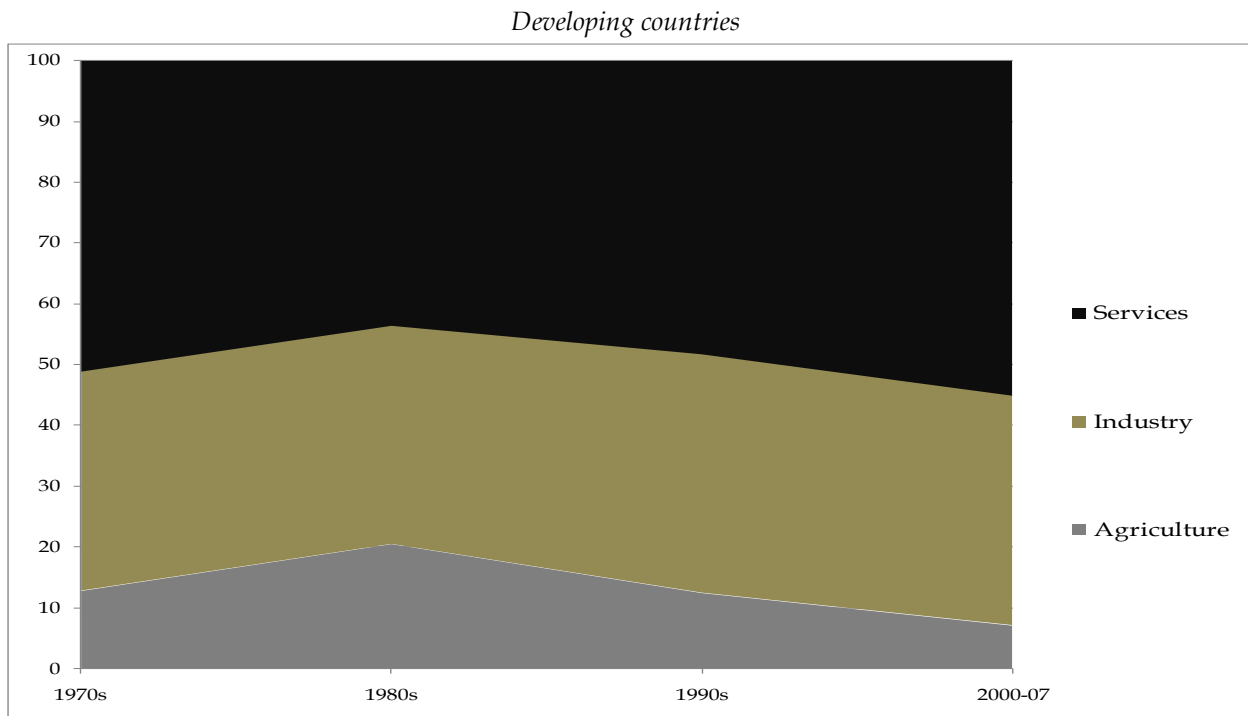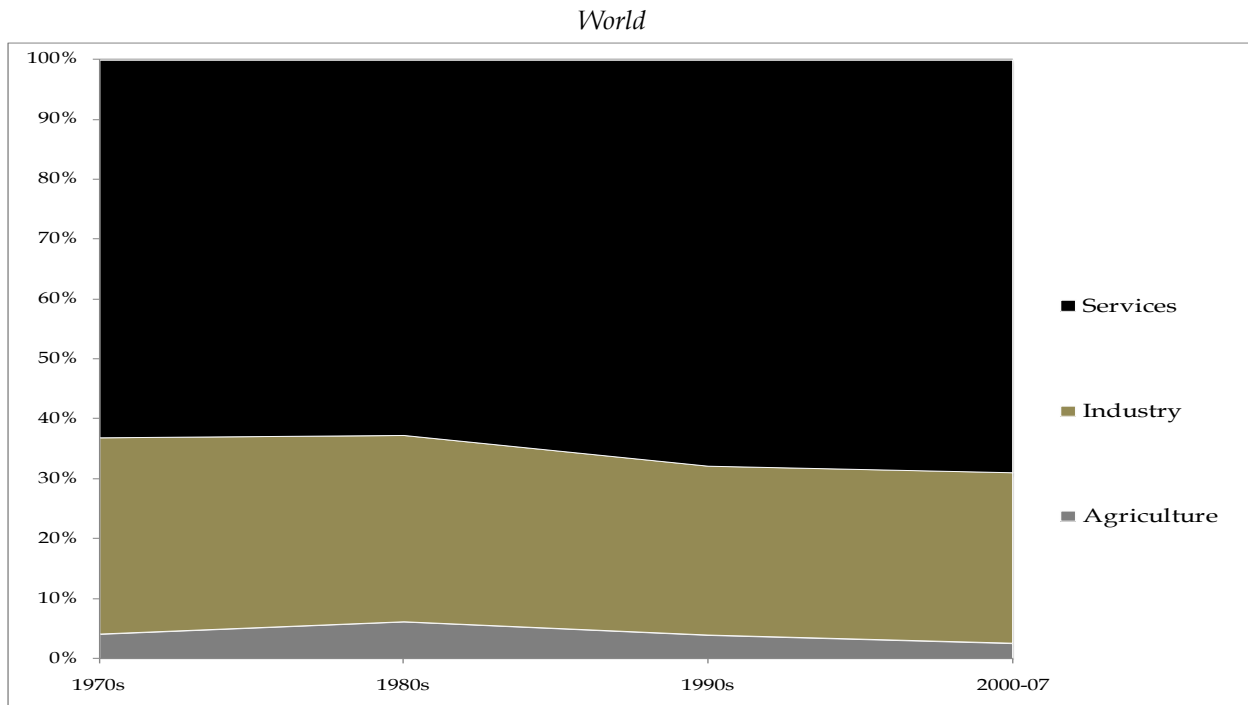
Source: World Development Indicators, World Bank, 2010 and authors' calculations.
Note: Developing countries are Low-and middle-income economies for who 2009 GNI per capita was $12,195 or less.

