ARTNeT

TRADE PERFORMANCE AND COMPETITIVENESS: SELECTED ISSUES RELEVANT FOR ASIAN DEVELOPING ECONOMIES

A study by the Asia-Pacific Research and Training Network on Trade

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Economic and Social Commission for Asia and the Pacific

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ARTNeT

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Trade performance and competitiveness: Selected issues relevant for Asian developing economies

TRADE PERFORMANCE AND COMPETITIVENESS: SELECTED ISSUES RELEVANT FOR ASIAN DEVELOPING ECONOMIES

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Foreword

This volume comprises four selected research essays on different aspects of trade and industry issues in the Asian region.[1] They are written by researchers in Asian countries, brought together by the Asia-Pacific Research and Training Network on Trade (ARTNeT) which from April 2011 until September 2013 has implemented its Phase III under the topic of "Drivers of Competitiveness and Strategies for Economic Diversification for Developing Countries – Building Policy Making Capacity in Asia and the Pacific". The latest phase of ARTNeT reflects the diversity and breadth of research interests, as well as the depth of research talent, available in the region and harnesses these assets in addressing the major development policy issues facing developing Asian countries. Since its establishment ARTNeT has focused the efforts of the network on ensuring that research institutions of the Asia-Pacific region, particularly those in least developed countries, provide more relevant and higher-quality applied research and policy recommendations to policymakers. ARTNeT and its members and associates have endeavored to produce high quality and relevant studies on trade issues on the basis of a demand-driven research programme, to improve the communication and dissemination of research study results of research institutions to policymakers; and to increase the capacity of research institutions in the region, especially in the least developed countries. All of this has been done with the aim of making trade and investment related research more useful and accessible to policymakers who are thus better informed and able to design and prepare for implementation of coherent trade and investment related policies for inclusive development.

With the success of the previous phases ARTNeT has evolved to be one of the leading networks of researchers, analysts and policymakers in the region. Its acceptance as an active and unique network seems fully justified when viewed from its membership which is cohesive, professionally credible and mutually supportive. The growth and extensive outputs of the network in itself speaks volumes about the relevance of the network and the demand for its quality outputs. The interest in the capacity building and training conducted by ARTNeT has grown at a similar pace and it testifies to the strong need for organizations like ARTNeT to continue addressing gaps in capacity within the Asia-Pacific.

The studies in this volume and other research produced under the ARTNeT Phase III Research programme (available through ARTNeT's website) are produced with the aim of addressing these explicit and implicit demands of the Asia-Pacific countries and to fill in the gaps in capacity and knowledge. The studies are of significance and interest to researchers and policy analysts alongside policymakers. This is primarily because they look at previously unexplored issues using new and innovative analytical and methodological approaches, which can be drawn on to conduct similar studies in the region. We hope that these will stimulate further work on these important issues.

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[1] The volume carries only several of the studies that were conducted under this programme phase reflecting the efforts towards reducing the volume of printed publications and a gradual shift to online release only. The other studies undertaken under this phase are available in electronic copies.

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The authors of the studies and the ARTNeT secretariat received invaluable research guidance, constructive comments and suggestions from advisor to this project Professor Sisira Jayasuriya, Monash University, Australia, and other experts whom the authors have acknowledged for specific studies. The project was coordinated by Dr. Mia Mikic, Chief, Trade Policy and Analysis Section, ESCAP under the general guidance of Dr. Ravi Ratnayake, Director, Trade and Investment Division, ESCAP. The authors have also had the opportunity to discuss their methodology and preliminary findings during the ARTNeT conference on "Empirical and policy issues of integration in Asia and the Pacific" on 1 to 2 November 2012 held in Colombo, Sri Lanka, in which the discussants, Mr. Denis Hew, Mr. Jason Lao, Mr. Sarath Rajapatirana, Dr. Nagesh Kumar and other participants provided very useful comments and suggestions. Notwithstanding this, any remaining errors and omissions in this publication should be attributed to the authors only and not to the advisors and benevolent commentators. There are many other people that needed to be thanked, without implicating them in the views expressed in this volume, for assisting through the process, since the design of ARTNeT Phase III until preparation of these selected studies for the publication. These include Ms. Melanie Ramjoue who contributed to the formulation of the Phase III programme and Mr. Adam Heal who has coordinated the preparation of the book for print. The studies in the book were edited by Ms. Nicole Colmar and other research under the programme by Mr. Robert Oliver both of whom should be thanked for more uniform style of the material presented but should not be blamed for the content remaining. Ms. Panjai Limchupong, Ms. Tavitra Ruyaphorn and Ms. Chaveemon Sukpaibool have all contributed in different but important ways towards the fruition of the project. Mr. Teemu Alexander Puutio has provided technical support to the ARTNeT Secretariat and also, with Yisi Chen, the idea for the cover page of the book. The International Development Research Centre's support since the establishment of ARTNeT and during this phase is gratefully acknowledged. This support proved to have been the factor that made an important difference in the effectiveness of research capacity-building in the trade and trade-related areas under ARTNeT since 2004. This, combined with a significant substantive contribution from the ESCAP secretariat as well as a technical support in the implementation of the projects, have been instrumental in the growing presence of ARTNeT in the region.

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Acronyms and Abbreviations

AB	Arellano-Bond
ACE	Air-Conditioning Equipment
ADB	Asian Development Bank
ADF	Augmented Dickey-fuller
ARTNeT	Asia-Pacific Research and Training Network on Trade
ASEAN	Association of Southeast Asian Nations
ATE	Average Treatment Effects
BAs	Business Associations
BEC	Broad Economic Categories
CAGR	Compound Annual Growth Rate
CES	Constant Elasticity of Substitution
CoC	Chamber of Commerce
DCS	Department of Census and Statistics of Sri Lanka
DID	difference-in-differences
EHS	Early Head Start
ERIA	Economic Research Institute for ASEAN and East Asia
ESCAP	Economic and Social Commission for Asia and the Pacific
EXPY	export basket of a country
FEM	Finite Element Method
FTAs	Free Trade Agreements
GDP	Gross domestic product
HS	Harmonized System
CIC	Industry and Commerce
ICT	Information and Communication Technology
IDE-JETRO	Institute of Developing Economies-Japan External Trade Organization
IIT	Intra-Industry Trade
IoO	Index of Opportunities
ISIC	International Standard Industrial Classification of All Economic Activities
IT	Information technology
ITC	International Trade Centre
LDCs	Least Developed Countries
LPI	Logistics Performance Index
MNEs	Multinational Entities
MSMEs	Micro, small, and medium Enterprises
NAFTA	North America Free Trade Agreement
NBER	National Bureau of Economic Research
NIC	National Industrial Classification
NTIS	Nepal Trade Integration Strategy
OLS	Ordinary Least Squares
PCA	Principal Component Analysis
Pce	per capita consumption of electricity
PSM	Propensity score matching

RCA	Revealed comparative advantage
SAFTA	South Asian Free Trade Area
SEZ	Special Economic Zone
SITC	Standard International Trade Classification
SMEs	Small and Medium Enterprises
SSCs	Supply-side constraints
SV	Strategic Value
UNCTAD	United Nations Conference on Trade and Development
USDA	United States Department of Agriculture
WDI	World Development Indicators
WITS	World Integrated Trade Solution
WTO	World Trade Organization

Overview

The first essay on “Structural transformation and trade policy: The Case of Nepal” by Paras Kharel reviews recent trade and industry policy initiatives in Nepal. This is in the context of recent literature pioneered by Dani Rodrik, Ricardo Hausmann and colleagues, suggesting that some patterns of production and trade may be more conducive to structural transformation and industrialization. The essay provides an excellent overview of this new literature, which is starting to have an important influence in both academic and policy circles. It also provides an application of some of the approaches using network analysis to develop a graphical representation of the product space in Nepal. Based on a very detailed and comprehensive analysis, Kharel draws important implications for trade and industry policy. He argues that there is scope for better targeting of Nepalese trade and industry promotion policies.

Kharel’s discussion raises some of the unresolved and difficult issues in targeted government interventions of this type. These issues have a long history; from the time when import substitution industrialization (ISI) policies held sway in much of the developing world, and that continue today to have relevance for policy debates. This is not only in Nepal, but also for many other countries grappling with the challenges of sustaining industrialization and development over the longer term. The long history of ISI policies provides plenty of examples where government interventions to guide the industrialization process through targeted support has resulted in costly misallocation of resources, which often trap economies in “infant industries that never grow up”. While making a case for governments to pay attention to the potential benefits of well-directed industry promotion, Kharel also points to the potential tension between assisting industries with the highest potential for export earnings and employment and, on the other hand, assistance for upgrading the industrial and export structures, and capabilities to be able to produce and export (or expand) the production and export of, more sophisticated products requiring a greater number of capabilities. For a country like Nepal, traditional labour-intensive industries (such as garments) may offer the best potential in terms of maximising export earnings and employment. However, it may not be most helpful for industry upgrading and a progressive shift into more sophisticated manufactured products.

In the second essay, “Logistics performance, trade and production fragmentation: An analysis of India’s trade with Bangladesh and Thailand”**,** Prabir De and Amrita Saha investigate the important issue of logistical services for successful industrialization and export growth. They analyse the link between logistical performance and trade in parts and components in the manufacturing industries. This is central to the growth of international production linkages and networks associated with the phenomenon of international production fragmentation. They focus specifically on trade in two commodities – India’s export of yarn to Bangladesh and India’s import of air-conditioning equipment from Thailand, in the context of the broader regional trading context.

Logistics involves a multiplicity of services including various forms of transport, communications and quality of human resources. They develop a logistical services index

for 20 Asia-Pacific countries based on data on a wide range of such services. This is to quantify the link between logistic services and trade. They demonstrate not only that improved logistical services have a positive impact on trade, but also that there is a two-way relationship between trade and logistical services in that increased trade, in turn, tends to enhance the quality of logistical services. Although the precise mechanism through which this occurs is not explored in the paper, it is likely that expanded trade in turn may induce market and government policy responses. The wide differences observed in quality of logistical service among the countries studied indicate that there is a large potential for improvement in logistics. In turn, this contributes to beneficial expansion of trade and fosters closer and deeper regional production linkages.

The pace and impact of progress in trade and industrialization in the region ultimately depends on the extent to which firms can address the challenges of competing and succeeding in markets where policy liberalization and the resulting pressures from globalization intensify competitive pressures, even as they open up broader opportunities. The importance of firm level differences in critically influencing outcomes when economies are opened up to international competition has been highlighted in recent literature on international trade following Melitz (2003). The next two essays explore firm level issues related to competing in globalized markets.

In the third essay, “An analysis of export performance of manufacturing and service sector enterprises in Sri Lanka”, Jeevika Weerahewa, Sarath S. Kodithuwakku and Rifana Buhary investigate the different characteristics of exporting and non-exporting firms in two key industries using a rice data set from a recent (2011) World Bank “Enterprise Survey” of over 800 firms. The researchers chose econometric techniques and a modelling approach that avoids the common problem of “selection bias” in studies of this type. They show that several firm-level characteristics, in particular size and geographical location, as well as the managers’ perceptions regarding the overall business environment, influence whether firms become exporters or not. Indeed, a few large exporters, many with foreign linkages, account for the bulk of exports. The results of this study raise several issues that merit future investigation in more detail, including the reasons for different managerial perceptions regarding the business climate. The overall impression conveyed by the results of this analysis is that Sri Lanka faces formidable challenges if it were to succeed in fostering a broad based export culture among the small and medium sized firms who comprise the majority.

The final essay, “Evaluation of business association membership on small and medium enterprises’ growth performance: Evidence from enterprise survey of Cambodia” is by Vathana Roth. It addresses issues relating to the major policy challenge of how to assist small and medium enterprises operating in a developing country setting of imperfect factor and information markets, and how to overcome scale and market access constraints. It examines factors that impact on performance among small and medium firms, with a focus on whether business associations can contribute to increasing their competitiveness and overall performance. The study uses data from the 2007 World Bank Enterprise Surveys of Cambodia to examine the impact of belonging to a business association on Small and

Medium Enterprises (SMEs) from four sectors – manufacturing, tourism, trade, and others. The analytical approach involved propensity score matching (PSM) as well as PSM with ordinary least squares (OLS) regression. The study finds that firms belonging to business associations tend to have higher turnover and production, and tend to spend more on production and other related costs. However, it did not find membership to have any significant impact on firms' labour productivity and labour cost per worker. This may be due to business associations in Cambodia having limited capacity to enhance productivity of members through provision of appropriate services. In any case, the results ought to be treated with some caution, not only because of data limitations but also as participation in such associations is a relatively new experience for many firms.

I. Structural transformation and trade policy: Case of Nepal

By Paras Kharel

Introduction

High and sustained economic growth entails structural transformation. This involves the shift of productive factors from low-productivity and low-wage activities to high-productivity and high-wage activities. The aim is to move the output structure into higher-productivity activities, and production of more complex and sophisticated products. In the past, structural transformation was generally seen as a consequence of growth and development. However, recent advance in literature has produced powerful analysis methods for appreciating the role of structural transformation in inducing growth and development. It also provides evidence that product potential varies in effecting structural transformation. In particular, what a country exports now influences the type of goods it will export in future, thus influencing its future economic growth rate. In this context, the literature suggests that governments may have a more direct and important role to play, particularly in economies with low economic complexity.

These findings are particularly relevant for Nepal. Asa least developed economy starting to rebuild its economy after a period of political conflict, it is now attempting to embark on a sustainable economic development path. The country has formulated a range of policies, including Trade Policy 2009 and Nepal Trade Integration Strategy (NTIS) 2010, for active government intervention in stimulating export growth and industrialization. It has also selected products to be given high-priority status for government support. This paper analyses the nature and extent of structural change in the Nepali economy by studying trends, patterns and composition of productivity growth. It also assesses Nepal's export performance, including the sophistication and diversification of its exports, and the extent government high-priority products have in assisting Nepal's structural transformation and future growth.

The rest of the paper is organized as follows. Section 2 reviews the literature on structural transformation, including recent methodological advances. Section 3 discusses Nepal's economic and export performance. Section 4 discusses sectoral productivity growth and whether structural change has been growth-enhancing or growth-reducing in Nepal over a recent decadal period. Section 5 reviews Nepal's trade policy, plans and strategies, with focus on products identified for export promotion. Section 6 discusses the methods and data used for analysing the nature, pattern and prospects of structural transformation from the export dimension. Section 7 analyses the evolution of Nepal's export basket in terms of export sophistication and diversification. It also assesses the prospects for structural transformation offered by products identified/targeted by Trade Policy 2009 and NTIS 2010. Section 8 concludes.

A. Review of literature on structural transformation

High and sustained economic growth entails structural transformation – a shift of productive factors from low-productivity and low-wage activities to high-productivity and high-wage activities. This is such that the output structure progressively shifts into higher-productivity activities, including increased production of more complex and sophisticated products. Countries should be able to produce not just more of the same products, but also new ones. Also, the products chosen for specialization will have different consequences for development.

Founders of development economics emphasize the importance of industrialization for the externalities it generates, leading to accelerated growth (Rosenstein-Rodan, 1943; Hirschman, 1958; Kaldor, 1967). Experiences of industrialized economies, as well as those of the newly industrialized East Asia, suggests the importance of structural transformation (see, for example, Chang, 2002). However, lacking formal models, mainstream economic theory has made little use of these ideas (Hidalgo and Hausmann, 2008:5).

Dominant neo-classical trade and growth theories state that the type of products a country produces and exports have little or no bearing on long-term growth and development. The Heckscher-Ohlin model suggests that, in an open economy, countries specialize on the production of goods that intensively use the productive factors that they are endowed with, such as physical capital, labour, land, human capital, infrastructure and institutions. The specialization pattern changes with the accumulation speed of specific factors. Therefore, controlling for initial factor endowments, the particular products a country produces and exports do not matter for its future economic performance (including export).

Similarly, the Ricardian model argues that technological differences across countries determine comparative advantage. Also two other dominant theories – the varieties model of Romer (1990), and the quality ladders model of Aghion and Howitt (1992) and Grossman and Helpman (1991) – explain productivity differences as "assume a degree of homogeneity across products that eliminates the possibility to capture the impact of initial specialization" (Hausmann and Klinger, 2007:1). New trade theory (Helpman and Krugman, 1985; Krugman, 1979) explains intra-industry specialization (which Ricardian and Hecksher-Ohlin models cannot) through economies of scale and product differentiation. The so-called "new-new" trade theory – the Melitz model (Melitz, 2003) – takes into account heterogeneity among firms, explaining which firms would find it advantageous to export and which firms would sell only in the domestic market. However, neither explains the path-dependent process of specialization. Thus, dominant mainstream economic theories does not consider the structure of the product space (the universe of goods and services that a country may produce) to be important for future growth, ignoring the path-dependent nature of growth and development.

Recent advances in the literature challenge this view with more explicit recognition of externalities and path dependence. Hausmann *et al.* (2006) finds that countries that export goods associated with higher productivity levels grew more rapidly, even after

controlling for initial income per head, human capital levels, and time-invariant country characteristics. This is through measures of the productivity or income potential of a product (PRODY and EXPY). Their findings also reveal that countries with initial high levels of export sophistication subsequently experienced higher growth in exports. Hausmann *et al.* (2006) argues that "countries become what they produce". This appeals to the mechanism of "cost discovery" (Hausmann and Rodrik, 2003), under which the range of goods that an economy ends up producing and exporting is determined not just by the usual fundamentals, but also by the number of entrepreneurs who can be stimulated to discover the cost of production in modern sectors of the economy. Such cost discovery generates considerable positive externalities for other entrepreneurs.

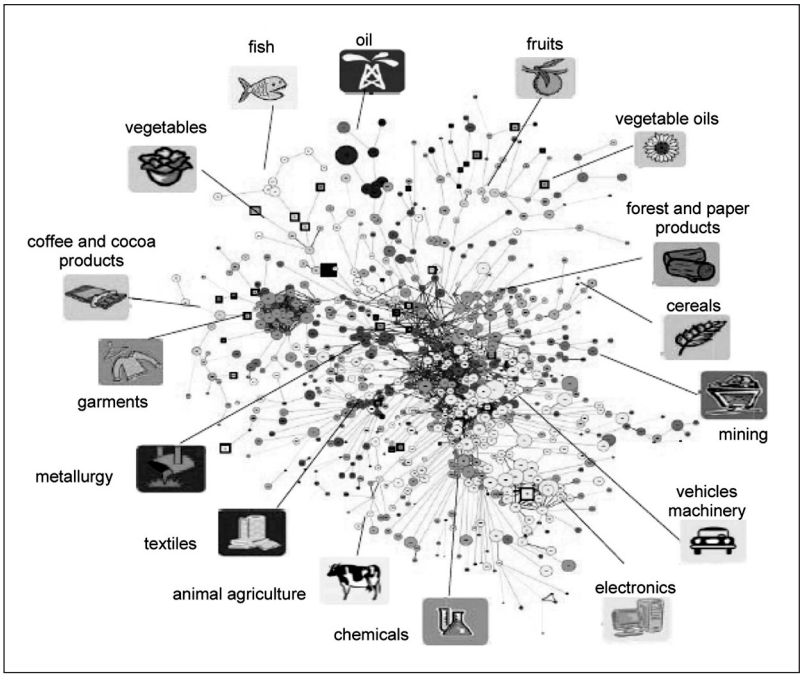
Hausmann and Klinger (2006, 2007) show that changes in the revealed comparative advantage of nations are governed by the pattern of relatedness of products at the global level. As countries change their export mix, there is a strong tendency to move towards "related goods" (goods that are, somewhat, more sophisticated but fairly similar), rather than to goods that are farther away. They introduced an outcome-based measure of relatedness, called proximity, between pairs of products using cross-country export data. Formally, the proximity between products i and j is the minimum of the pair-wise conditional probabilities of a country exporting a good, given that it exports another. Their findings show that the pattern of relatedness of products is only very partially explained by similarity in broad factor or technological intensity classifications, as in Leamer (1984) or Lall (2000). This suggests that the relevant determinants are much more product-specific. Countries that specialize in a dense part of the product space (where there are a lot of products in close proximity to one another) find it easier to change their revealed comparative advantage than countries that specialize in more disconnected products.