Figure A2. Growth in Modern and Traditional Service Exports

Note: In the first figure 1990 is indexed to 100 and the second figure 2000 is indexed to 100. Modern Services include communication, insurance, finance, computer & information, royalties and license fees and other business services. Traditional service are Transport, Travel, Construction, Personal, cultural and recreational services.

Table A2. Growth in PRODY's

	Transportation	Travel	Communication	Construction	Insurance	Financial	Computer Information	Royalties & license fees	Other business	Personal & cultural recreational
Average annual growth 1991-2000	4.40%	1.90%	4.40%	-2.30%	6.90%	5.70%	6.90%	5.80%	4.70%	5.80%
Average annual growth 2000-07	2.50%	2.70%	2.30%	7.00%	0.60%	6.50%	3.90%	7.20%	5.80%	3.40%

Table A3. Mean & Standard Deviation of Service EXPY

| Year	Number of reporting countries	Standard Deviation	Mean
1990	138	1258	6615
1991	140	1249	6767
1992	144	1294	6855
1993	151	1321	6957
1994	151	1331	7228
1995	152	1598	7900
1996	153	1465	8085
1997	155	1380	8279
1998	155	1504	8538
1999	155	1728	8921
2000	155	1807	9253
2001	155	1787	9546
2002	160	1809	9855
2003	160	1905	10069
2004	161	2056	10487
2005	159	2179	10924
2006	153	2314	11462
2007	144	2599	11859

Figure A3. Cumulative distribution of Service EXPY
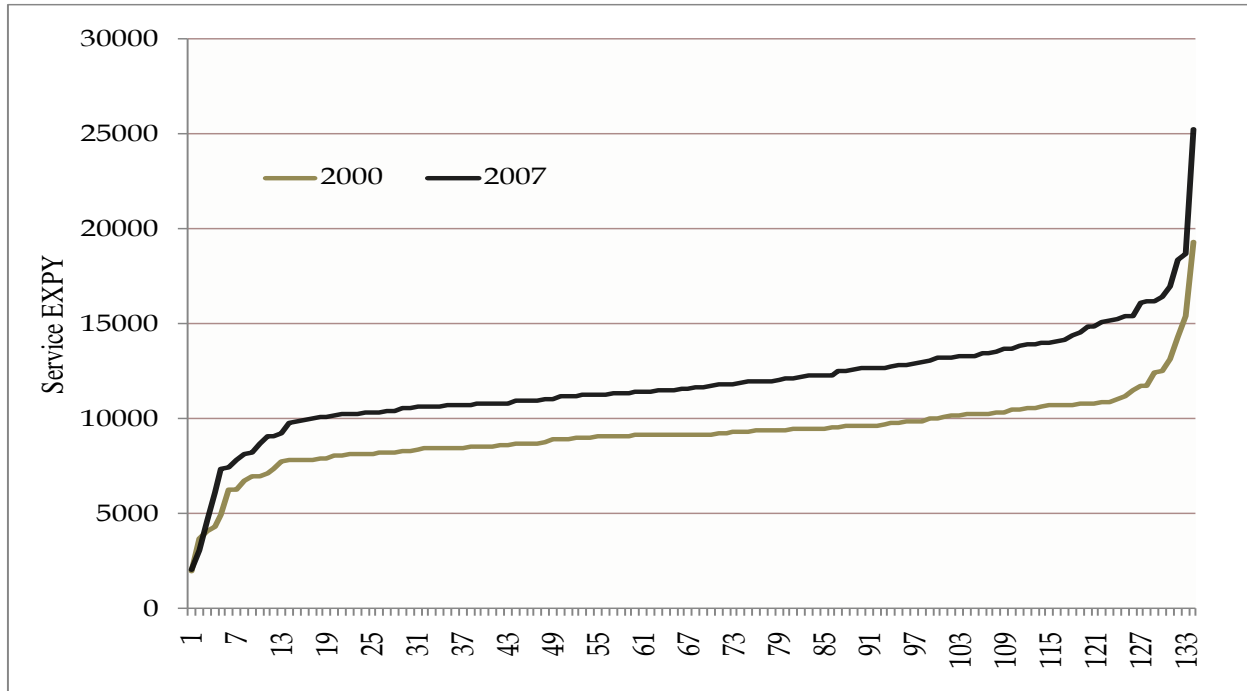
Source: Authors' calculations.