In general, rich (poor) countries tend to specialize in dense (sparse) parts of the product space, although there is significant variation in this relationship. Controlling for the level of income, countries like China, India, Indonesia, Turkey and Poland, specialize in a very dense part of the product space, while countries that specialize in natural resources (particularly oil) have export baskets in disconnected parts of the space (Hausmann and Klinger, 2007:16). Hausmann and Klinger (2007) find that the speed at which countries can transform their productive structure and upgrade their exports depends on having a path of nearby goods that are of increasingly higher value. In their model, they argue that the assets and capabilities[2] needed to produce one good are imperfect substitutes for those needed to produce another good. However, this degree of asset specificity varies, determining product interrelatedness. As a result, the process of structural transformation tends to favour nearby goods in the product space, making the pattern of structural transformation path-dependent.

[2] The model focuses on human capital but is applicable to other specific non-tradable assets like knowledge, labour training requirements, infrastructure needs, property rights, regulatory requirements or other public goods (Hausmann and Klinger (2006, 2007).

Building on Hausmann and Klinger (2006, 2007), Hidalgo *et al.* (2007) uses tools of network analysis to develop a graphical representation of the product space (the network of relatedness of products).[3] The product space (covering 775 four-digit products of SITC Rev. 2) is highly heterogeneous, with a core-periphery structure (figure 1).

Figure 1. The product space



Source: Hidalgo *et al.* (2007)

Hausmann and Klinger (2006, 2007) and Hidalgo *et al.* (2007) find that more-sophisticated products are located in a densely connected core (metal products, machinery, and chemicals, as per Leamer classification), whereas less sophisticated products occupy a less-connected periphery. At the top of the periphery are fishing, animal, tropical and cereal agriculture products. To the left are two strong peripheral clusters formed by garments and textiles, followed by a second animal agriculture cluster. At the bottom of the product space is a large electronics cluster and to the right there is mining, followed by forest and paper products. Poorer countries tend to be located in the periphery.

[3] Product space is the network of relatedness between products traded in the world, which is very useful to study the structural transformation of economies. The product space analysis was pioneered by Hausmann and Klinger (2006). Hidalgo *et al.* (2007)) uses the tools of network analysis to construct a visual image of the product space. In product space analysis, the proximity (øij) between products does not measure physical distance but is a conditional probability-based measure used as an inverse proxy for distance between two products. It is calculated as the minimum of probability that a country exporting product B with comparative advantage also exports A with comparative advantage, and vice versa.

The empirical findings indicate that countries move through the product space by developing goods close to those they currently produce, and that many countries will meet considerable difficulty in reaching the core. An important implication of these findings is that even with similar levels of production and export sophistication, countries face different prospects for structural transformation. This would depend on the proximity of more sophisticated products to their respective current productive capacities (proxied by the products that a country exports with revealed comparative advantage).

Felipe *et al.* (2010a) develops an "Index of Opportunities" (IoO) for 130 countries based on their capabilities to undergo structural transformation. The four dimensions of IoO are related to the characteristics of a country's export basket: sophistication, diversification, standardness, and possibilities to export other products with comparative advantage. The rationale behind IoO is that in the long run a country's income is determined by the sophistication and variety of products it makes and exports, reflecting its capabilities. In the IoO rankings, Nepal ranks 33rd among 96 non-high income countries, putting it in the second quintile. Among the four South Asian countries (for which data is available), Nepal's capabilities to undergo structural transformation are better than Bangladesh, Pakistan and Sri Lanka and second only to India.

Felipe *et al.* (2010b) argues that becoming a rich country requires the ability to produce and export goods that embody certain characteristics. In classifying 779 exported goods (SITC Rev. 2, 4-digit), two dimensions are accorded – sophistication (measured by PRODY) and connectivity to other products (measured by PATH). As a result, 352 "good" products and 427 "bad" products are identified.

Researchers then categorized 154 countries into four groups according to these two characteristics, with Nepal being among the "low core" 75 countries in the "low product" trap. This group also includes Pakistan, Sri Lanka and Bangladesh from South Asia. The share of core products in the number of products Nepal exports with comparative advantage is 18.8 per cent. The exports of the countries in this group are concentrated in products with low sophistication and little or average linkages with other products. Felipe *et al.* (2010b) suggests that to escape this situation, these countries need to implement policies that would help them accumulate the capabilities needed to manufacture and export more sophisticated and better connected products. This would involve human capital acquiring skills, technology and knowledge; a higher drive to diversify and to increase sophistication by embracing a realistic industrial vision; and improvement in organizational abilities e.g. firm-level organization (Felipe *et al.,* 2010b: p. 30).

Felipe *et al.* (2010c) argue that the key factor underlying China's fast development during the last 50 years is its "ability to master and accumulate new and more complex capabilities", citing the increase in diversification and sophistication of its export basket. Furthermore, they say China's accumulation of new capabilities is policy induced and not the result of the market, beginning before economic liberalization started. Analysis of China's current export opportunity set shows that the country is "exceptionally well positioned" to continue learning and gaining revealed comparative advantage in the export of more sophisticated products.

Abdon and Felipe (2011) find that in contrast the majority of Sub-Saharan African countries are trapped in the export of unsophisticated, highly-standard products that are poorly connected in the product space. This makes the region's process of structural transformation particularly difficult. As the products that are "nearby" to those they already export have the same characteristics, Abdon and Felipe (2011) conclude that shifting to these products will do little to improve the region's growth prospects. As a means for jump-starting and sustaining growth, they recommend implementation of policies and provision of public inputs that encourage the private sector to invest in new and more sophisticated activities.

Hidalgo and Hausmann (2009) use the techniques of network science to develop a method to characterize the structure of bipartite networks connecting countries to the products they export. Labeled Method of Reflections, it creates measures to count the relative number of capabilities present in a country without making any assumptions about the nature of capabilities. This is done by iteratively combining information on diversity of countries (number of products a country exports) and ubiquity of products (number of countries that export a product) using trade data. The number of capabilities present in a country forms the country's economic complexity. The complexity measures developed through the Method of Reflections do not include information on income.[4] This method of measuring complexity of product and economy addresses criticism of PRODY and EXPY (measures using income information), which makes the tautological observation that rich countries export rich country goods.

Hidalgo and Hausmann (2009) find that a) the complexity of a country's economy is correlated with per capita income. Deviations from this relationship are predictive of future growth, suggesting that countries tend to approach the level of income associated with the available capability set. B) The level of complexity of a country's economy predicts the type of products that a country will be able to develop in the future. This suggests that the new products that a country develops depend substantially on the capabilities already available in that country. Hidalgo and Hausmann (2009) argue that changes in a country's productive structure can be understood as a combination of two processes a) that by which "countries find new products as yet unexplored combinations of the capabilities they already have", and b) that by which "countries accumulate new capabilities and combine them with other previously available capabilities to develop yet more products" (Hidalgo and Hausmann, 2009:10575).

Ranking of products and countries according to the measures of complexity (developed by Hidalgo and Hausmann (2009); Abdon *et al.* (2010)) finds that the most complex products are in machinery, chemicals and metals, while the least complex products are raw materials and commodities, wood, textiles, and agricultural products. More so, the most complex economies in the world are Japan, Germany, and Sweden, and the least complex, Cambodia, Papua New Guinea, and Nigeria; the major exporters of the

[4] However, there is a strong correspondence between PRODY and EXPY with their network counterparts, "suggesting that most of the information contained in PRODY and EXPY comes from the structure of the network connecting countries to the products they export, rather than from income" [Hidalgo 2009: p. 7].

more complex products are the high-income countries, while the major exporters of the less complex products are the low-income countries; and export shares of the more complex products increase with income, while export shares of the less complex products decrease with income. Among the South Asian economies with available data, Nepal is ranked 89th out of 124 countries in terms of economic complexity. This is higher than Bangladesh, Sri Lanka and Pakistan but below India. Despite this, Nepal's export basket is positively skewed towards less complex products.

Using the measures of complexity (diversification and ubiquity) developed in 2009, Hausmann and Hidalgo, in 2010, construct a simple model that assumes that each product requires a potentially large number of non-tradable inputs (capabilities). More so, that a country can only make the products for which it has all the requisite capabilities. Within the model, products differ in the number and specific nature of the capabilities they require, while countries differ in the number and nature of capabilities they have. Therefore, products that require more capabilities will be less ubiquitous, while countries that have more capabilities will be more diversified. Mathematically, this proves that: i) the level of diversification of a country increases on average with the number of capabilities it has; ii) the ubiquity of a product decreases, on average, with the number of capabilities it requires; iii) the average ubiquity of products exported by a country decreases with that country's level of diversification; iv) the average level of diversification of products exported decreases with the ubiquity of that product.

The model also implies that the return (in terms of diversification) to the accumulation of new capabilities increases exponentially with the number of capabilities already available in a country. This gives rise to the "quiescence trap" or a "trap of economic stasis", meaning countries with few capabilities will have negligible or no return to the accumulation of more capabilities, while countries with many capabilities will experience large returns to the accumulation of additional capabilities. The model opens up two options to the quiescence trap – increase in the average complexity of products, or increase in the total number of capabilities that exist in the world. The trap calls for solving the coordination problem between the accumulation of additional capabilities and the demand for those capabilities.

Particular within Hausmann and Hidalgo (2010)'s empirically validated model, calibration suggests that the world exists in a regime with a strong quiescence trap. More so, when this model is combined with the results of Hausmann and Klinger (2006, 2007) and Hidalgo *et al.* (2007), a more refined insight into the process of structural transformation is revealed. This is "the ability to add a product to the production set of a country depends not only on how close a given product is to an already existing one, but also on how many other capabilities are present in the country and used in other, potentially more distant, products" (Hausmann and Hidalgo, 2010: p. 27).

Furthering economic complexity analysis, Hidalgo (2009) finds that during the 42-year period 1963-2005 (while the product space remains relatively stable) only a few highly dynamic economies have been able to considerably transform their productive structures. Products, such as vehicles and machinery, populated the more densely

connected part of the network, while oil and some of its derivate products are always located in a weakly connected periphery of the network. This demonstrates that oil requires specific capabilities that do not foster development, despite generating large revenues. Agricultural products and raw materials are also consistently located in the periphery of the space. The countries that have transformed their productive structures most dramatically are Brazil, Indonesia, Turkey, Malaysia, Thailand, Republic of Korea, Singapore and China. They have followed different trajectories. While the economic complexity of Republic of Korea, Singapore and China were relatively high at the beginning of the observation period, Brazil, Indonesia and Turkey started from a primitive production structure. Hidalgo (2009) argues that in complex economies good governance and institutions may be all that is required to stimulate capability building and economic growth. In turn, governments of countries with low economic complexity should actively help catalyze market activities and solve coordination problems associated with attempts to accumulate capabilities.

Freire (2011) creates an index of productive capacity of an economy using a variant of the Methods of Reflections. This shows that it is very difficult for countries to improve their productive capacities when they start from lower levels. Focusing on the period 1984-2009, he also finds that while there has been convergence in productive capacity among countries that were initially above the average (relative to the world), those that had below average productive capacity two decades ago have lagged further behind. This suggests increasing overall divergence. The countries that have transformed the most in the 25-year period are China, India and the United Arab Emirates. In the Asia-Pacific region, Turkey, the Republic of Korea and Thailand are among the top 10 countries which increased their productive capacity in relation to the average in that period (Freire, 2011). With the exception of Bangladesh, all other least developed countries (LDCs) in the region have ended the period further away from the world's average in 2009 when compared with their position in 1984 (Freire, 2011). LDCs of the region have productive capacity way below the world average. Nepal's productivity capacity, relative to the world average in 2009, was only marginally worse than in 1984. It is greater than that of all Asia-Pacific LDCs, except Bangladesh, but lower than that of the developing countries in South Asia, namely India, Pakistan and Sri Lanka. Regionally, it is average for Latin America and the Asia-Pacific.

Using methods developed by Freire (2011) in a related research, ESCAP (2011) finds that the countries that export the greatest number of categories of products and those which have more products at different prices within those categories tend to have higher levels of GDP. Findings also show that diversifications within and between categories of products are not mutually exclusive. Richer countries continue to diversify, with the dominant form of diversification being the expansion of production of different varieties within the same category, as product categories rise. With average diversification of countries increasing, but product mix becoming more standard, countries that do not diversify are likely to fall behind (ESCAP, 2011).

Notably, only four countries – Estonia, Latvia, Lithuania and Vietnam – have succeeded in transforming themselves during 1984-2009. The group began with productivity capacities similar to those of the LDCs, and then raised it to above the world

average (ESCAP, 2011; Freire, 2011). The process of transformation was gradual, e.g. as in Vietnam (ESCAP, 2011).

Based on the experiences of the countries that have transformed themselves, ESCAP (2011) suggests a strategy for increasing productive capacities; this is made up of three main processes for discovering, acquiring and spreading the productive capacities required for developing economies to catch up. The first process is differentiation through strategic product innovation, which is identification and production of products that are new to the economy and more complex, facilitating further diversification. The second process is through the selection of the business models of firms and farms that are successful in the differentiation process. The third is the amplification of the successful business models and the exploitation of the new market (ESCAP, 2011). These processes have to be repeated continuously for the strategy to succeed (ibid.).

Regarding the first process, ESCAP (2011) finds that Asia-Pacific LDCs, on average, could product around 400 new products closely related to existing ones. However, only 10-15 per cent of these would be both more complex and better connected to other products. In the case of Nepal, there are around 514 products related to those already exported, of which 58 (11 per cent), are more complex and better positioned for future diversification. ESCAP (2011) suggests a pragmatic way to look for potential new products; this is to emulate the production pattern of countries that have higher productive capacities, even if they do not have higher per capita GDPs.

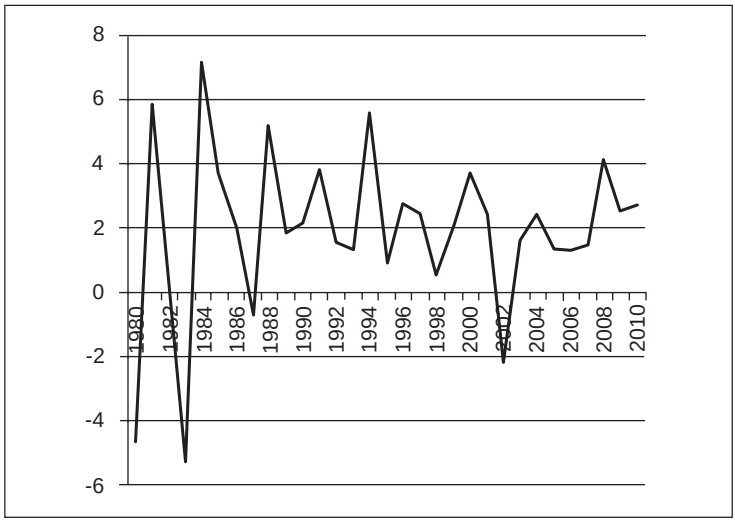
In the next section we review Nepal's recent growth and export performance, using some of the product classifications developed in this paper.

B. Nepal's economic and export performance: A preliminary analysis

In the 30-year period 1980-2010, Nepal's GDP per capita growth has been poor and erratic (figure 2). Annual compound growth of GDP per capita in the three decades was a meagre 2.16 per cent, the lowest in South Asia (figure 3). This region is also home to three other LDCs besides Nepal – Afghanistan, Bangladesh and Bhutan. While the annual growth rate of GDP per capita for other countries in the region improved during the recent decade (2000-2010), Nepal's growth rate declinedto an average of 1.8 per cent per annum. The contrast is even starker when compared with the GDP per capita growth rates of two LDCs of Southeast Asia – Cambodia and Lao People's Democratic Republic. These grew at average annual rates of 6.5 per cent and 5.4 per cent respectively.

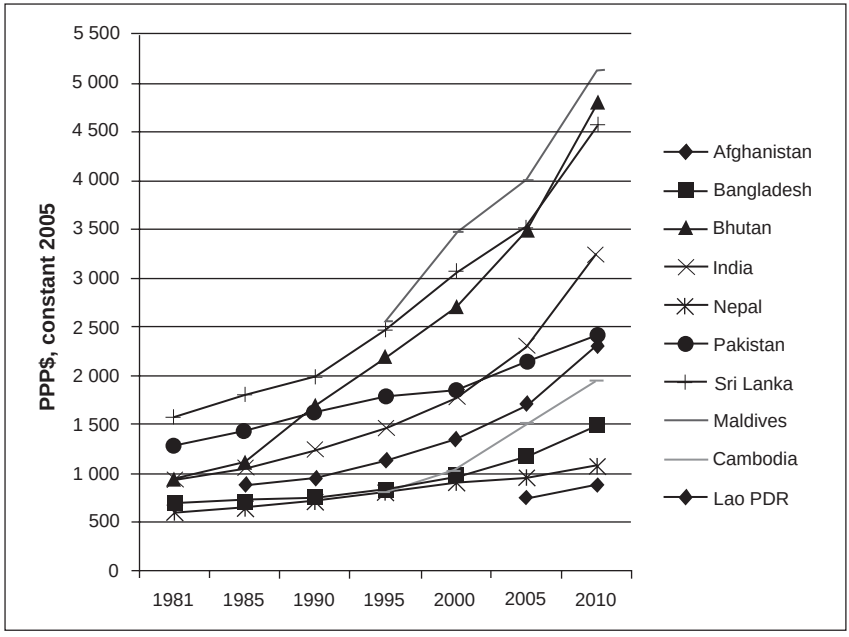
Nepal's dismal GDP per capita growth has led to its per capita GDP to being the lowest among South Asian countries, after Afganistan. This is also lower than the two Southeast Asian LDCs – Cambodia and Lao People's Democratic Republic (figure 4). The gap with all these countries has widened since 1981. Notably, Bangladesh and Cambodia, with about the same per capita GDP as Nepal's in 1981 and 1995, had their per capita GDP levels higher than Nepal's by 38 per cent and 80 per cent respectively, by 2010.

Figure 2. Nepal per capita GDP growth performance (per cent)



Source: Author's calculation based on World Development Indicators.

Figure 3. Nepal in comparative perspective: Growth of GDP per capita

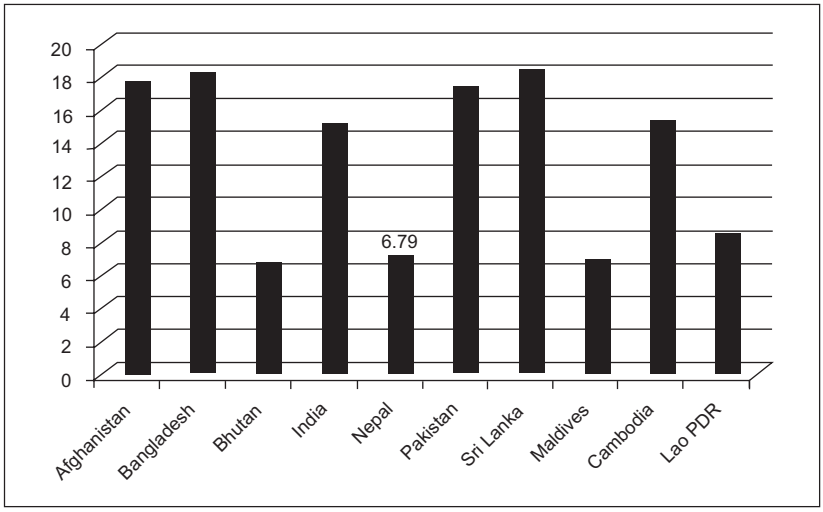


Source: Author's calculation based on World Development Indicators.