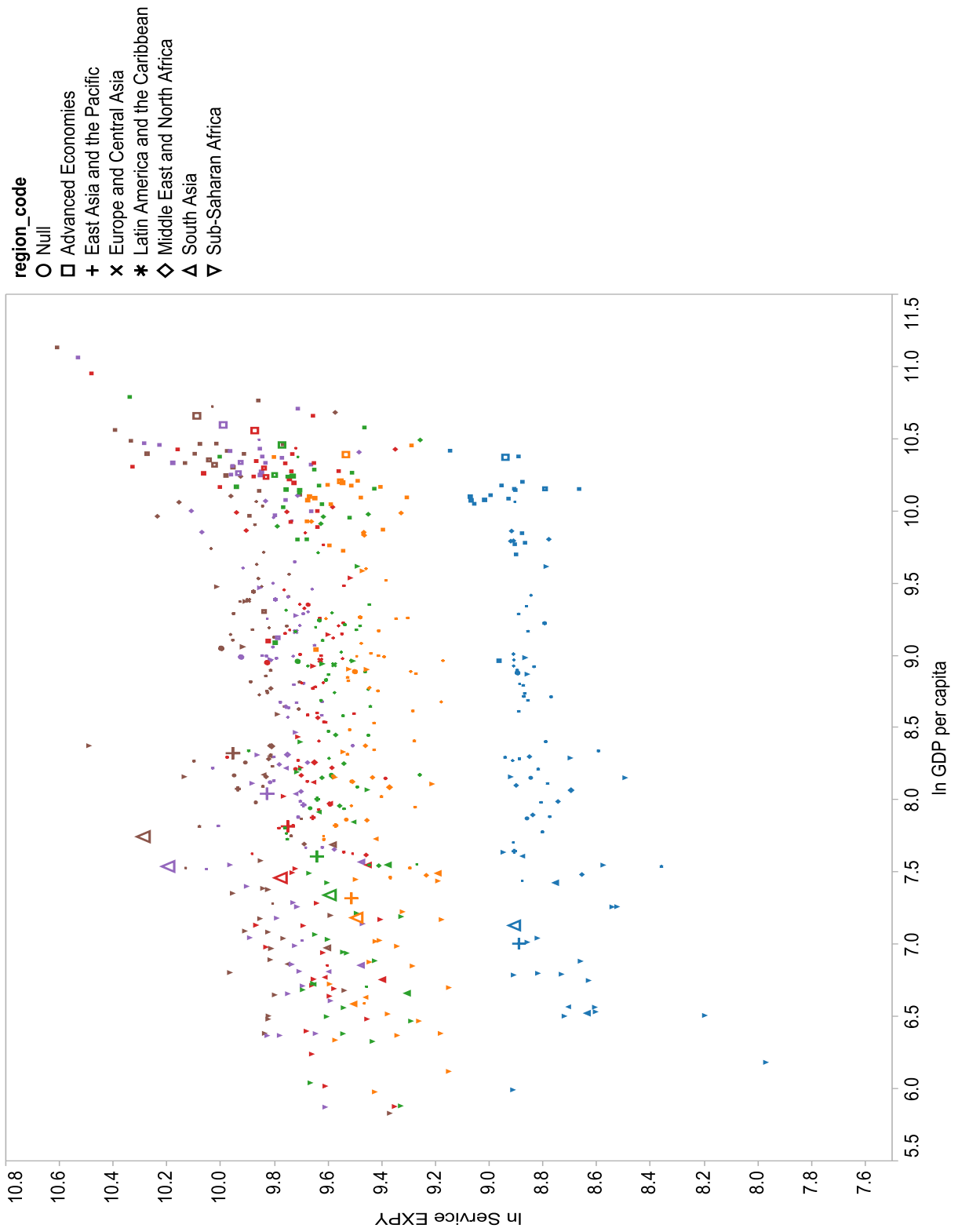
Figure A4. Service EXPY against GDP per capita
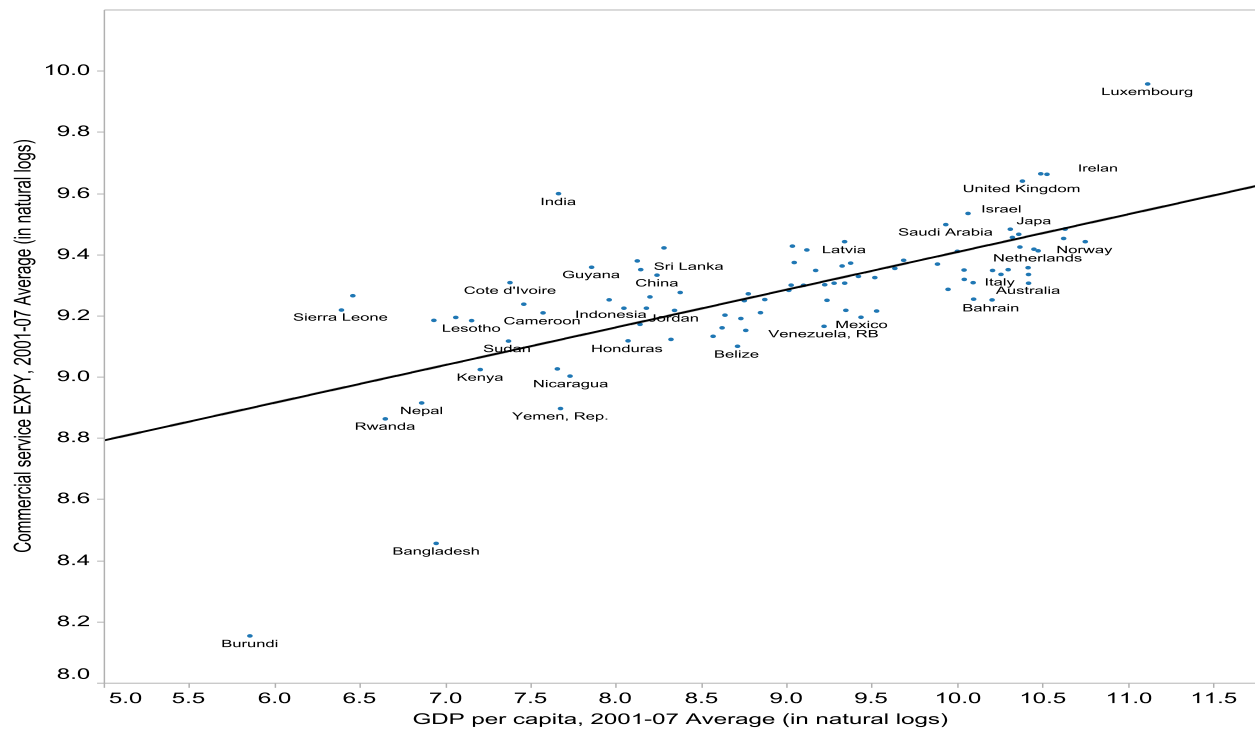
Source: Authors' calculations.

Figure A5. ln Service EXPY against ln Goods EXPY over time
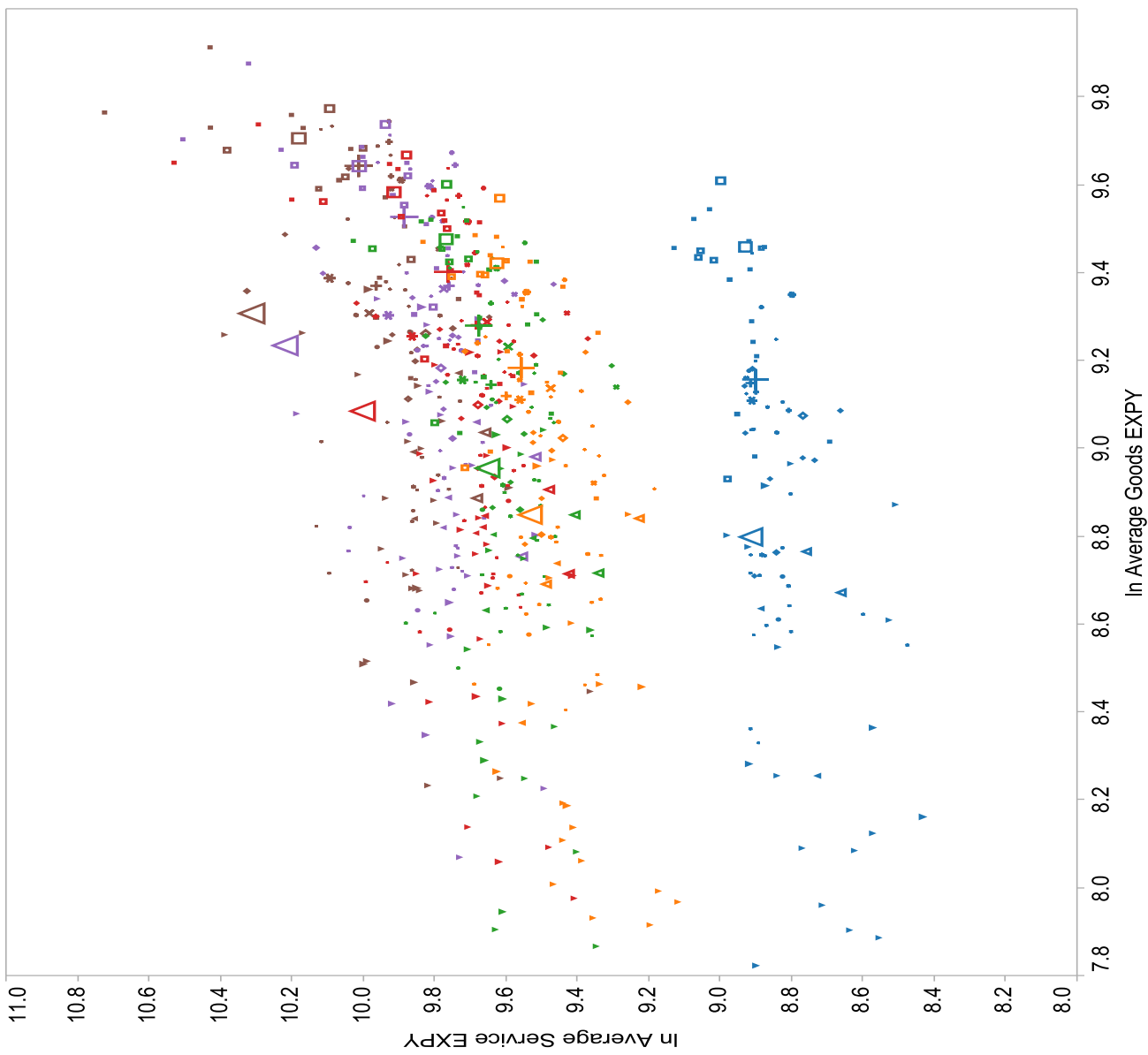
Average of expyppavg vs. average of commercial_service_avg_ln. Color shows details about year. Size shows average of pop. Shape shows details about region_code. Details are shown for code. The view is filtered on code, which excludes DEU and VNM.