Note: 2008 figure for Afghanistan's GDP for 2010.

The share of manufacturing value added in Nepal's GDP was 6.79 per cent in 2009, among the lowest in the set of comparator countries (figure 4), and also lower than for LDCs as a group. During 1980-2009, Nepal's manufacturing value added never reached 10 per cent of GDP (figure 5). However, while its share in GDP improved in the 1980s and the early 1990s, it fell continuously after 2000. The share of agriculture in its GDP declined more sharply, going from 61.7 per cent in 1980 to 33 per cent in 2011. However, agriculture continues to employ as much as 74 per cent of the currently employed labour force (CBS, 2008). Services[5] (mostly of non-tradable variety) grew faster than agriculture and manufacturing at 4.5 per cent per annum (compounded) during 2000/01-2010/11, accounting for 52 per cent of GDP in 2010/11.[6] The largest services sectors (in 2010/11) are wholesale and retail trade (25 per cent), transport, storage and communication (19 per cent), real estate, renting and business (16 per cent), education (13 per cent), and financial intermediation (8.6 per cent). The structure of the Nepali economy has thus shifted from an agriculture-dominated one to that of a non-tradable services-dominated one, with the manufacturing sector faltering.

Figure 4. Nepal in comparative perspective: Manufacturing, value added (per cent of GDP), 2009



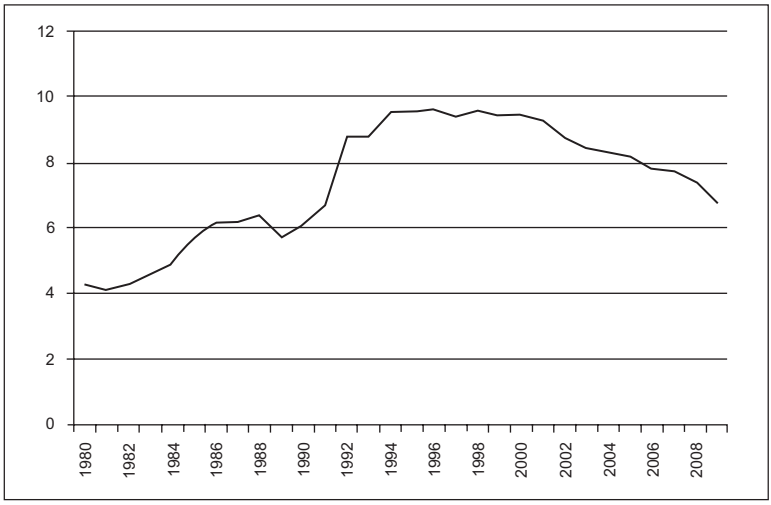
Source: Author's calculation based on World Development Indicators.

Note: Afghanistan's figure is for 2008.

[5] Excluding construction, and electricity, gas and water. Adding construction takes the ratio to over 58 per cent.

[6] Data on share of agriculture in GDP in 2010/11 and data on services are from Nepal Rastra Bank, "Recent Macroeconomic Situation", various issues.

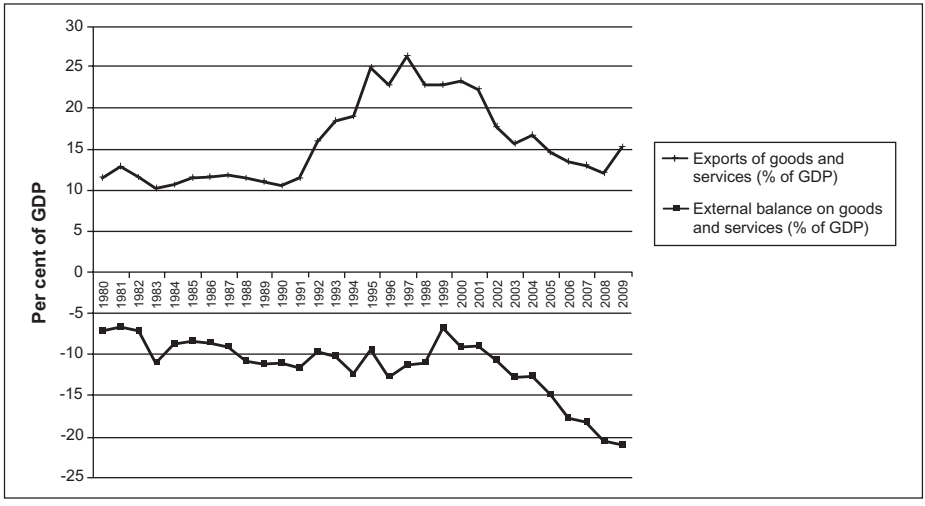
Figure 5. Share of manufacturing in Nepal's GDP over time (per cent of GDP)



Source: Author's calculation based on World Development Indicators.

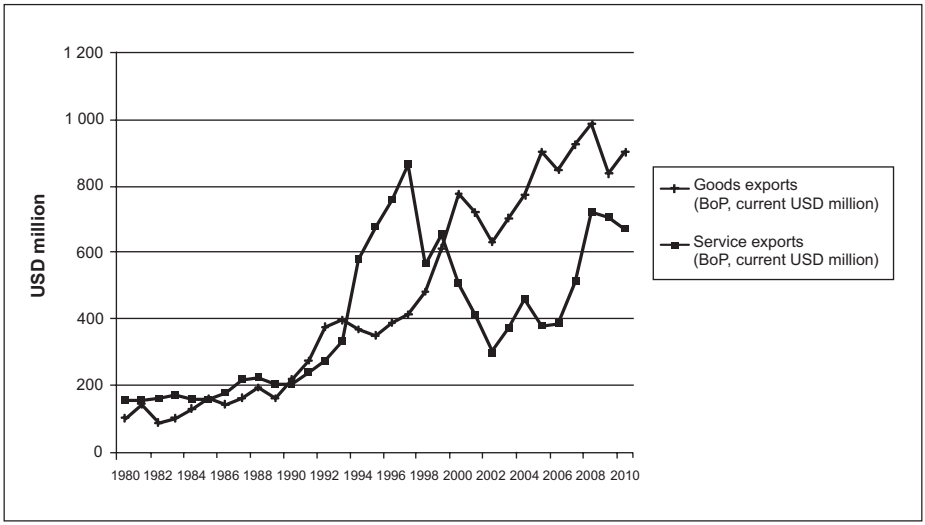
Nepal's export performance, while relatively encouraging in the mid-to-late 1990s, has been weak after 1999. Goods and services exports fell from 22.8 per cent of GDP in 1999 to 15.3 per cent in 2009. With imports increasing rapidly, fuelled and financed by remittance earnings, the trade deficit (goods and services) has been burgeoning since the turn of the millennium, touching 21 per cent of GDP in 2009 (figure 6). Both merchandise exports and services exports have performed poorly. However, services exports have begun to recover after severely suffering between 1997-2007 (figure 7).

Figure 6. Nepal's trade performance



Source: Author's calculation based on World Development Indicators.

Figure 7. Nepal's exports of goods and services



Source: Author's calculation based on World Development Indicators.

Nepal's exports-to-GDP ratio for 2009 is the lowest among the set of comparator countries after Pakistan. Its trade balance-to-GDP ratio is among the worst (table 1).

Table 1. Nepal in comparative perspective: Trade performance

	Exports of goods and services (per cent of GDP), 2009	External balance on goods and services (per cent of GDP), 2009
Afghanistan	15.57	-32.1
Bangladesh	19.43	-7.1
Bhutan	58.55	9.8
India	19.58	-4.4
Nepal	15.26	-21.1
Pakistan	12.84	-7.5
Sri Lanka	21.32	-6.5
Maldives	62.84	-23.4
Cambodia	59.61	-3.0
Lao PDR	28.94	-12.9

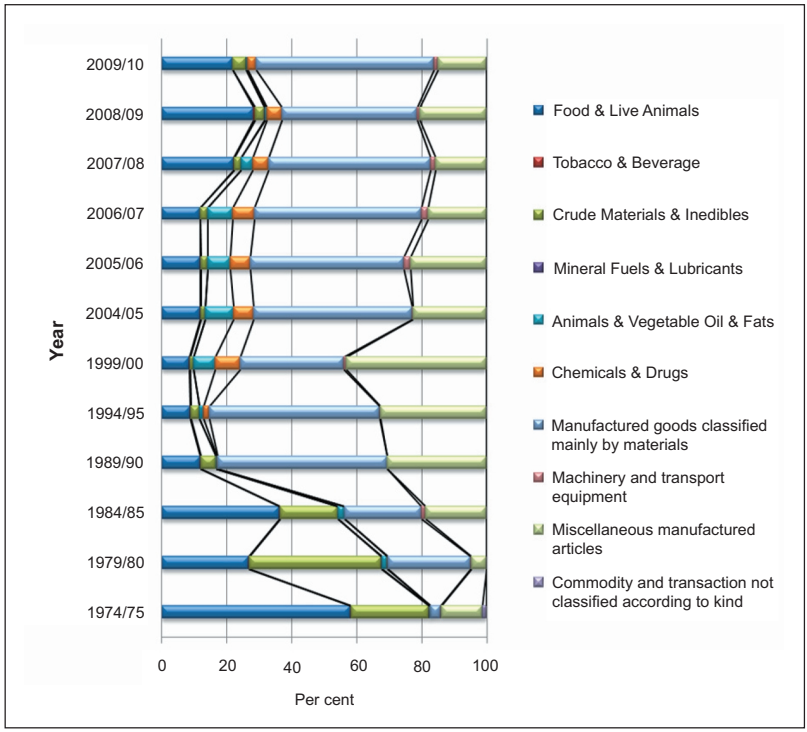
Source: Author's calculation based on World Development Indicators.

Note: 2008 figures for Afghanistan.

Not only has Nepal's export performance been poor (in terms of value and growth), its merchandise export basket remains low in technological sophistication and it is poorly diversified with almost no change during the past decade.[7] In 2010, Nepal exported 118 products with export value of more than $100, 000 (out of 277 possible products at 3-digit level of SITC Rev. 3). In comparison, Bangladesh exported 213 and Cambodia 137.[8] The top 20 products made up 72 per cent of Nepal's total merchandise exports.[9]

Figure 8 shows the evolution of the export basket since 1974/75 in terms of the shares of nine SITC 1-digit categories. While manufacture products account for almost 70 per cent of exports in 2009/10, the share of food and live animals, and crude materials and inedibles has increased in recent years. Although, this is still below levels reached in

Figure 8. Nepal's export composition (in terms SITC 1-digit categories)



Source: Author's calculation based on data from Ministry of Finance, Government of Nepal, Economic Survey, various issues.

7 Based on data from UNCTADstat.

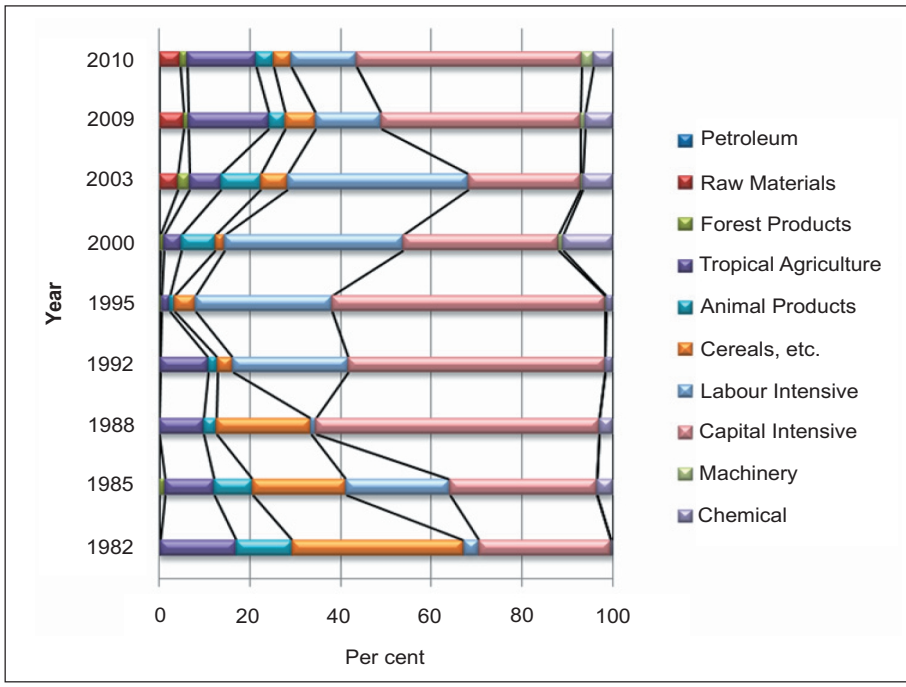
8 Data from UNCTADstat.

9 Data from UNCOMTRADE.

the mid-1980s. Animal and vegetable oils and fats, as high as 6.4 per cent in 1999/2000, have a negligible share in 2009/10.[10]

Figure 9 shows the evolution of Nepal's export basket in terms of the shares of factor-intensity-based Leamer (1984) groups formed by aggregating SITC 2-digit categories. The share of labour-intensive manufacturing has declined notably after 2003, while the shares of capital-intensive manufacturing and tropical agriculture have increased. Capital-intensive manufacturing made up almost half of total exports in 2010, while tropical agriculture exports exceeded labour-intensive manufacturing exports. The sharp fall in apparel exports since 2003 largely explains the declining share of labour-intensive manufacture exports.[11]

Figure 9. Nepal's export composition in terms of Leamer categories



Source: Author's calculation based on UN Comtrade, SITC Rev. 2.

[10] The major destination of Nepal's vegetable ghee was India. From 2002, India imposed quantitative restrictions and non-tariff barriers on Nepal's vegetable ghee exports. In subsequent years, India reduced and eliminated ad valorem duty on imports of palm oil, the basic raw material used in the production of vegetable ghee, eroding the competitiveness of Nepali exports, which was largely derived from the difference in the tariff on the raw material.

[11] Exports in HS Chapters 61 and 62 declined by almost 69 per cent during 2003-2010. The share of these products in Nepal's total exports declined from 34 per cent to 8 per cent in the same period (Based on author's calculation using UNCOMTRADE data). See Belbase and Kharel (2009) for the impact of expiry of the Agreement on Textiles and Clothing on Nepali readymade garments export sector.

The growth of iron and steel (SITC 67) and articles of metals, mostly of iron and steel (SITC 69), contributed to the increase in the share of capital-intensive goods. Their shares increased from 5 per cent and 2 per cent, respectively, in 2003 to 14 per cent and 3 per cent in 2010. Also contributing are textiles exports, whose share rose to 31 per cent during this period.[12] The top 10 capital-intensive products (SITC Rev. 2, 4-digit) in 2010, in terms of export value, accounted for 44 per cent of total exports and 89 per cent of total capital-intensive goods exports. Besides iron and steel, these products included carpets, synthetic yarn and fabric, jute twine, cordage and rope, among others. While carpet exports fell, other textile exports increased in both quantum and share.

However, the high share of capital-intensive goods in Nepal's export basket should be interpreted with caution. In the Nepali context, some goods, classified with the Leamer (1984) classification, are in practice relatively labour-intensive. For example, carpet exports are mostly of the hand-knotted variety, and hand-knitting as well as use of hand-looms and hand-and-footdriven machines, are still prevalent in production of other woolen goods. On the other hand, while iron and steel products do represent capital-intensive modes of production, it should be noted that domestic value addition (as a share of industry output) is limited. This is due to complete dependence on imports for manufactured steel, and limited transformation domestically (to be discussed later).

The share of raw materials has also increased substantially in the new millennium. Data for 2010 shows that Nepal's export basket has the highest capital-intensive manufacture share and the lowest labour-intensive manufacture share among the export baskets of the comparator countries, excluding Afghanistan, Bhutan and the Maldives (figure 10). In terms of importance of tropical agriculture, Nepal is second only to Sri Lanka.

Figure 11 shows the shifts in major export items between 2003 and 2010. Note the declining share of apparel, and the rising shares of iron and steel and textiles.

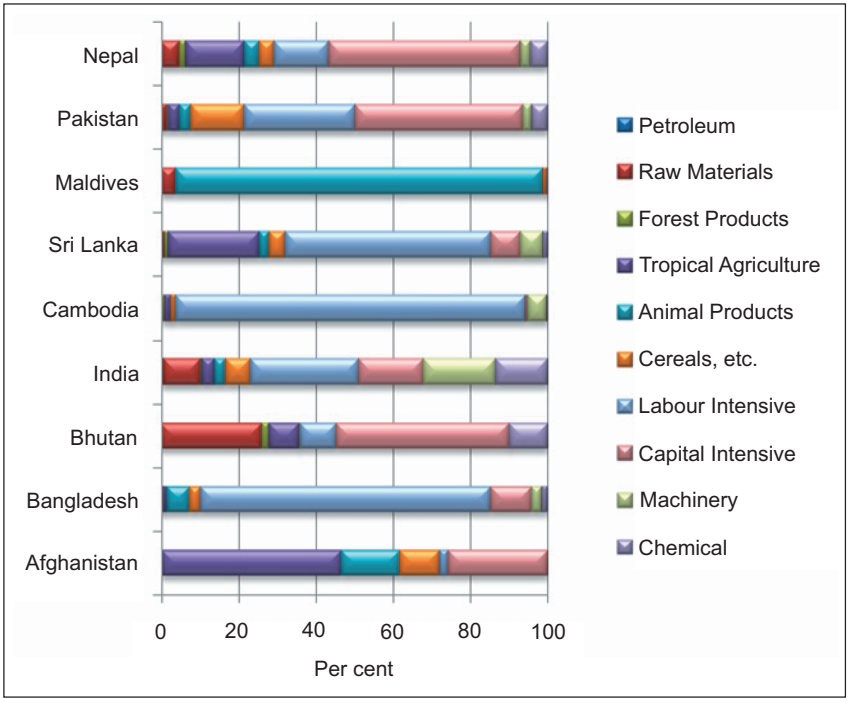
Looking at changes in the composition of Nepal's exports, in the decade from 1985 to 1995 the shares of primary products and resource-based manufactured products decreased substantially. Meanwhile the share of low-technology products, comprising of textile, garment and footwear (LT1), increased significantly (to over 85 per cent). This is based on Lall (2000) classification of technological sophistication[13] (figure 12). The shares of other low-technology products (LT2) and medium and high-technology products were negligible. However, by 2009 and 2010, the share of primary products and agro-based manufactures had more than doubled. Also, the share of LT1 products dipped to 35 per cent, the share of LT2 increased to 19 per cent, and the share of process-related medium-technology (MT2) products increased to 13 per cent.

---

12 Iron and steel exports were negligible in 1995.

13 The Lall (2000) classification does not cover all SITC (Rev. 2) 3-digit codes. Specifically, it does not cover animals, live, n.e.s., including zoo-anima, cinematograph film, exposed-develop, coin (other than gold) not being leg, electric current, gold, non-monetary, printed matter, works of art, collectors pieces & an. Cambodia's export composition, in terms of Lall (2000) classification as shown in Figure 13, should be interpreted cautiously because of the 32 per cent share of "unclassified" products.

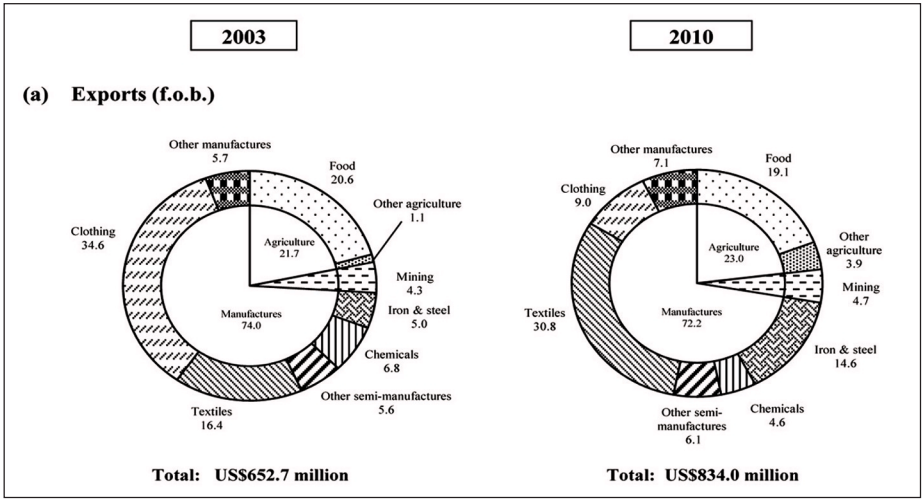
Figure 10. Comparative export composition – Leamer categories 2010



Source: Author's calculation based on UN Comtrade, SITC Rev. 2.

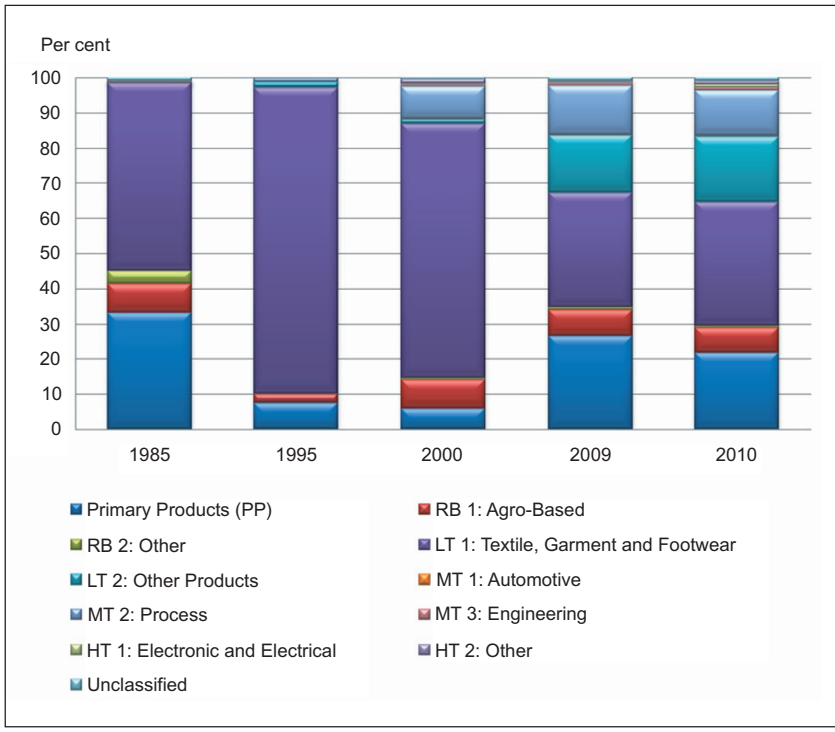
Note: 2010 data for all countries, except Bangladesh (2007).

Figure 11. Major exports



Source: WTO (2012). Trade Policy Review of Nepal.

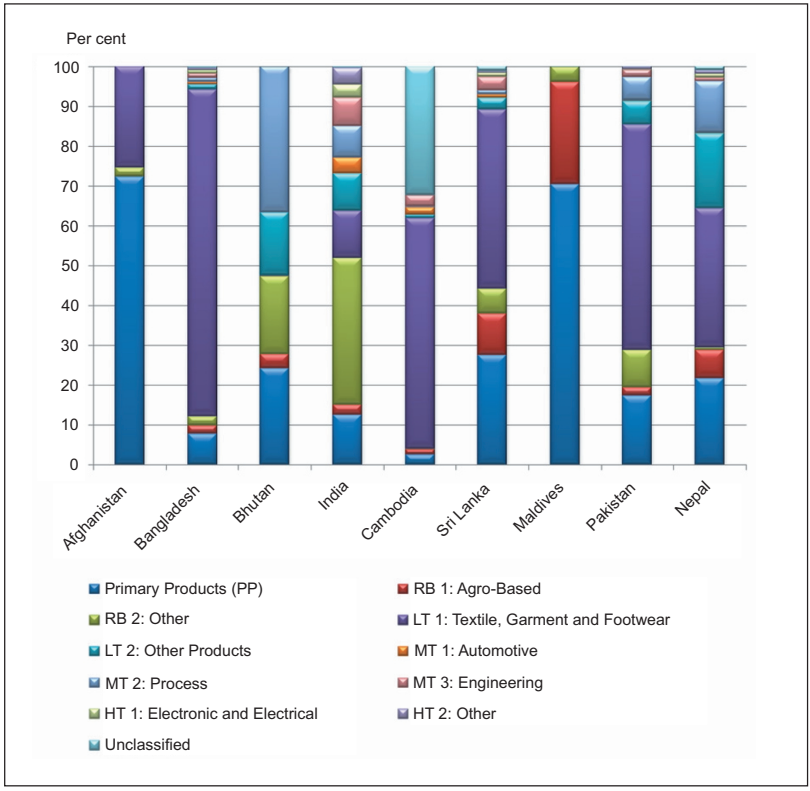
Figure 12. Nepal's export composition – Lall classification



Source: Author's calculation based on UN Comtrade, SITC Rev. 2, 3-digit level, and using the classification of Lall (2000).

The major LT2 products are iron and steel, which are heavily dependent onimported intermediate goods (as noted above). Meanwhile, the shares of engineering-related medium-technology products and high-technology products are negligible. The increase in the share of primary products (to 22 per cent in 2010) corresponds to the decrease in the share of manufacturing in GDP in the new millennium. Data for 2010 shows that Nepal's export basket has the highest LT2 and MT2 shares and the lowest LT1 share among the export baskets of the comparator countries (figure 13), excluding Afghanistan, Bhutan and the Maldives. In terms of importance of primary products, Nepal is second only to Sri Lanka. In a sign of increasing commodity dependence, while the share of primary products more than doubled during the decade, the share of resource-based manufactures declined, albeit slightly.

Figure 13. Nepal in comparative perspective: Export composition – Lall classification, 2010



Source: Author's calculation based on UN Comtrade, SITC Rev. 2, 3-digit level, and using the classification of Lall (2000).

C. Structural change and productivity growth in Nepal's economy

When economic development and structural transformation takes place, overall productivity growth occurs from within sectors (sectoral productivity growth), as well as from shift in resources from low-productivity sectors to high-productivity sectors. In the case of labour productivity, this implies that there are two components to productivity growth; this is sectoral labour productivity growth and productivity growth resulting from reallocation of labour across sectors, that is, changes in employment shares across sectors (McMillan and Rodrik 2011). When employment share changes are positively correlated with productivity levels, structural change contributes positively to productivity growth (*ibid.*). In this section, the McMillan and Rodrik (2011) approach is followed. Nepal's labour productivity growth is decomposed into these two components using sectoral value added and employment data.

This is to assess the nature and direction of structural transformation in the economy as a whole.[14]

In the nine-year period of 1999-2008, labour productivity grew by a compound annual growth rate of 1.44 per cent. The contribution of the "within" component (productivity growth within sectors) was 0.88 percentage point (61 per cent). This is while the contribution of the structural change component (the productivity growth resulting from reallocations of labour across sectors) was 0.57 percentage point (39 per cent) (table 2). That the contribution of structural change is positive is in line with McMillan and Rodrik (2011)'s finding – that the aggregate structural change has been growth-enhancing in Asia. However, in Africa and Latin America it has been growth-reducing, although the period considered is longer – 1990-2005.[15]

Table 2. Decomposition of Nepal's labour productivity growth during 1999-2008 (average annual compounded growth rate)

	per cent
Labour productivity growth	1.44
Within component	0.88
Structural change component	0.57

Source: Author's calculations.

The positive contribution of the structural change component is also reflected in the positive correlation between the log of the ratio of sectoral productivity to total productivity at the end of the period in consideration (2008), as well as the change in sectoral employment shares during the period (1999-2008), as depicted in figure 14.

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[14] Labour productivity is real value added divided by people employed in the sector. The decomposition is done with the formula used by McMillan and Rodrik (2011):

$$\Delta Y_t = \sum_{i=n} \theta_{i,\,t-k}\,\Delta\, y_{i,\,t} + \sum_{i=n} y_{i,\,t}\,\Delta\theta_{i,\,t}$$

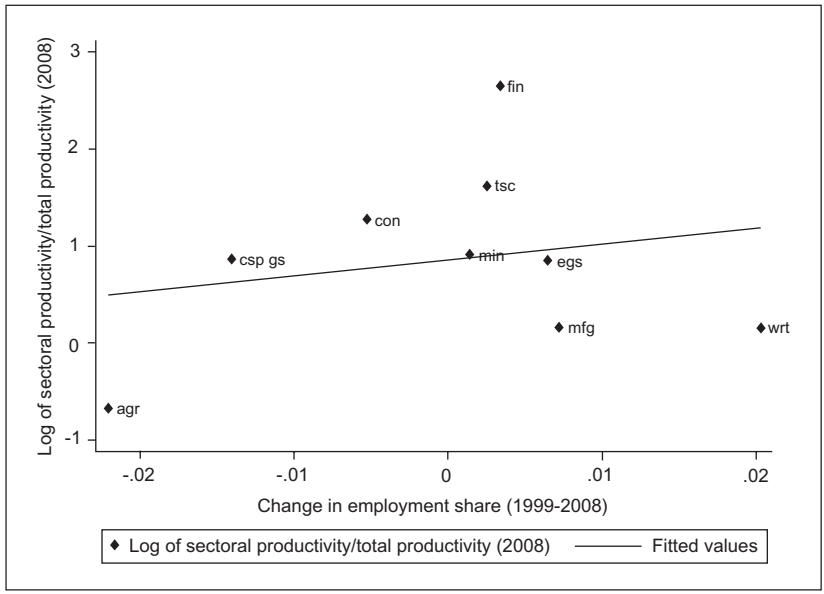
where Y_t amd $y_{i,\ t}$ refer to economy-wide and sectoral labour productivity levels at time t, $\theta_{i,\,t}$ is the share of employment in sector i in time t, and the Δ operator denotes change in productivity or employment shares between time t-k and t.

The choice of the period of analysis is 1999-2008, which is determined by the availability of reliable employment data disaggregated by major sectors. The chosen period corresponds to two points in time (fiscal years 1998/99 and 2007/08) when labour force surveys were conducted in Nepal (CBS 1999 and 2008). Employment is that of "currently employed" labour force, comprising people aged 15 years and above (CBS 1999 and 2008). Nine sectors are considered (See Table 3).

Data on value added by sectors are drawn from the *Economic Survey*, Ministry of Finance, Government of Nepal, various issues. As the real value added data for 1998/99 are available at 1994/95 prices, the real value added data for 2007/08 are available at 2000/01 prices. The latter are rebased to 1994/95 prices by deriving the ratio between the price deflators for the two base years for each sector from the ratio of real value added data for 2001/02, at 1994/95 and 2000/01 prices.

[15] They do not include Nepal in their sample.

Figure 14. Correlation between sectoral productivity and change in employment shares in Nepal (1999-2008)



Source: Author's calculation.

Notably, the somewhat surprising find in this paper is that Nepal's relative contribution of the structural change component to productivity growth is two and a half times that for the un-weighted average for Asia (14.7 per cent) in the period 1990-2005. However, in absolute terms the total annual labour productivity growth is quite low, at only 1.4 per cent. Productivity growth is negative in five of the nine sectors, including manufacturing. Low overall productivity growth is largely due to the low "within" sector productivity growth, contributing less than 1 percentage point. In contrast, as shown in McMillan and Rodrik (2011), general "within" sector productivity growth is much higher in high-growth countries, as well as the key driver of total productivity growth. When "within" productivity growth is low or negative and productivity levels are also low, there is only so much that the structural change component can contribute. The latter can only supplement growth "within" sectors under such circumstances.

The manufacturing sector is a key tradable sector with high potential to absorb labour. It has the lowest productivity level after agriculture, and has exhibited negative productivity growth as well as low total value added growth. Its employment share has increased by only 0.7 percentage points during 1999-2008 (table 3). It is the only sector (besides mining – of minor significance in the economy) to have witnessed a decline in the share in total value added (by 2.3 percentage points), despite registering a small increase in employment share. The largest increase in employment share has been in the wholesale, retail trade, restaurants and hotels sector, which is largely a non-tradable sector

(except for its tourism component).[16] The community, personal, social and government services sector – another non-tradable services sector – has recorded the highest productivity growth rate. Agriculture, despite being the least productive sector, still employs about 74 per cent of the labour force. The employment share of agriculture fell by only 2.2 percentage points.

Table 3. Sectoral employment, value added shares and their change, and productivity level and growth (Nepal)

	Employment share 2008	Value added share 2008	Productivity 2008 (NPR, constant 1994/95 prices)	Change in employment share (1999-2008)	Change in value added share (1999-2008)	Productivity growth (%, compound annual, 1999-2008)
Agriculture, forestry, fishing	0.74	0.37	15,231.19	-0.02	-0.01	1.47
Mining and quarrying	0.00	0.01	73,969.93	0.00	0.00	-9.24
Manufacturing	0.07	0.08	35,018.69	0.01	-0.02	-2.74
Electricity, gas and water	0.01	0.02	69,840.27	0.01	0.01	-7.09
Construction	0.03	0.11	106,421.83	-0.01	0.00	2.71
Wholesale, retail trade, hotels and restaurants	0.08	0.09	35,137.95	0.02	-0.03	-4.99
Transportation, communication, storage	0.02	0.08	151,632.23	0.00	0.01	1.22
Finance and real estate	0.01	0.12	422,924.29	0.00	0.02	-1.94
Community, social, personal and government services	0.05	0.12	71,379.13	-0.01	0.03	7.13
All sectors			30,270.74			1.44

Source: Author's calculations.

Note: Zero values in shares and changes in shares denote extremely small values.

[16] Sub-sectoral data on value added in this sector are not available for 1998/99. But they are available for 2007/08. In that year, wholesale and retail trade value added was 7.6 times higher than restaurants and hotels value added.

There is a massive under-utilization of labour. Conservative estimates puts the labour under-utilization rate at 30 per cent in 2008, although the official unemployment rate is just 2.1 per cent (CBS, 2008).[17] Furthermore, the above analysis of labour reallocation across sectors within the domestic economy, is based on the active labour force, hence excludes Nepali nationals working abroad. Lack of productive employment opportunities in the country is driving people to migrate abroad for work in increasing numbers. There has been an annual outflow of over 200,000 people to destinations other than India in recent years (or about 50 per cent of the annual addition to the labour force). The total number of migrants abroad is at least 2 million, with a quarter of the adult male population working abroad.[18] Therefore, although reallocation of employed labour in the aggregate has been from low-productivity to high-productivity sectors in the last decade, faster transfer of labour from agriculture to more productive sectors within the economy is constrained by a weak manufacturing sector. This sector is experiencing declining productivity, and whose productivity level relative to total productivity is lower than for the world on average.[19]

Here, the emphasis on manufacturing should not be interpreted as ignoring the potential of the modern services sector, such as tourism. The emphasis is because: i) manufacturing constitutes a tradable sector and global experience shows that it combines relatively high productivity with the potential to absorb low-skilled labour from agriculture; ii) there is empirical evidence that, unlike economies as a whole, manufacturing industries exhibit unconditional convergence in labour productivity across economies (see Rodrik 2011a, 2011b); iii) development of tradable sectors is critical for reducing Nepal's excessive reliance on remittances for foreign exchange; iv) while tourism is a key tradable service sector with high potential for employment generation and it should no doubt be developed, arguably a sustainable growth strategy for a small open economy calls for robust expansion of bothtradable services and manufacturing sectors; v) the poor performance of Nepal's manufacturing sector absolutely calls for urgent attention. Notably, it is relative to other sectors of the Nepali economy, as well as relative to other countries/groups/regions (e.g. South Asia, East Asia, LDCs). Productivity in manufacturing is even lower than that of the community, social, personal and government services sector, which is the least productive sector in the world (see McMillan and Rodrik, 2011). This low productivity and extremely slow expansion of manufacturing suggests that constraints to growth have been especially severe for the sector. The poor performance of the manufacturing sector is also reflected in the poor performance of merchandise exports, in terms of both earnings and export basket composition.

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17 Comparable under-utilization data is not available for 1999.

18 Stock and flow employment data compiled from CBS (2008), CBS (2011); CBS (2012), *Economic Survey*, Government of Nepal, Ministry of Finance, various issues and "Nepal Migration Survey". Preliminary findings are presented by the World Bank, August 2011.

19 The comparison is with the average global figures for manufacturing productivity and total productivity for 2005 presented by McMillan and Rodrik (2011).

D. Nepal's trade and industrial policies in the context of structural transformation

Nepal introduced a new Trade Policy in 2009, replacing the Trade Policy 1992. The main objective of Trade Policy 2009 is to support economic development and poverty alleviation initiatives through "the enhanced contribution of trade sector to the national economy" (GoN, 2009). Its specific objectives are:

- To create a conducive environment for the promotion of trade and business in order to make it competitive at the international level
- To minimize the trade deficit by increasing exports of value-added products through linkages between import and export trade
- To increase income and employment opportunities by increasing competitiveness of trade in goods and services, and using that as a means of poverty alleviation
- To clearly establish the interrelationship between internal and foreign trade, and develop them as complementary and supplementary to each other

Promoting exports, in order to facilitate structural transformation of the economy, is not an explicit aim of the trade policy. The emphasis on exports of "value-added" products is motivated more by the need to reduce the trade deficit. However, fostering of backward-forward linkages, product diversification, and domestic value addition and processing do feature in strategies, and specific and working policies. This includes those at the sectoral/product level.

Trade Policy 2009 aims to promote the exports of both goods and services. However, it discusses goods trade elaborately, envisaging the promotion and development of select goods, and classifying them into "Special Focus Area" and "Special Thrust Area". Whereas, Trade Policy 1992 did not target any products, as such. In the first group are the labour-intensive goods already established in export markets, such as readymade garments, woolen carpets and handicraft goods. The second group includes "highly potential export items" (GoN, 2009: p. 29), mostly agricultural and forest-based products. The rationale for promoting exports of agricultural and forest-based products is based on the Agricultural Perspective Plan and Periodic Plan accepting agriculture as a priority sector of the economy. Recognition of the important role of agricultural development in poverty reduction is also part of this rationale. Table 4 lists the identified goods. The "Special Focus Area" has four goods, while the "Special Thrust Area" has 15 goods. There is some overlap between the Special Focus Area and the Special Thrust Area.

Table 4. Products identified in Trade Policy 2009

Special focus area	Special thrust area	
1. Readymade garments, cotton towels	1. Tea	9. Herbs and essential oils
2. Woolen carpets	2. Vegetable seeds	10. Handmade paper and paper products
3. Pashmina and silk products	3. Large cardamom	11. Wood craft products
4. Handicraft goods (Pashmina, woolen products, silver products, metal products, handmade paper)	4. Pulses	12. Coffee
	5. Floriculture	13. Honey
	6. Precious/semi-precious gems and stones, and gold and silver ornaments	14. Oranges (*junar*)
	7. Processed leather (and leather goods)	15. Vegetables
	8. Ginger/dried ginger	

Source: Author's compilation based on Trade Policy 2009 (GoN, 2009).

Rationale for selection of goods for export promotion is "goods that are of comparative advantage, and based on skills, means and resources available in the country will be identified and selected, and promotion of trade in such goods will be supported." (GoN, 2009: p. 4). Utilizing local resources to create employment and income generating opportunities in rural areas is the main rationale for the dominance of agricultural and forest-based products in the Special Thrust Area. Trade Policy 2009 also provides for the identification of new exportable goods in which the country has comparative advantage. Emphasis is on commercial farming, livestock, and non-timber forest products.