Figure A6. ln Service EXPY against ln GDP per capita over time

Average of lngdppc vs. average of commercial_service_ln. Color shows details about year. Shape shows details about region_code. Details are shown for code. The view is filtered on Exclusions (code,year), which specifies a set. Size shows average of pop.

Annex

Annex 1: Service Exports Data description

Export Service Category	Explanation
Transportation	Transportation covers all transportation (sea, air, land, internal waterway, space, pipeline, etc) services that are performed by residents of one economy for those of another and that involve the carriage of passengers, goods (freight), rentals of carriers with crew, and related supporting services.
Travel	Travel differ from the other categories in the sense that the consumer (traveler) moves to the location of the provider (a resident of the economy) and what is covered by the travel category are those goods and services acquired during the visit (less than a year). The international carriage of the traveler is covered under transportation. The measure can be interpreted as a proxy for international tourism, business travelling and international student (even if staying longer than one year).
Communication	Communication covers (i) telecommunication and (ii) postal and courier between residents and nonresidents international transactions.
Construction	These are construction services performed by employees outside the country of the location of the enterprise. It also includes the goods the employees bring with them abroad to perform the task. Expenditures for local good though are recorded under Other business services.
Insurance	Insurance services cover insurances provided by a resident to a nonresident and vice versa. It would often be freight insurances but also other direct services.
Financial	Financial services cover financial intermediary and auxiliary services (except those of insurance enterprises and pension funds) between residents and nonresidents. This could be fees related to letters of credit, lines of credit, financial leasing, foreign exchange transaction, transaction in securities, asset management, etc, etc.
Computer Information	Computer data and new-related service transactions between residents and nonresidents. These could be data bases, data processing, hardware consultancy, software implementation, maintenance and repair of computers, new agency services, etc.
Royalties & license fees	These are exchange of payments between residents and nonresidents for the use of intangible and nonfinancial assets or property rights such as patents, copy rights, franchising, manuscripts, films, etc).
Other business	Other businesses include (i) Merchanting (the purchase of goods by a resident from a nonresident and the subsequent resale to another nonresident, during which the good does not leave the compiling country), (ii) Operational leasing without operators covers resident-nonresident leasing, and charter without crew, (iii) Miscellaneous services, including (a) legal, accounting, management consulting, public relation services, (b) advertising and market research services, (c) research and development services, (d) architectural, engineering and other technical services, (d) agricultural, mining and on-site processing services, and (e) other services between residents and nonresidents.
Personal & cultural	These services are divided into (i) audiovisual (services and fees for motion pictures – including to actors and producers, radio and television programs and musical recordings) and (ii) other (services related to museums, libraries, sporting, correspondence courses, etc).

Annex 2: Data description

Indicator	Description	Source
Country Size	Country area in square kilometers	World Bank, 2008, WDI
Expected years of schooling	Expected years of schooling is the number of years a child of school entrance age is expected to spend at school, or university, including years spent on repetition.	Barro & Lee, 2010.
Financial Services	Financial services cover financial intermediary and auxiliary services (except those of insurance enterprises and pension funds) conducted between residents and non-residents.	Balance of Payments, 2010. IMF
Goods Exports	Goods exports refer to all movable goods (including nonmonetary gold) involved in a change of ownership from residents to nonresidents. Forms of processed goods, repairs on goods, and goods procured in ports by carriers.	Balance of Payments, 2010. IMF
Insurance Services	*Insurance services* cover the provision of various types of insurance to non-residents by Trade in services by service-category and country resident insurance enterprises, and vice versa.	Balance of Payments, 2010. IMF
Institutional Democracy	Value between 0 and 10. This is composite index which includes information on degree of participatory democracy, the existence of institutionalized constraints on the exercise of power by the executive and other aspects of plural democracy, such as the rule of law, systems of checks and balances, freedom of the press.	ACI Datasets, Available publicly at http://www.systemicpeace.org/inscr/inscr.htm
Log GDP per capita	Natural Log of GDP per capita, which is measured in constant 2005 PPP$	World Development Indicators, World Bank. 2010.
Personal, cultural and recreational services	(i) audiovisual and related services and (ii) other personal, cultural and recreational services.	Balance of Payments, 2010. IMF
Service Exports	Services refer to economic output of intangible commodities that may be produced, transferred, and consumed at the same time.	Balance of Payments, 2010. IMF
Services (% of GDP)	Value added of service in GDP	World Development Indicators, World Bank. 2010.
Labor Productivity	Value added by sector x (at constant 2000 US$) divided by total employment in sector x	WDI, World Bank, 2010. Bosworth, Maertens. 2010 for India. Bosworth, Collins, 2007 for China
Transportation Services	*Transportation* covers all transportation (sea, air, and other - including land, internal waterway, space, and pipeline) services that involve the carriage of passengers, the movement of goods (freight), rentals (charters) of carriers with crew, and related supporting and auxiliary services.	Balance of Payments, 2008. IMF
Travel Services	Travel covers primarily the goods and services acquired from an economy by travelers during visits of less than one year in that economy.	Balance of Payments, 2008. IMF
Value added	Value added in Agriculture, Manufacturing, Industry and Services in constant 2000 US$	World Bank, 2008, WDI