Policies for the Special Thrust Area goods stress value addition, processing, forward linkages (using primary goods for the production of manufactured goods) and vertical product diversification. Even within the Special Focus Area, which only includes manufactured goods, there is an emphasis on backward linkages. This is done by increasing the domestic production of raw materials and inputs, including agriculture and forest products. There are also policies for value addition and vertical diversification for manufactured products in the identified Special Focus Area. However, concrete value addition and product diversification strategies as well as programs for turning commodities into manufactured goods are lacking. This is important in order to avoid the possible trap of commodity dependence.

The Trade Policy 2009 strategy of mostly promoting goods that intensively utilize domestically available resources has merit in terms of addressing immediate concerns of unemployment/underemployment of human resources and poverty. However, it does not address the question of what potential the production and export of the selected goods holds for structural transformation. This is needed for rapid and sustained growth. In other words, still to be investigated is the potential of identified goods for upgrading the national industrial production structure. This would enable the economy to progressively produce more sophisticated and complex products. Importantly, (as discussed in Section 3) recent research consistently shows that the type of goods that a country currently exports determines the type of goods it will export in future, and its future economic growth rate.

Following Trade Policy 2009, the Government of Nepal created the Nepal Trade Integration Strategy (NTIS) 2010. This strategy identifies 19 "priority export potential sectors" – goods and services – and the "most attractive markets" for them. Focusing on the identified sectors, it charts a short- to medium-term course of action for the development of the country's export sector until 2013-2015 (see GoN, 2010a). Among the 19 sectors, 12 are goods (7 agriculture and food products, 5 craft and industrial goods) and 7 services (table 5). Most of them are also included in the Trade Policy 2009 special focus and thrust areas, and have been in Nepal's export basket for decades. NTIS 2010 has two sectors/products that are not identified in the Trade Policy 2009. Whereas, the Trade Policy 2009 identified nine sectors/products that are not in NTIS 2010 (namelyready made garments and cotton towels, woolen carpets, vegetable seeds, floriculture, processed leather – and leather goods, wood craft products, coffee, oranges *junar*, and vegetables). Among the 12 identified goods with export potential, NTIS proposes to focus, in the short- to medium-term, on agriculture (including forest) and food products.

Table 5. Priority export potential products/sectors identified by Nepal Trade Integration Strategy 2010

Products		Whether the product is identified in Trade Policy 2009 (only goods)
Agro-food		
1	Cardamom	Yes
2	Ginger	Yes
3	Honey	Yes
4	Lentils	Yes
5	Tea	Yes
6	Noodles	No
7	Medicinal herbs/essential oils	Yes

Table 5. ***(continued)***

Products		Whether the product is identified in Trade Policy 2009 (only goods)
Craft and industrial goods		
8	Handmade paper	Yes
9	Silver jewelry	Yes
10	Iron and steel	No
11	Pashmina	Yes
12	Wool products	Yes
Services		
13	Tourism	
14	Labour services	
15	IT and BPO services	
16	Health services	
17	Education	
18	Engineering	
19	Hydro-electricity	
Other potential export sectors		
20	Transit trade services	
21	Sugar	No
22	Cement	No
23	Dairy products	No
24	Transformers	No

Source: Author's compilation based on GoN (2009) and GoN (2010a).

The 19 goods and services sectors are identified based on an initial assessment of export performance and some extensive discussions with Nepalese business community and government officials. The sectors' aim is diversifying exports product-wise and destination-wise, moving up the value chain and ensuring that exports have a robust, positive impact on inclusive growth (GoN, 2010a: p. 10). Most of the selected sectors are identified as having medium or high export potential, or medium or high socio-economic impact, or both (GoN, 2010a).

However, it must be noted that the assessment (using a number of indexes) of the export potential of the 19 goods was done *ex post*, i.e. after they were identified. Thus, the export potential of the identified goods or services is to be interpreted regarding one another, not with respect to all goods or services. The factors, considered in the construction of the export potential index used in NTIS 2010, are the current export

performance of Nepal in a given product, current world demand and market access conditions for the product, as well as domestic supply capacity. This last factor includes quality of products, the productivity and cost of production factors, and the efficiency of supporting domestic industries.

Likewise, the potential socio-economic impact is measured by a socio-economic impact index. This is a composite indicator of full-time equivalent employment, participation of women in the sector, impact on poor regions, and impact on skill development. The resource intensity (defined as dependence on electricity and water) of most of these sectors was found to be medium to low. This implies that the promotion of these sectors will not be constrained by two current critical resource bottlenecks (GoN, 2010a). Together, the 19 sectors cover about 30 per cent of goods exports in 2008, and the vast majority of service exports – broadly defined to include exports of labour services (GoN, 2010a). NTIS 2010 also identifies five "other" sectors (four goods and one service) with export potential (table 5).

NTIS 2010 shows some recognition of the need for enhancing value addition, processing and diversification of the identified products, including agro-food products that are accorded high-priority. However, the methodology employed for product/sector identification does not explicitly take into account the possibilities the selected products hold (or do not hold) for future product diversification and enhanced export sophistication.

Trade is identified as one of the six pillars of development strategy for the realization of the goals (poverty reduction) and objectives of the Government of Nepal's Three-Year Development Plan 2010/11-2012/13 (GoN, 2011). This is the first period development plan to focus on mainstreaming trade in order to achieve development objectives. Export trade is one of the priority sectors in the Plan. Guided by the Trade Policy, the Plan envisages reducing trade deficits by developing exportable goods and services to having comparative advantage, as well as how best to utilize the opportunities created by the bilateral, regional and multilateral trading systems. The objectives of the Plan, with respect to trade, are to enhance income and employment opportunities by promoting domestic and international trade; to derive maximum benefits from goods and services trade by identifying comparatively new beneficial goods and services. This, with the participation of the private sector and the government, is to make price and quality more competitive in internal and external markets; to alleviate poverty by promoting exports of goods using local raw materials, resources and skills; more so, to expand the benefits from trade to rural areas (GoN, 2011).

One of its working policies is identification, development, promotion, marketing, and establishment of value chains of new exportable goods and services. Another working policy is to implement the NTIS 2010. The strategies include developing trade as an important pillar of the national economy. This means increasing value addition in exportable products, value chain development and identification, and promotion of new export potential goods (both horizontal and vertical diversification). Also, in the strategies is the mobilization of foreign aid to increase export competitiveness, and provide incentives, facilities and concessions for exportable products. At the programme level, the Plan

emphasizes the development of exportable agriculture and forest-based products. Given that the Plan is guided by the Trade Policy and intends to implement NTIS, the products identified in the policy and the strategy is expected to be targeted during the Plan's implementation.

The Government introduced a new industrial policy in 2010. This is in response to the poor performance of the industrial sector following the unsatisfactory implementation of the Industrial Policy 1992. It is also due to new opportunities and challenges on the industrial front (GoN, 2010b: 1-3). The long-term goal of the Industrial Policy 2010 is to contribute to poverty alleviation through sustainable and broad-based industrial development. A major objective is to increase the national income and employment. This includes increasing exports of industrial goods through expansion of quality and competitive industrial production, and rise in industrial productivity. The policy also aims to increase the contribution of the industrial sector to national and regional development through the mobilization of local resources, raw materials and skills. Its strategies, with respect to the industrial export sector, emphasizes increasing domestic value addition in exportable goods, fostering domestic forward and backward linkages, and development of industries (including agro-based) utilizing domestically available raw materials .

The Industrial Policy 2010 provides facilities and concessions (including in taxes) to export-oriented industries, among others. It also provides for additional facilities and concessions, (including in taxes) to export-oriented industries located in special economic zones – these are yet to be established. The Industrial Policy 2010 declares 10 industries as priority industries entitled to additional facilities and incentives. The list covers a variety of goods and services (e.g. particular tourism-related sectors, computer software), as well as non-good/service-specific industries (e.g. export-oriented industry and traditional cottage industry). Notably, the agriculture and forestry-based industry (listed as a priority industry) includes both farming/cultivation (agriculture) and processing/manufacturing. The inclusion of agriculture as an industry may be due to the critical importance of its production in raw material requirements of agriculture and forestry-based industries.[20] Relatively sophisticated (non-services)[21] priority industries include clinker and cement production based on domestic limestone; pulp and paper production; chemical fertilizer production (other than simple mixing); powder milk production; pharmaceutical production; production of fuel-saving equipment; production of pollution-reducing equipment; production of equipment and gadgets used by the physically challenged; production of agriculture tools and equipment and industrial machinery; and production of electric vehicles. Among these, only three products (in broad terms) feature in the trade policy and/or NTIS. Paper has been identified for export promotion in both the trade policy and NTIS, and cement and dairy products (which included powder milk) are among the "other" potential export sectors in NTIS. Changes to the Industrial Enterprises Act are needed to incorporate some of the provisions in Industrial Policy 2010.

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[20] A related issue is that the definition of "industry" by the policy is very broad as such, encompassing even real estate business.

[21] We consider energy production and distribution, including hydropower production and distribution, as a service industry.

As noted in the previous section, there is a close link between the sophistication, complexity and diversity of products produced by an economy, the structural transformation and growth paths of the economy. Sophistication, complexity and diversity of an economy are reflected in its export basket. The degree of export-orientation varies across industries, as demand and competition conditions for different products differ in the domestic market and foreign markets. The relatively sophisticated manufacturing products accorded priority by the Industrial Policy may not be targeted for exports in the immediate future. But the fact that they are accorded priority may reflect an aim to create and/or enhance the capabilities of the economy to produce such products, at least for the domestic market. An economy's ability to produce more and more diverse and complex/sophisticated products is likely to produce a similar effect in its export basket. Equally, increasing the diversity and complexity/sophistication of exports is also likely to help make the industrial structure of the economy more diverse and complex/sophisticated, as the exportable products are produced within the economy. The potential synergy between the industrial policy and the trade policy/NTIS for industrial upgrading and structural transformation remains to be investigated.

Neither Trade Policy 2009 nor NTIS 2010 take into account the fact that all products do not hold the same prospects for structural transformation and economic growth. In which part of a product space a country's exportable products are concentrated and what products (upscale or downscale) the country exports also matter for future rates of income growth. Given that the Government of Nepal has taken trade as an engine of growth in its Plan document, it is important that this structural transformation dimension is brought into trade policy making and implementation.

E. Methodology for assessing structural transformation through the "export" lens

1. *Methods, tools and measures*

Methods, tools and measures developed in the empirical literature discussion on structural transformation, are employed to describe the pattern of evolution of Nepal's merchandise exports. These will then assess the structural transformation-effecting potential of the goods identified for export promotion in Nepal's Trade Policy 2009 and the NTIS 2010 (Hausmann *et al.,* 2006, Hidalgo *et al.,* 2007; Hausmann and Klinger, 2006, 2007; Felipe *et al.,* 2010c; and Abdon and Felipe, 2011).

Measures for analysis of the following three variables are the level of productivity/ sophistication associated with a particular product; the level of sophistication of the export basket of a country (or a set of products exported/targeted for exports by a country); the inter-relatedness between and among products (or how close a product is to other products).

We use the measure of productivity associated with a product (PRODY) developed by Hausmann *et al.* (2006). PRODY is a weighted average of the GDP per capita of the

countries that export the product. The weights are taken as the ratio of the revealed comparative advantage (RCA) of each country in the product to the sum of the RCAs of the all countries in the product:[22]

$PRODYi = \sum_j \frac{xij/xj}{\sum_j xij/xj} Yj$, where xij is exports of country j of product i, Xj is total exports of country j, and Yj is GDP per capita (PPP$) of country j.

We use the measure of sophistication of export basket of a country (EXPY), developed by Hausmann *et al.* (2006). EXPY is the weighted average of the PRODY of products exported by a country, with the weights being the share of the product in the country's total exports:

$$EXPYj = \sum_i \left(\frac{xi}{Xi}\right) PRODYi$$

We use PRODY and EXPY to measure the sophistication/complexity of products/ export basket/economy. These are used instead of the better measures of complexity based on the Methods of Reflection developed by Hidalgo and Hausmann (2009), that only considers network information and does not use income information. This is because PRODY and EXPY are easier to construct and, more importantly, there is a strong correspondence between PRODY and EXPY with their network counterparts as discovered by Hidalgo (2009). This suggests that "most of the information contained in PRODY and EXPY comes from the structure of the network connecting countries to the products they export, rather than from income" (Hidalgo, 2009: p. 7). Thus, the power of PRODY and EXPY in explaining growth and structural transformation (e.g. Hausmann *et al.,* 2006) "comes from the information on the diversification of countries and on the ubiquity of products" (Hidalgo, 2009: p. 8).

We use the outcome-based measure of proximity between two products (øij) developed by Hausmann and Klinger (2006, 2007) and Hidalgo et al. (2007).

Mathematically, the proximity between two products i and j is defined as:

Øij = min {P (RCAi|RCAj), P (RCAj|RCAi)}.

Proximity between the two products i and j is, therefore, the minimum conditional probabilities that a country exporting one good with comparative advantage (RCA>1) also exports the other with comparative advantage.

These three basic measures are used to calculate four other measures: Path, Density, Open Forest and Strategic Value.

[22] The RCA measure used by Hausmann *et al.* (2006) is different from the more popular RCA index of Balassa (1965).

The Path associated with a product (i) is the measure of the inter-connectedness of that product with all other products. It is calculated as: Path i = $\sum_j$ Øij (Hausmann and Klinger, 2006). It indicates the potential for future export diversification associated with product i.

Density associated with a product (i), developed by Hausmann and Klinger (2006, 2007), is a measure of the ease with which a country can deploy its existing capabilities to produce it, that is, proximity of the product to the current export basket of the country. Density measures the degree to which a country's current exports "surround" the particular product under consideration. It is the sum of all proximities between the product and all products in which the country is present (has comparative advantage), scaled by the sum of all proximities leading to the product. It varies from 0 to 1, with higher values indicating that the country is more likely to effectively export that product in the future.

Mathematically, $densityi = \frac{\sum_k øik\ xik}{\sum_k øik}$ where x_{ik} = 1 if the country is present in the product, 0 otherwise.

Open Forest represents the "option value" of a country's unexploited opportunities, an option set for future structural transformation (Hausmann and Klinger, 2006 and 2007). It is the distance-weighted value of all the products a country could potentially produce, where the distance is the relative distance of each product not currently effectively exported to the current export basket. This is calculated as:

$open\ forest = \sum_j \frac{\sum_i øij\ xi}{\sum øij} (1 - xj)\ PRODYj$ where $Øij$ is proximity and

x_i , $x_j = \left\{ \begin{matrix} 1 & if\ RCA > 1 \\ 0 & otherwise \end{matrix} \right\}$; $\frac{\sum_i øij\ xi}{\sum øij}$ is the density

The Strategic Value of a product is a proxy for the spillovers derived from acquiring comparative advantage in that product (Felipe *et al.,* 2010c). It is the increase in the Open Forest assuming that the country gains comparative advantage in that product (ibid.). The Strategic Value of a product j is calculated as:

$Vj = \sum_i \frac{øij}{\sum_j øij} (1 - xi)\ PRODYi$, for all i, i≠j, x_i=1 if RCA>1

Strictly speaking, the concept of Strategic Value pertains to products in the Open Forest only, that is, those products not currently exported with comparative advantage. However, we calculate Strategic Values of all identified products, even if they happen to not be in the Open Forest (i.e. they are already being exported with comparative advantage in the RCA>1 sense). The reason is provided later in the paper. In such calculations too, the formula remains the same.

We also use the classification of products employed by Abdon and Felipe (2011), in terms of distance from the current export basket. Abdon and Felipe (2011) describe products as "nearby" if the distance (density) is less than 0.5 standard deviations from the

mean distance, “middle” if the distance is within ± .5 standard deviations from the mean distance, and “far away” if the distance is more than 0.5 standard deviations from the mean distance.

We also use the classification of products as high-path/PRODY, mid-path/PRODY or low-path/PRODY depending on whether they belong to the first, second or third tercile of path/PRODY, as used by Felipe *et al.* (2010c).

Using these methods, tools and measures, we first describe the evolution of Nepal’s exports in the product space during the 15-year period 1995-2010. Three points in time are considered – 1995, 2003 and 2010. Also described is how the sophistication of the country’s export basket and the Open Forest associated with its export basket (indicating the prospects for structural transformation) has evolved over the period. This sets the context forassessing the potential held by the products identified by Trade Policy 2009 and NTIS 2010 for future structural transformation.

2. *Data*

We use the values of PRODY and proximity (Øij) calculated by Hidalgo *et al.* (2007). They are the two basic measures required for analysis, as well as being the basis for calculation of EXPY, Open Forest, Paths and Density. The level of disaggregation of products is the four-digit Standard International Trade Classification (SITC) Revision 2. Their dataset covers 775 products. Proximity values are missing for about 5 per cent of the possible product pairs. We consider them to be zero, that is, the products are unrelated.

The fact that the PRODY used by Hidalgo *et al.* (2007) is in constant 2000 PPP$ will not affect the study’s analysis when we compare values between cross-sectional units (countries), or over time for a cross-sectional unit, or between cross-sectional units over time. The proximity calculated by Hidalgo *et al.* (2007) is an average of the proximity for the three years 1998-2000. The relatively dated data of proximity (and also PRODY) will not substantially alter our results because Hidalgo (2009) finds that during the 42-year period 1963-2005 the structure of the product space (connectivity among products) remained relatively stable. Also, the level of product sophistication remained relatively stable during the 20-year period 1985-2005.

Although some papers have calculated PRODY and proximity values with more recent data, and/or using a greater level of product disaggregation (for example, Felipe *et al.,* 2010a, 2010b, Abdon *et al.,* 2010 and Hidalgo, 2011), we use the values calculated by Hidalgo *et al.* (2007) because they are publicly available, while others are not.

The products identified in NTIS have been specified in Harmonized System (2002) codes at the six-digit level. We convert them into SITC Rev. 2 4-digit classification. The relevant SITC codes are allocated for the products identified in Trade Policy 2009 as they are not specified in terms of international classification. Use of SITC classification instead of HS classification entails a loss in product diversity. However, this is unavoidable given the availability of PRODY and proximity values only at the SITC 4-digit level. Code

conversion is done using the concordance table available at World Integrated Trade Solution (WITS).

Export data is taken from UNCOMTRADE, via WITS. Direct export data for Nepal are available for every year in the period 1982-2000, after which data is only available for 2003, 2009 and 2010. The number of SITC 4-digit products exported by Nepal fluctuates sharply during 1982-1995, with apparently inexplicable spikes every three years or so. We take 1995 as the initial year when analysing the evolution of the export basket in detail.

3. Limitations

Our method and approach suffer from a number of limitations. The PRODY and EXPY measures, based on gross trade flow data, do not fully take into account the type of production activities that occur in the exporting country. In the presence of international production fragmentation and intermediate good trade, a country's exports does not necessarily reflect the embodied technology and relative endowments that have gone into the country's domestic production activities (Aashe and Gangnes, 2007). Further, these measures only consider across-product sophistication. It does not consider "within-product" sophistication or product quality (see Xu, 2010).

The approach is based on exports, and does not consider production and industrial capabilities not associated with exports, but which are nonetheless important. Only merchandise exports are considered. Service exports, which are globally faster growing than goods exports (and which are important for Nepal), are not considered because data constraints do not make services amenable to product space analysis.

In our discussion, we acknowledge these and other limitations. We emphasize, where relevant, the need to interpret and analyse the results carefully, taking into account the country-specific peculiarities and needs.

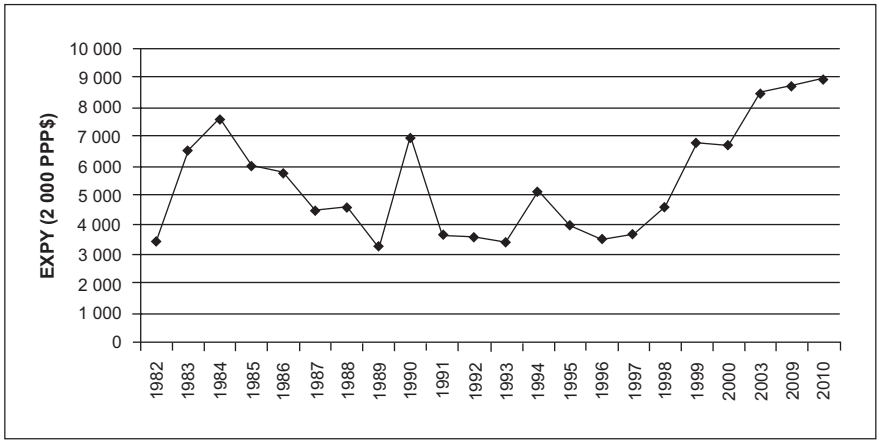
F. Analysis of export baskets and identified products

1. *Analysis of export baskets over time*

Using the PRODY values (2000 PPP$) calculated by Hidalgo *et al.* (2007), for products under SITC Rev. 2 at the 4-digit level, we calculate and compare the sophistication of Nepal's export basket and that of the comparator countries.[23]

[23] PRODY values calculated by Hidalgo *et al.* (2007) are missing for some products exported by the countries under consideration. Products with missing PRODY account for less than 1.2 per cent of exports of Pakistan, about 2 per cent of exports of Sri Lanka, about 5.4 per cent of exports of Cambodia, and negligible percentage of the exports of other countries. While calculating EXPY, the weights are taken as in the original formula (shares of products in total exports). This approach does not change EXPY values drastically, although EXPY for Cambodia it is 10,317.64 instead of 9,675.14 when the exports of products with missing PRODY are deducted from the total export figures while calculating the weight shares. But while calculating the distribution across PRODY groups and across countries (Figure 16), a separate group for products with missing PRODY is also created.

Figure 15. Evolution of EXPY



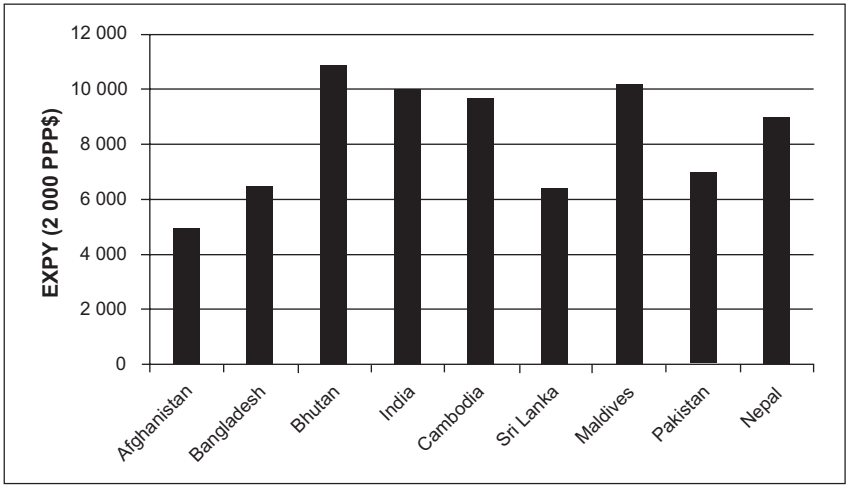
Source: Author's calculation.

A time series plot of EXPY shows a downward trend depicted in export sophistication during the mid-1980s. This failed to recover lost ground until the mid-1990s, but exhibited a rising trend thereafter (figure 15).[24] The rise in EXPY was rapid during the period 1995-2003, with a compound annual growth rate (CAGR) of 13.8 per cent. However, growth slowed down substantially thereafter, with the CAGR of EXPY for the period 2003-2010 barely 0.7 per cent. In 1995, 83 per cent of exports are in the low PRODY, low Path category, while less than 4 per cent of exports are in the middle PRODY, high Path category. By 2003, the share in the first group halved to 42 per cent and that in the second group increased fivefold to 19 per cent. The shifts in the relative size of the two groups are far less pronounced during 2003-2010. The first category's share declined by 35 per cent and the second category's share increased by 60 per cent. Products in the so-called "core" of the product space (metals, machinery and chemicals, as defined by Felipe, 2010a) made up 1.6 per cent of total exports in 1995, the share increased to 14.3 per cent in 2003, and at a slower rate to 24 per cent in 2010.

Figure 16 shows that Nepal's export sophistication, as measured by EXPY, is higher than that of Sri Lanka and Pakistan, and Afghanistan and Bangladesh. However, it is less than that of India, Bhutan, Cambodia and the Maldives. Notably, the EXPY measure should be interpreted with caution, as the extent of domestic value addition and transformation in production is not reflected in the measure. It only considers the nature of the final good exports (to be discussed in more detail later).

[24] Data are missing for the years 2004-2008.

Figure 16. Nepal in comparative perspective: Export sophistication 2010

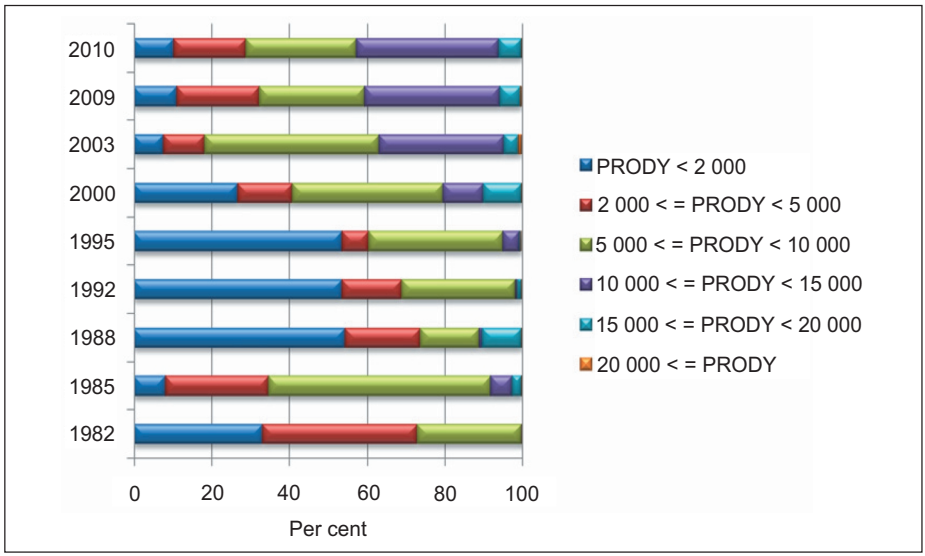


Source: Author's calculation based on UNCOMTRADE, SITC Rev. 2.
Note: 2010 data for all countries, except Bangladesh (2007).

In figure 17, we divide the products exported by Nepal into three six PRODY groups (in increasing order of PRODY range) and determine their shares in total exports at different points in time. We find that the share of group 1 (PRODY<2000) has decreased sharply since the 1990s to 10 per cent in 2010. Group 4 accounts for 36 per cent of exports, the largest share. Group 5 has a 6 per cent share and Group 6 less than 0.2 per cent. In 1982, total exports consisted almost entirely of Groups 1, 2 and 3. During 2003-2010, the share of Group 2 increased while that of Group 3 decreased. Figure 18 shows that after Afghanistan and Sri Lanka, Nepal has the highest share of Group 1 products in its export basket. However, at the same time, the country has the highest share of Group 4 products in its export basket, after Bhutan. India, Cambodia and the Maldives have a significantly higher share of Group 5 products in their export baskets than Nepal. At 1.5 per cent, the share of Group 6 products in India's export basket is the highest among the export baskets of the countries compared.

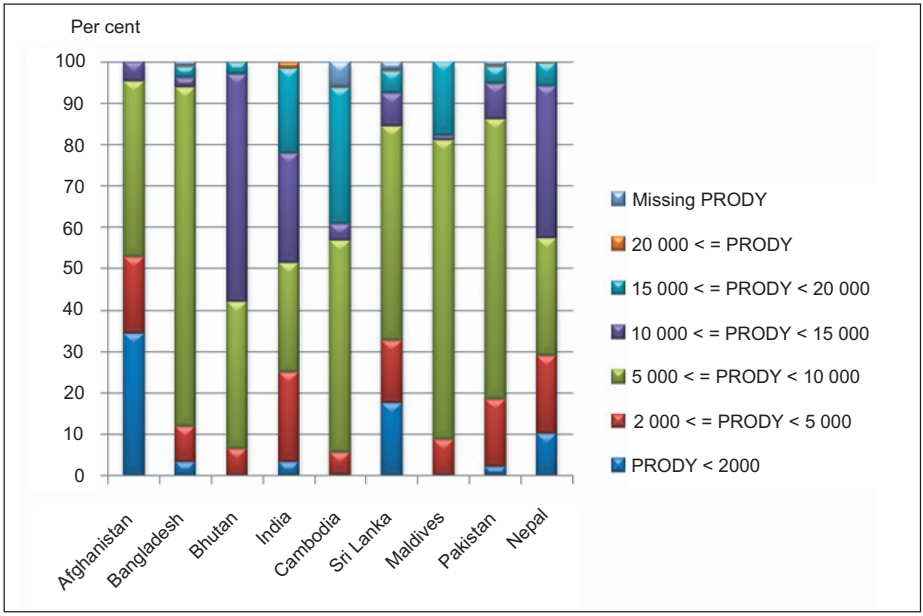
The above analysis indicates that Nepal's export performance, in terms of export earnings growth, has been poor since the late 1990s. However, in comparison to both its past performance and to performance of comparator countries, the country fares relatively better in terms of the sophistication of export basket. But sophistication of its export basket has improved very slowly since 2003. The export sector has been unable to make inroads into products in the higher range of technological sophistication. Also, the share of primary products in the export basket has been increasing in the last decade. The challenge that Nepal faces on the export front is two-fold: a) to increase the export earnings by increasing the export of existing products. Given the current industrial and export structures and capabilities, this aims at turning around the deteriorating trade balance and increasing

Figure 17. Nepal's export sophistication



Source: Author's calculation based on UN Comtrade, SITC Rev. 2.

Figure 18. Nepal in comparative perspective: Export sophistication 2010



Source: Author's calculation based on UN Comtrade, SITC Rev. 2.

Note: 2010 data for all countries, except Bangladesh (2007).

income and employment, and b) to upgrade the industrial and export structures and capabilities in order to produce and export (or expand the production and export of) more sophisticated products requiring a greater number of capabilities.

Nepal exported 65 products (SITC, Rev. 2, 4-digit levels) in 1995, exhibiting comparative advantage in 42 of them (as measured by the revealed comparative advantage (RCA) index). The number of items increased to 343 in 2003, with revealed comparative advantage in 127 items. However, while the number of items exported increased to 438 by 2010, the rate of increase is strikingly slower. Moreover, the number of products with revealed comparative advantage declined slightly to 120.

The Open Forest represents products which Nepal did not export intensively, as measured by the RCA index. Of the 733 products in the Open Forest in 1995, 193 products were "nearby" the current exports of that time. Comparative advantage was gained in a quarter of the nearby products by 2003, as well as 7 faraway products and 34 middle-distance products. Comparative advantage was thus gained in 12.4 per cent of the unexploited Open Forest products. Concurrently, comparative advantage was lost in just nine products, three fourths of which had low Path or PRODY (or both). The median PRODY and Path of the 91 products in which comparative advantage was gained were, respectively, 17 per cent and 29 per cent greater than that of the entire export basket of 1995. Along with the robust increase in export sophistication, the prospects for future export diversification also increased substantially during 1995-2003. The value of the Open Forest trebled to 1.2 million (PPP$ 2000). In contrast, during 2003-2010 comparative advantage was gained in 42 products or 6.5 per cent of the unexploited Open Forest products in the 2003 (compared to the gain made earlier the rate was 50 per cent slower). Out of them, 18 are nearby, 17 middle-distance and 7 faraway products. Thus, comparative advantage was gained in less than 10 per cent of the nearby products. The median PRODY and Path of the 42 products (in which comparative advantage was gained) is only 5.5 per cent and 0.6 per cent, respectively. This is greater than that of the entire export basket of 2003, implying that the gain in comparative advantage during 2003-2010 entails a relatively less gain in sophistication and connectedness of products, compared to the gain in comparative advantage during 1995-2003. In the recent period (2003-2010), Nepal lost comparative advantage in 49 products, with a concentration of medium-to-high connected products. Some two thirds of them[25] had low PRODY or Path or both, compared to three fourths in the earlier period.

[25] PRODY and Path data are available for only 47 of the 49 products in which comparative advantage was lost.

Table 6 shows the features of Nepal's export basket in 2010. Of the 120 products, in which the country had comparative advantage in 2010 and which accounted for 95 per cent of total exports, 31 belonged to the capital-intensive category, 27 to the labour-intensive category and 20 to the cereals category. There are only 6 and 8 products, respectively, in the machinery and chemical categories. Nepal's exports are grouped into 9 Leamer categories, excluding petroleum where no products are exported with comparative advantage. The country's exports have above-average PRODY and Path in 4 and 6 Leamer categories, respectively.[26]

While the value of Open Forest trebled during 1995-2003, it increased by just 3 per cent during 2003-2010. Of the 656 products in the Open Forest in 2010, about 28 per cent (182) are nearby products, about 40 per cent (251) are middle-distance products and the remaining 32 per cent (222) are faraway products.[27] Tables 7-9 show the top 10 nearby, middle-distance and faraway products ordered by Strategic Value. As expected of the Open Forest of a low-income country with a weak industrial base, Strategic Value of Open Forest products vary inversely with density, shown in Figure 19.[28] Density measures the relative proximity between Open Forest products from the current export basket. In other words, on average, the higher the Strategic Value of a product, the farther it is from the current export basket.

The overall top 30 products, as well as the top 30 nearby products (not shown here, but shown in Appendix Tables A1 and A2) have high Path. This means they are highly interconnected with other products, and gaining comparative advantage in them would augur well for export diversification and structural transformation. None of the overall top 30 products in the Open Forest are nearby, mostly being far away from Nepal's current industrial and export capabilities. But even among the nearby products, there are products that have medium-to-high sophistication as well as high connectedness with other products, and represent relatively high Strategic Value. Of the 182 nearby products, there are almost an equal number of capital and labour intensive products (32 and 31, respectively). This is followed by tropical agriculture and cereal etc. (27 each), animal products (24) and forest products (14) (table 10). There are only 8 and 4 products in the machinery and chemical categories, respectively. These two are mostly faraway products. Among the top 30 nearby products, 14 are capital intensive, 6 labour intensive, 4 forest, 3 machinery, 2 tropical agriculture and 1 cereal products. Given the current industrial and export capabilities, it is possibly easier to export the nearby products. Notably, nearby and middle-distance products with relatively high path and Strategic Value includes textiles, such as fabric and yarn (although capital intensive). These are consistent with certain types of fabric and yarn already being exported with comparative advantage, implying capabilities for such production. However, the presence of petroleum products as nearby products is likely to be a spurious result, given Nepal's natural resource endowment.

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[26] Classification of products under Leamer (1984) groups is based on the classification provided in the data set of Hidalgo *et al.* (2007). Leamer group name is missing for one product.

[27] Leamer group name is missing for one product.

[28] The correlation coefficient is 0.49 and is significant at 1 per cent level.

Table 6. Features of export basket in 2010

Leamer group	No. of products exported	No. of total products	Exports, 2010 ('000 $)	No. of products with RCA>1	Share in exports	Average PRODY	Average Path	Average PRODY (All, Leamer)	Average Path (All, Leamer)
Petroleum	1	10	0.40	0	0.00	11,437.13	142.19	9,554.66	111.96
Raw materials	19	62	39,389.06	5	4.73	9,018.40	128.27	10,060.59	105.34
Forest products	25	38	13,750.14	8	1.65	13,559.48	148.99	13,134.52	135.58
Tropical agriculture	33	46	125,323.20	8	15.05	7,884.47	125.69	7,553.05	115.01
Animal products	31	53	32,078.28	7	3.85	10,326.37	123.78	10,813.78	119.38
Cereals, etc.	45	81	32,878.50	20	3.95	9,248.02	109.89	9,008.84	102.38
labour intensive	74	96	118,530.48	27	14.23	10,661.69	132.38	11,333.09	135.67
Capital intensive	79	115	412,895.66	31	49.58	11,199.42	149.34	11,471.45	150.74
Machinery	93	179	21,251.32	6	2.55	16,141.82	140.72	16,054.66	136.10
Chemical	38	94	36,664.20	8	4.40	14,931.70	149.49	15,274.56	142.16
Total	438	774	832,761.21	120					

Source: Author's calculation.

Table 7. Top 10 nearby products, ordered by Strategic Value

SITC code	Product	Leamer group	Path	PRODY	PRODY tercile	Path tercile	Contribution to Open Forest (PRODY* density)	Strategic Value
8932	Sanitary or toilet art. of materials of div. 58	labour intensive	195.22	13,541.54	medium	high	2,289.36	15,076.17
6421	Boxes, bags & oth. packing containers, of paper/papbd	Forest products	182.21	14,854.13	medium	high	2,576.47	14,184.04
6924	Casks, drums, boxes of iron/steel for packing goods	Capital intensive	183.55	12,609.02	medium	high	2,187.44	14,059.19
6417	Paper & paperboard, corrugated, creped, crinkled etc.	Forest products	183.28	10,462.18	medium	high	1,814.01	13,886.84
6794	Castings or iron or steel, in the rough state	Capital intensive	185.55	11,749.49	medium	high	2,065.54	13,790.18
8212	Furniture for medical, surgical, dental etc. practice	Labour intensive	176.70	13,331.69	medium	high	2,296.04	13,489.34
6975	Sanitary ware for indoor use, and parts	Capital intensive	173.04	15,926.95	high	high	2,716.29	13,319.42
6973	Domestic-type, non-electric heating, cooking appar.	Capital intensive	179.19	12,795.86	medium	high	2,324.09	13,104.04
6517	Yarn of regenerated fibres, not for retail sale	Capital intensive	178.03	9,639.35	low	high	1,804.43	13,042.27
6560	Tulle, lace, embroidery, ribbons, & other small wares	Capital intensive	171.36	12,836.79	medium	high	2,497.21	12,899.75

Source: Author's calculation.

Table 8. Top 10 middle-distance products, ordered by Strategic Value

SITC code	Product	Leamer group	Path	PRODY	PRODY tercile	Path tercile	Contribution to Open Forest (PRODY* density)	Strategic Value
6996	Miscellaneous articles of base metal	Capital intensive	207.69	15,704.52	high	high	2,418.90	17,006.43
6785	Tube & pipe fittings (joints, elbows) of iron/steel	Capital intensive	207.19	15,323.85	high	high	2,385.44	16,929.91
7449	Parts of the machinery of 744.2-	Machinery	199.53	16,022.39	high	high	2,239.96	16,886.23
7139	Parts of int. comb. piston engines of 713.2-/3-/8-	Machinery	194.09	16,920.96	high	high	2,314.52	16,883.36
8935	Art. of electric lighting of materials of div. 58	Labour intensive	198.18	15,538.38	high	high	2,341.37	16,768.43
6210	Materials of rubber (e.g. pastes, plates, sheets, etc.)	Capital intensive	198.81	15,040.43	high	high	2,219.33	16,665.21
6953	Other tools for use in the hand	Capital intensive	189.71	14,733.62	medium	high	2,200.75	16,174.98
6991	Locksmiths wares, safes, strong rooms of base metal	Capital intensive	189.13	16,414.08	high	high	2,416.89	16,155.87
7919	Rail & tramway track fixtures & fittings, signall. equi.	Machinery	191.91	14,949.81	high	high	2,077.53	16,139.35
6424	Paper and paperboard, cut to size or shape, n.e.s.	Forest products	190.87	15,599.70	high	high	2,222.51	16,131.59

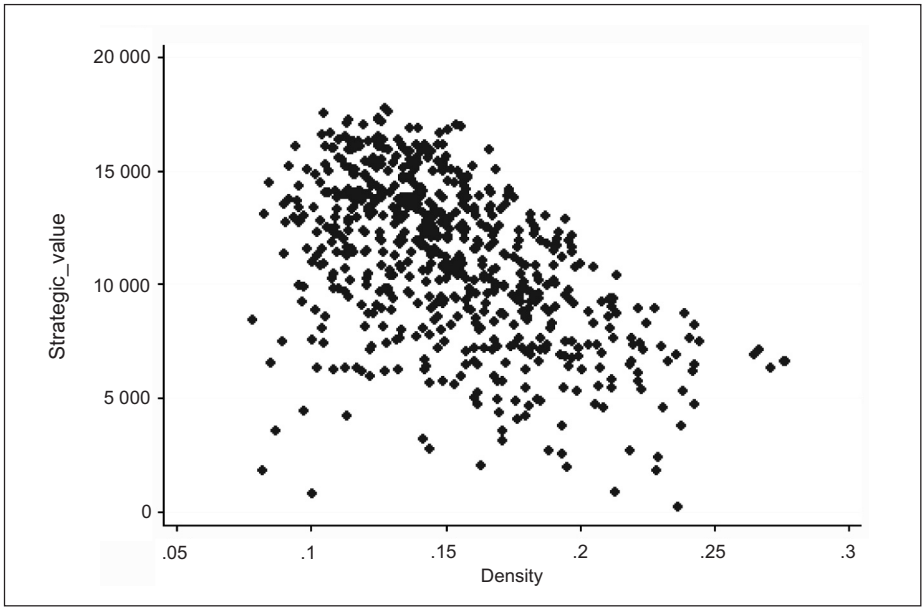
Source: Author's calculation.

Table 9. Top 10 faraway products, ordered by Strategic Value

SITC code	Product	Leamer group	Path	PRODY	PRODY tercile	Path tercile	Contribution to Open Forest (PRODY* density)	Strategic Value
5335	Colour. preptns of a kind used in ceramic, enamelli.	Chemical	196.55	18,099.09	high	high	2,307.83	17,717.46
6632	Natural or artificial abrasive powder or grain	Labour intensive	194.49	18,839.34	high	high	2,423.08	17,615.70
7267	Other printing mach. for uses ancillary to printing	Machinery	174.30	21,054.27	high	high	2,200.40	17,527.86
7492	Taps, cocks, valves etc. for pipes, tanks, vats etc.	Machinery	189.17	17,626.42	high	high	2,209.09	17,306.65
7269	Parts of the machines of 726.31, 726.4-, 726.7-	Machinery	176.80	20,564.04	high	high	2,337.46	17,207.22
6418	Paper & paperboard, impregnat. coat. surface-coloured	Forest products	189.02	19,418.90	high	high	2,430.43	17,197.90
7849	Other parts & accessories of motor vehicles	Machinery	193.79	17,158.54	high	high	2,166.88	17,185.51
7429	Parts of the pumps & liq. elevators of 742–	Machinery	176.21	18,779.22	high	high	2,127.31	17,088.95
7439	Parts of the machines of 743.5-, 743.6-	Machinery	181.99	16,500.97	high	high	1,975.90	17,027.87
7493	Transmission shafts, cranks, bearing housings etc.	Machinery	171.15	17,263.96	high	high	1,855.28	16,647.64

Source: Author's calculation.

Figure 19. Strategic Value against density of unexploited products, 2010



Source: Author's calculation.

Table 10. Products in Open Forest according to Leamer classification

	All products in Open Forest	Nearby products
Petroleum	10	5
Raw materials	57	12
Forest products	30	12
Tropical agriculture	38	27
Animal products	46	24
Cereals, etc.	61	27
Labour intensive	69	32
Capital intensive	85	31
Machinery	173	8
Chemical	86	4
Total	655	182

Source: Author's calculation.

G. Analysis of targeted products

Two groups of targeted products are comparatively analysed: a) NTIS-identified products, which include some products identified in the Trade Policy, b) products exclusive to Trade Policy (not in NTIS). The approach is to first assess export implications of diversification and structural transformation in promoting the products identified by NTIS – which is the trade strategy of the Government of Nepal until at least 2015. The NTIS-identified products are then compared with products identified by Trade Policy. Researchers compare the identified products with the existing export basket, as well as the Open Forest. The "other" export potential products of NTIS are also briefly assessed.

1. NTIS products

There are 131 NTIS-identified products in terms of HS (2002) 6-digit codes and 61 in terms of SITC (Rev. 2) 4-digit codes. Although, less product diversity is captured by SITC codes than HS codes, the former is still employed as the PRODY and Path data available are based on SITC classification. Almost all of iron and steel products are manufactured, capital-intensive, numbering at 38 of the 61 identified, followed by wool products with 11. Accorded special priority in NTIS, agro-food products number 7.[29] Forty-seven of the 61 identified products are exported in 2010, accounting for 37 per cent of Nepal's merchandise exports. All the 14 products identified, though not exported in 2010, are iron and steel products. Twenty-four products are exported with comparative advantage in 2010. Notably, natural honey, silver jewelry and handmade paper are not exported with comparative advantage. Twenty-two of the 61 products are also listed in the Trade Policy 2009. Instant noodle and all iron and steel products are exclusive to NTIS. Table 11 summarizes the features of NTIS-identified products.

Of the 61 identified products, 36 have PRODY greater than EXPY (measuring overall sophistication of the export basket) for 2010. Twenty-four products have PRODY and Path greater than the average for their respective Leamer groups. However, these are disproportionately concentrated in the iron and steel products category.

As expected, basic agricultural products, such as lentils, cardamom, ginger, tea, medicinal herbs and honey, have low PRODY. This points to it being less than EXPY, and/or belonging to the lowest PRODY tercile (table 11 and figure 20). Notably, while PRODY represents the sophistication of a product by taking into account the income levels of countries effectively exporting it, Path shows how connected a product is with other products. A higher Path indicates greater potential for industrial and export diversification. The highest Paths are depicted by, on average, handmade paper, iron and steel products, natural honey and pashmina products (figure 21). Outside of iron and steel products, only handmade paper makes it to the top (first) Path tercile. Among agro-food products, natural

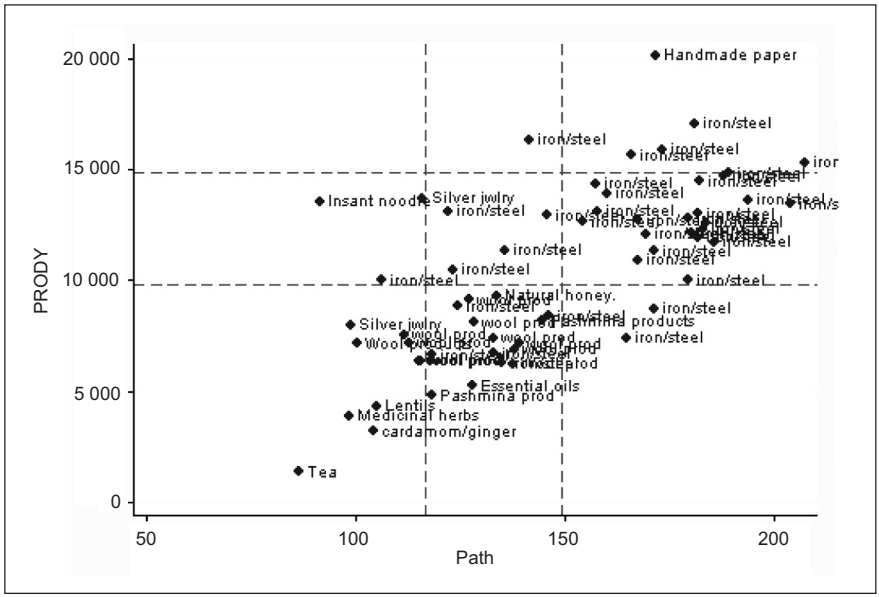
[29] Essential oils are classified as chemical products under Leamer classification, but NTIS considers them agriculture products. They are derived from plants and the WTO's Agreement on Agriculture lists them as agriculture goods. Another incongruity is that medicinal plants are placed under animal products by Leamer. But these do not affect the analysis in any significant way.

Table 11. Summary features of NTIS-identified products

NTIS group	Leamer group	No. of identified products	No. of products also in Trade Policy	Products exported	Exports 2010 ($ '000)	Share in NTIS exports	PRODY> EXPY	RCA>1	Path tercile	PRODY and path> Average Leamer
Lentils	Tropical agriculture	1	1	1	51,394.18	16.72	0	1	low	0
Cardamom/ ginger	Tropical agriculture	1	1	1	22,929.11	7.46	0	1	low	0
Tea	Tropical agriculture	1	1	1	16,356.39	5.32	0	1	low	0
Medicinal herbs	Animal products	1	1	1	6,020.03	1.96	0	1	low	0
Instant noodle	Cereals, etc.	1	0	1	5,967.00	1.94	1	1	low	0
Essential oils	Chemical	1	1	1	504.29	0.16	0	1	medium	0
Natural honey	Tropical agriculture	1	1	1	3.14	0.00	1	0	medium	1
Iron and steel products	Capital intensive (37), raw materials (1)	38	0	24	146,624.80	47.70	31	7	High (27), medium (10), low (1)	22
Wool products	Labour intensive	11	11	11	34,233.23	11.14	1	9	Medium (6), low (5)	0
Pashmina products	Capital intensive (1), labour intensive (1)	2	2	2	19,882.70	6.47	0	2	Medium	0
Silver jewelry	Labour intensive	2	2	2	2,986.02	0.97	1	0	Low	0
Handmade paper	Forest products	1	1	1	513.00	0.17	1	0	High	1
	Total	61	22	47	307,413.89	100.00	36	24		24

Source: Author's calculation.

Figure 20. Sophistication and connectivity of NTIS-identified products



Source: Author's calculation.

Note: The dashed lines demarcate high, medium and low PRODY/Path groups.

honey and essential oils stand out for belonging to the medium (second) Path tercile, the rest have low Path. This is despite all identified agro-food products having low PRODY. Appendix Table A3 provides detailed data on NTIS-identified products.

The NTIS-identified products are compared with the export basket of 2010, which comprises of all products that are exported regardless of comparative advantage (table 12). In terms of sophistication (PRODY) and connectedness with other products (Path), this reveals that, on average, the identified products fare better than the export basket (all exported products or products exported with comparative advantage). However, this is overwhelmingly driven by the presence of iron and steel products among the identified products. Excluding iron and steel products, the identified products, on average, mostly lag behind the export basket on the same parameters. Apart from most iron and steel products, handmade paper, pashmina products and three wool products have Path greater than the export basket average.

Of the 61 identified products, 37 are not exported with comparative advantage, meaning that they are strictly in the Open Forest. The median Path and Strategic Value of the 37 products (31 of which are iron and steel products) are higher than those of the entire Open Forest. This is driven by the presence of a high number of iron and steel products (table 13). Handmade paper also has Path and Strategic Value greater than the median of the Open Forest, and greater than the majority of iron and steel products. Natural honey,

silver jewellery (2) and wool products (2) have Strategic Value lower than the median. However, among them, natural honey has relatively higher Strategic Value along with Path. Of the 37 products, 21 are middle-distance products, 12 are nearby products and 4 are faraway products – all four are iron and steel products (table 13). Seven of the 12 nearby products have medium-to-high Path and Strategic Value, which is higher than the median of nearby products in the Open Forest.

Table 12. Summary statistics of PRODY, Path and Strategic Value of across groups

Variable	No. of products	Mean	Median	Standard Deviation	Min	Max
Export basket, 2010						
PRODY	434	12,008.96	12,351.52	5,206.23	1,371.40	34,113.69
Path	434	136.04	137.50	34.13	9.28	207.69
RCA>1						
PRODY	119	9,549.24	9,148.28	4,659.04	1,371.40	19,962.62
Path	119	131.57	132.83	33.33	30.19	197.11
NTIS products						
PRODY	61	10,424.90	10,939.27	3,894.29	1,371.40	20,158.88
Path	61	146.84	144.30	31.44	86.31	207.19
Strategic Value	61	11,094.15	11,284.76	3,227.76	5,889.44	16,929.91
NTIS iron and steel						
PRODY	38	12,116.09	12,636.83	2,765.47	6,290.71	17,100.74
Path	38	163.28	168.31	25.14	105.91	207.19
Strategic Value	38	12,999.33	13,545.04	2,238.39	8,271.48	16,929.91
NTIS excluding iron and steel						
PRODY	23	7,630.75	7,167.00	3,923.76	1,371.40	20,158.88
Path	23	119.68	115.95	19.88	86.31	171.62
Strategic Value	23	7,946.47	7,852.64	1,832.93	5,889.44	14,714.97
Open Forest						
PRODY	656	12,889.38	13,391.83	5,445.34	801.23	34,113.69
Path	656	129.97	133.49	38.31	2.89	207.69
Strategic Value	656	11,074.84	11,517.18	3,474.22	180.99	17,717.46
NTIS products in Open Forest						
PRODY	37	11,828.01	12,322.83	3,403.55	6,290.71	20,158.88
Path	37	156.13	164.60	29.08	98.70	207.19
Strategic Value	37	12,327.22	13,280.49	2,869.61	6,488.86	16,929.91

Source: Author's calculation.

Note: There are 434 products in the 2010 export basket in this calculation, instead of 438. This is because PRODY and Path values are not available for 4 of the exported products.

Table 13. NTIS products that lie in the Open Forest

NTIS group	Faraway	Middle	Nearby	Total	Nearby products with medium-to-high Path and Strategic Value>Median_nearby Open Forest
Handmade paper	0	1	0	1	
Iron and steel products	4	20	7	31	6
Natural honey	0	0	1	1	1
Silver jewellery	0	0	2	2	
Wool products	0	0	2	2	
Total	4	21	12	37	7

Source: Author's calculation.

The Strategic Values of all 61 identified products are considered in order to gauge what opportunities they have to offer, regardless of whether they were exported with comparative advantage or not. This is in terms of producing and exporting other more sophisticated products once the country produces and exports the identified products effectively. "Effectively", in this context, means production and export capacity in the identified products is significantly scaled up. It is unnecessary to determine a calculation threshold for effective producing and exporting of the identified products, as all identified products are being considered. It is assumed that production and export capacity in these are less than the desired level, despite the potential. This is why they are being targeted for export promotion. As a basis to determine what the "other" products are, the identified products are defined as those in which the country does not have revealed comparative advantage, i.e. RCA<1. Notably, the exercise findings reveal that the Strategic Value of about half of the identified products is less than the average Strategic Value of Open Forest products. All those with Strategic Value above average are iron and steel products, with the exception of handmade paper (which has higher Strategic Value than most iron and steel products).

Focusing on Path, we find that, for natural honey, pashmina products (1) and wool products (3), Path is greater than Open Forest average. Only handmade paper and most of the iron and steel products both have Strategic Value and Path greater than the average for the Open Forest. Comparing the identified products with nearby products in the Open Forest, we find that Path is greater than the Open Forest average also for essential oils, handmade paper, natural honey, two pashmina products and six wool products. This is besides most iron and steel products. Strategic Value is also greater than the Open Forest average for essential oils, handmade paper, natural honey, one pashmina product, and one silver jewellery product. Lastly, both Path and Strategic Value are also greater than the Open Forest average for handmade paper and one pashmina product (table 14).

Table 14. Comparison of NTIS products with export basket and Open Forest

NTIS group	Path> Median_ export basket	Path> Median_ Open Forest	SV>Median_ Open Forest	Path & SV>Median_ Open Forest
Handmade paper	1	1	1	1
Iron and steel products	30	32	28	28
Natural honey		1		
Pashmina products	1	1		
Wool products	3	3		
Total	35	38	29	29
NTIS group	**Path>Median_ nearby Open Forest**	**SV>Median_ nearby Open Forest**	**Path & SV>Median_nearby Open Forest**	
Essential oils	1	1		
Handmade paper	1	1	1	
Iron and steel products	37	34	30	
Natural honey	1	1		
Pashmina products	2	1	1	
Wool products	6			
Silver jewellery		1		
Total	48	39	32	

Source: Author's calculation.

2. *Identified in the 2009 Trade Policy*

Products exclusive to the Trade Policy 2009 are analysed here. Trade Policy 2009 identifies products broadly, and not in terms of a standard classification system. Therefore, 338 products are identified at HS (2002) 6-digit level, corresponding to the broad categories identified in Trade Policy. This is based on HS 6-digit products exported in 2010 and HS 6-digit products under the same or similar categories considered in the International Trade Centre's *Nepal Export Potential Assessment* (ITC, 2007).

When converted to SITC (Rev. 2) 4-digit levels, the number reduces to 54. The PRODY, Path and Strategic Value of these 54 Trade Policy-identified products are, on average, less than the NTIS products. They are higher if compared to the NTIS product set, excluding iron and steel products (table 15).[30] The PRODY and Path of the Trade Policy products are, on average, also less tan those of the 2010 export basket.

[30] Appendix Table A4 provides details of the TP products.

Table 15. Summary statistics of Trade Policy identified products

Variable	No. of products	Mean	Median	Standard Deviation	Min	Max
PRODY	54	8,902.05	8,232.19	4,742.03	1,576.46	20,806.53
Path	54	125.35	118.59	34.42	63.90	190.87
Strategic Value	54	9,198.65	8,471.46	3,364.40	3,792.50	17,197.90

Source: Author's calculation.

In 2010, 48 of the 54 products are exported, 18 of those with comparative advantage (table 16). The exports amounted to 12 per cent of total merchandise exports. For 2010, 23 products have PRODY greater than the EXPY. Thirteen products have PRODY and Path greater than the average for their respective Leamer groups. In comparison to NTIS products, the Trade Policy products represent a greater variety of manufactured goods.

Table 16. Summary features of Trade Policy identified products

Trade Policy group	Leamer group	No. of products	Products exported	RCA>1	Exports (U$ '000)	PRODY> EXPY	PRODY and Path> Average_ Leamer
Coffee	Tropical agriculture	1	1	0	316.14	0	0
Floriculture	Animal products	2	2	0	285.64	1	0
Fresh vegetables	Tropical agriculture	3	3	0	202.09	2	2
Gems and jewellery	Labour intensive	2	1	0	0.63	1	0
Handicraft (non-wood)	Capital intensive (1), labour intensive (1)	2	2	2	1,010.40	1	0
Handicraft (wood)	Forest products	1	1	1	3,293.58	0	0
Leather goods	Capital intensive (3), labour intensive (3)	6	4	0	468.89	3	1
Orange	Tropical agriculture	1	1	0	3.21	0	0
Paper products	Forest products	10	9	2	4,612.27	10	7

Table 16. ***(conitued)***

Trade Policy group	Leamer group	No. of products	Products exported	RCA>1	Exports (U$ '000)	PRODY> EXPY	PRODY and Path> Average_ Leamer
Processed leather	Capital intensive	5	3	2	8,041.43	1	0
RMG	Labour intensive	11	11	7	21,336.80	0	0
Silk products	Capital intensive (1), cereals, etc.* (1)	3	3	1	9.09	0	0
Towel	Capital intensive	5	5	2	2,058.14	3	2
Vegetable seeds	Animal products	1	1	0	37.38	1	1
Woolen carpet	Capital intensive	1	1	1	59,675.00	0	0
Total		54	48	18	101,350.68	23	13

Source: Author's calculation.

Of the 54 Trade Policy products, 12 have high Path and 17 medium Path (table 17). Three of the eight agricultural products have medium Path. All 11 RMG products have low PRODY, but five of them have medium Path. A total of 18 products – including leather goods, paper products, processed leather, vegetable seeds, towel and non-wood handicraft – have medium-to-high PRODY and Path (figure 22).

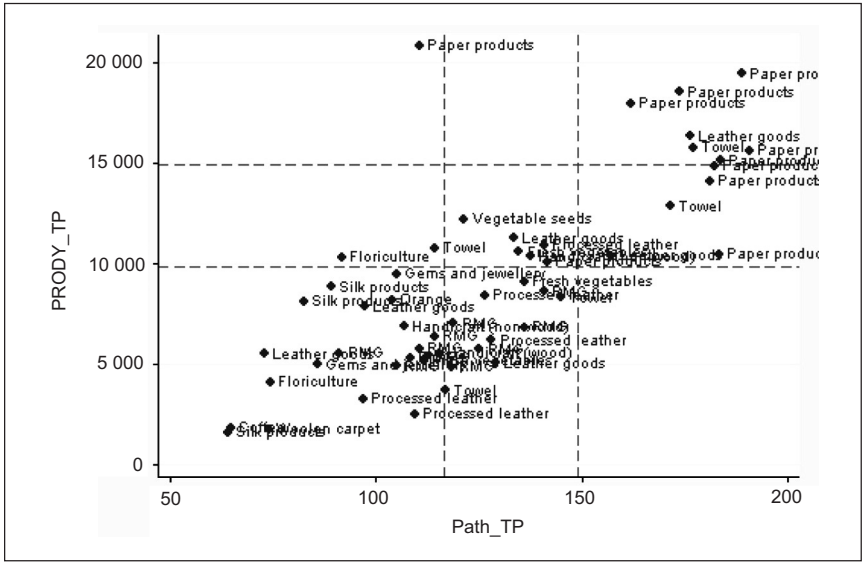
There are 16 products with Path above the median Path of the 2010 export basket. There are 13 products with Path and/or Strategic Value exceeding the median of NTIS products. However, 29 products have Path and/or Strategic Value exceeding the median of the NTIS product set, excluding iron and steel (table 18). While 21 products have Path greater than the Open Forest median, 12 have Strategic Value greater than the Open Forest median. The latter number increases to 27 or half of the Trade Policy products, if comparison is made with the median of nearby products in the Open Forest. In particular, leather goods, processed leather, paper products and towels exhibit higher-than-average Path and Strategic Value consistently across all comparator groups. In contrast, products such as coffee, floriculture, wooden handicraft, orange, silk products and woolen carpet have below-average Path and Strategic Value across all comparator groups. Most RMG products have lower-than-average Path and Strategic Value across most comparator groups. However, compared to the NTIS product set (excluding iron and steel), five RMG products exhibit higher-than-average Path and two higher-than-average Strategic Value. This means that although they are low-tech labour-intensive manufactured goods, RMG products hold greater potential for industrial and export diversification than many of the NTIS products, excluding iron and steel.

Table 17. Distribution of Trade Policy identified products across path terciles

Trade Policy group	High	Medium	Low	Total
Coffee	0	0	1	1
Floriculture	0	0	2	2
Fresh vegetables	0	2	1	3
Gems and jewellery	0	0	2	2
Handicraft (non-wood)	0	1	1	2
Handicraft (wood)	0	0	1	1
Leather goods	2	2	2	6
Orange	0	0	1	1
Paper products	8	1	1	10
Processed leather	0	3	2	5
RMG	0	5	6	11
Silk products	0	0	3	3
Towel	2	2	1	5
Vegetable seeds	0	1	0	1
Woolen carpet	0	0	1	1
Total	12	17	25	54

Source: Author's calculation.

Figure 21. Sophistication and connectivity of Trade Policy products



Source: Author's calculation.

Note: The dashed lines demarcate high, medium and low PRODY/Path groups.

Table 18. Number of products exceeding median values of comparator groups

Trade Policy group	Path> Export basket	Path> NTIS	SV> NTIS	Path> NTIS-iron, steel	SV> NTIS-iron, steel	Path> Open Forest	SV> open forest	SV> Nearby_ open forest
Fresh vegetables	0	0	0	2	2	2	0	2
Gems and jewellery	0	0	0	0	1	0	0	1
Handicraft (non-wood)	0	0	0	1	2	1	0	1
Leather goods	2	2	2	4	4	3	2	4
Paper products	9	8	8	9	10	9	8	10
Processed leather	1	0	1	3	3	1	0	3
RMG	1	0	0	5	2	2	0	1
Towel	3	3	2	4	4	3	2	4
Vegetable seeds	0	0	0	1	1	0	0	1
Total	16	13	13	29	29	21	12	27

Source: Author's calculation.

Notably, clothing has been the launching pad of industrialization and export diversification in many developing countries. Even among agricultural products, fresh vegetables and vegetable seeds have above-average Path and Strategic Value when compared to the NTIS product set, excluding iron and steel. After pressure from the Garment Association of Nepal, in September 2012 the government decided to include RMG in the NTIS list of priority products. However, strategies specific to that sector are yet to be formulated.[31]

Finally, in combining NTIS products and Trade Policy products (excluding iron and steel, which yields 77 products), findings show that among the top 20 products in terms of Strategic Value, 19 products are exclusive to Trade Policy, while one product is common to both. In sum, quite a few of the products identified by Trade Policy hold greater potential for export diversification and structural transformation than many NTIS products, particularly when excluding iron and steel.

In 2010, 36 of the Trade Policy products were not exported with comparative advantage, hence strictly belong to the Open Forest (table 19). Three fourths of them are nearby products, including manufactured products such as leather goods, paper products and towel. These have relatively high sophistication, connectedness and/or Strategic Value. About a dozen of the Trade Policy-identified nearby products have medium-to-high Path and Strategic Value. This is greater than the average of nearby products in the Open Forest

[31] "Govt to include garment in NTIS," *Republica*, 8 September 2012, http://www.myrepublica.com/portal/index.php?action=news_details&news_id=41317

Table 19. Trade Policy products that lie in the Open Forest

Trade Policy group	Faraway	Middle	Nearby	Total	Nearby with medium-to-high Path and Strategic Value> Median_nearby Open Forest
Coffee	0	0	1	1	0
Floriculture	0	0	2	2	0
Fresh vegetables	0	0	3	3	2
Gems and jewellery	1	0	1	2	0
Leather goods	0	1	5	6	3
Orange	0	0	1	1	0
Paper products	2	4	2	8	2
Processed leather	0	0	3	3	2
RMG	0	0	4	4	0
Silk products	0	0	2	2	0
Towel	1	0	2	3	1
Vegetable seeds	0	0	1	1	1
Total	4	5	27	36	11

Source: Author's calculation.

(table 19). Considering all 54 Trade Policy products, findings show that 12 have Strategic Value greater than the average for the Open Forest, 21 have above-average path and 12 have both above-average path and Strategic Value (the latter includes leather goods, paper products and towel).

3. Other NTIS products

As noted in Section 5, NTIS also identifies four "other" product groups with export potential – sugar, cement, dairy products and transformer. These do not fall in the priority list, with no specific strategies and actions pertaining to them in the document. In the preceding section, findings reveal that some products identified in Trade Policy (but excluded from NTIS) present, on average, greater opportunities for industrial and export upgrading, and diversification than NTIS products.

Now, to investigate how "other" NTIS products compares with the main NTIS products. There are 34 HS (2002) 6-digit products corresponding to the four product groups.[32] They reduce to eight products at SITC (Rev. 2) 4-digit level (table 20). These products, on average, exhibit higher PRODY, Path and Strategic Value than the main NTIS

[32] When deriving the tariff subheadings, domestic production and exports in the given product categories are also taken into account.

Table 20. Features of "other" NTIS products

SITC code	Product	Leamer group	PRODY	Path	Strategic value	PRODY tercile	Path tercile	Distance from current export basket
223	Milk & cream, fresh, not concentrated or sweetened	Animal products	15,617.02	156.01	12,934.60	high	high	middle
224	Milk & cream, preserved, concentrated or sweetened	Animal products	15,704.30	131.91	10,443.87	high	medium	middle
230	Butter	Animal products	18,586.19	143.02	12,161.97	high	medium	
240	Cheese and curd	Animal products	18,067.83	167.50	13,253.28	high	high	middle
611	Sugars, beet and cane, raw, solid	Tropical agriculture	6,461.67	74.16	4,554.49	low	low	nearby
612	Refined sugars and other prod. of ref. beet/cane	Tropical agriculture	5,718.05	138.51	9,740.18	low	medium	nearby
6612	Portland cement, ciment fondu, slag cement etc.	Labour intensive	9,491.74	140.98	9,391.88	low	medium	**Error! Bookmark not defined.**
7711	Transformers, electrical	Machinery	12,421.36	151.66	10,603.38	medium	high	

Source: Author's calculation.

products. Interestingly, whereas agricultural products generally depict lower-than-average PRODY, Path and Strategic Value, the four dairy products surpass the majority of the main NTIS products on these attributes. Note that powder milk[33] production is a priority industry as per Industrial Policy. This can also be said of cement production, which despite having low PRODY, has medium Path, greater than the average main NTIS product. Except raw sugar, all "other" NTIS products have medium-to-high Path. Two (butter and transformer) of the 8 products were exported with comparative advantage in 2010. The remaining six belong to the Open Forest – 3 middle-distance from and 3 nearby the current export basket (containing goods exported with comparative advantage).

H. Discussion

With regard to its export sector, the challenges facing Nepal can be broadly grouped under two clusters. The first challenge is to increase the quantum (volume and value) of exports so as to stop the burgeoning trade deficit. More importantly, to create employment and generate income for an expanding labour force, raise economic growth and alleviate poverty. This first challenge is more pressing and has to be addressed immediately. The second challenge is to diversify and increase the sophistication and complexity of the export basket, that is, to produce and export a wider range of new and increasingly sophisticated and complex products.

Addressing the second challenge takes a longer period of time than the first, as it pertains to structural transformation of an economy. Also, it may not immediately address the first challenge. Given resource constraints (among other things), at times policymakers could face a trade-off between according priority to tackling the two challenges. However, addressing the second challenge is critical for ensuring sustained per capita income growth over the long run, as mounting evidence shows. This is discussed in Section 3. Policymakers should explore ways to increase the sophistication of exports when strategizing and directing resources to develop the sector. This would enable meeting the urgent objectives of immediate income and employment generation, as well as poverty alleviation.

Considerations of export potential and socio-economic impact underlie the choice of products for priority development and promotion in policy, notably Trade Policy 2009 and NTIS 2010. Export potential points to mainly demand, market access and competitiveness conditions, and supply-side capacities, while socio-economic impact is mainly employment and income generation, poverty reduction, and backward linkages.

Attention to socio-economic impact is guided by national development goals and objectives. Attention to export potential reflects realism. Products to be targeted for export promotion must have favourable demand and market access conditions. They must be fairly competitive, and there must exist (or there must be a strong potential for the emergence of) a domestic supply capacity associated with these products. In view of the

[33] It is not captured individually under SITC 4-digit classification.

power crisis (which could act as a critical supply-side constraint), NTIS takes into account the electricity intensity in production. All, but iron and steel products, have low-to-medium electricity intensity.

While Trade Policy 2009 provides the overall trade-related policy direction, it is NTIS 2010 that is to guide the Government's trade-related priorities until 2015. The Government has allocated budget specifically for NTIS implementation. Hence, the products identified in NTIS (some of which are also in Trade Policy) would take precedence over other Trade Policy products, in terms of priority accorded for development and promotion. NTIS products differ in their sophistication and potential for structural transformation. However, overall they are below-average on these parameters.

Iron and steel products have mostly high-to-medium sophistication and connectedness, as well as above-average Strategic Value. Also, most of it lies in the "core" of the product space. Agriculture products, such as tea, lentil, ginger, cardamom and medicinal herbs are at the low end. Handmade paper, some pashmina and wool products, honey and essential oils offer better prospects. Trade Policy products (products exclusive to Trade Policy) are also overall below-average, but fare better than some NTIS products. This is particularly when iron and steel products are excluded from the NTIS product set. Leather goods, paper products, processed leather, vegetable seeds, towel and non-wood handicraft hold prospects that are above average. These also surpass quite a few NTIS products. Note that paper production has been listed as a priority industry in Industrial Policy 2010. RMG and woolen carpets, still among the major exportable goods of the country, are notably excluded from NTIS, although, they are on the Trade Policy list. While woolen carpets (here captured by a single SITC code) are well below average, in terms of sophistication and potential for structural transformation, a few RMG product categories fare better than the average NTIS product. Thus, there is some scope to better the prospects of achieving greater export sophistication and diversification by drawing in some of the products identified by Trade Policy, but excluded from NTIS. Also to be noted is that Trade Policy, while representing a greater range of manufactured products than NTIS, has fewer capital-intensive products. Also, some of the "capital-intensive" products in Trade Policy are, in practice, relatively labour-intensive in the Nepali context (e.g. carpet, silk products, leather and leather products).

Of course, the choice of products for targeting is limited by the concentration of Nepal's effective exportable products (here defined as those with RCA>1) in the periphery of the product space. In turn, this is responsible for nearby products in the option set of unexploited opportunities (the Open Forest) being relatively low in sophistication and Strategic Value. And nearby products are those that can be relatively easy to produce and export effectively, given the economy's current capabilities. The question is whether the possibilities (however limited) for export diversification and structural transformation offered by nearby products in the Open Forest are being optimally captured while targeting products.

Quite a few of the targeted products (39 per cent of NTIS products and 33 per cent of Trade Policy products) are exported with comparative advantage, and hence do not

belong to the Open Forest in a strict sense. A dogmatic argument would be that such products should not be targeted at all, as they do not lie in the Open Forest. But in practice, it may not be sensible when targeting products to only include those not exported with comparative advantage, thereby excluding all products exported with comparative advantage. This is even if the basis for targeting is purely the potential for structural transformation (which is rarely the case). As the rationale for targeting, a product may be exported with comparative advantage in a technical sense (defined as RCA>1). However, there may be considerable need and scope to enhance the capabilities associated with its production and exportation. This is especially with regard to increasing production and exports.

Our approach, therefore, has been to regard all identified products as not being effectively exported and then assess their sophistication, connectedness and Strategic Value. The majority of NTIS and Trade Policy products have Strategic Value less than the median of Open Forest products, while the opposite is true when the comparison is made with only the median of Open Forest nearby products. However, in the latter case the above-average products are mostly iron and steel. Furthermore, among the 39 NTIS and Trade Policy products that lie strictly in the nearby area of the Open Forest, about half have medium-to-high Path and Strategic Value greater than the median of all the nearby Open Forest products.

However, it is notable that five NTIS products (out of 12 that are in the nearby area of Open Forest) are among the top 25 nearby Open Forest products in terms of Strategic Value. These are also only iron and steel products, and only four Trade Policy products (out of 27). Similarly, only 4 NTIS products are among the top 25 middle-distance Open Forest products in terms of Strategic Value. Again, all iron and steel (out of 21 that are in the middle-distance area of the Open Forest), and 2 Trade Policy products (out of 5). Likewise, none of the NTIS products (out of four that are in the faraway area of the Open Forest) and only 1 Trade Policy product (out of 4) is among the top 25 faraway Open Forest products in terms of Strategic Value. Overall, out of the identified 73 products that lie in the Open Forest (37 NTIS and 36 Trade Policy), only 2 products (one Trade Policy and one NTIS) are among the top 25 products in the Open Forest in terms of Strategic Value.

Therefore, there are some unexploited products with relatively high potential for further export diversification that should be considered while targeting products. This is, of course, subject to the condition that certain minimum demand, supply-side and competitiveness conditions are met. Attention must be paid to the fact that some nearby to middle-distance products in the Open Forest with relatively high Strategic Value and interconnectedness are textiles. Most are not featured on either NTIS 2010 or Trade Policy 2010. That these are close to Nepal's current industrial and export capabilities is consistent with the fact that exports of non-carpet textiles, like yarn and fabrics, have nearly trebled in value during 2003-2011. This nearly offsets the sharp decrease in clothing exports, and makes up about a quarter of merchandise exports in 2011. Even if it involves capital-intensive production (as per Leamer classification) and depends largely on imported raw materials, its capital-intensiveness and import dependence is unlikely to be higher than that of iron and steel. These were targeted by NTIS 2010. Additionally, some of the "other"

export potential products identified by NTIS have greater connectedness and Strategic Value than most of the "main" NTIS products, excluding iron and steel. These "other" export potential products, such as dairy products and cement, are not accorded priority.

The challenge in targeting lies in striking a balance between achieving short-term efficiency and realization of urgent socio-economic goals, and the long-term imperative of structural transformation. While these short-term goals aim to follow the signals of comparative advantage, reliance on comparative advantage alone will not generate structural transformation.

Given current capabilities, it is neither feasible nor desirable to attempt to "jump" to the so-called "core" of the product space (mainly machinery and chemicals). Nepal's position at the "core" is sparse, except for iron and steel. That would be taking the comparative advantage-defying industrialization strategy to the extreme (see Lin and Chang 2009 for a debate on industrialization strategy). The success of such a strategy is fraught with high uncertainty, even as scarce resources are diverted away from sectors – i) that exhibit comparative advantage or in which the acquisition of comparative advantage will not exact high short-term costs; ii) that have high potential to realize urgent socio-economic goals of, for example, employment generation and poverty reduction; iii) that offer moderate prospects for further industrialization and export sophistication and diversification, albeit not on the grand scale presented by "core" products.

Moreover, in the presence of production fragmentation and rising intermediate good trade, outward sophistication or complexity of a final product does not tell the actual extent (or nature) of value addition and manufacturing that takes place in a particular country. Products falling under SITC (Rev. 2) 2-digit codes 67 (iron and steel) and 69 (manufactures of metals, nes) are among the so-called "core" products. The former accounted for about 15 per cent of Nepal's merchandise exports in 2010, and all are targeted in NTIS. These products augur well for structural transformation, having well-above-average PRODY, Path and Strategic Value and leading the NTIS products on these parameters. But the industry is totally dependent on imported raw materials, with little prospects for backward linkages, and value added is roughly 20 per cent of total cost (GoN, 2010c).

Major exports include cold rolled steel sheets, galvanized color-coated steel sheets, black galvanized steel pipes and black galvanized wires. But production is based on imports of hot-rolled coil, sheets, steel wires, MS billets, sponge iron, and zinc (GoN, 2010c). Imports are mostly from India, and exports are destined mostly for India. To keep abreast of international development, many companies invest in the latest technology in most of the product lines on a regular basis. The companies also increase productivity and quality and kept operating costs relatively competitive (GoN, 2010c). However, most of the products are low-technology products, despite falling into the "core" of the product space. The import dependence should not be held too much against the industry, particularly if export volume is huge and growing, and given the relatively high sophistication and connectedness of the products. But neither should the import dependence aspect be dismissed when assessing the relative merits of targeting products. With scant domestic raw material base, enhancing labour productivity and continuous technological up-

gradation for vertical product diversification and quality upgrading[34] will be vital to making exports of this sector sustainable.

The heavy industry should gear its development towards the domestic market to create a foundation for breaking into export markets, if possible at all. Nepal's iron and steel industry, for one, predominantly caters to the domestic market and its first units were established in the 1980s. Exports of iron and steel products have been notable only in the last decade or so, and they are concentrated in the Indian market. Without the experience of catering to the domestic market, breaking into the Indian market is likely to be difficult. It follows that if effective exports of machinery (another "core" product) are to be aimed at, then first the machinery industry for the domestic market should be developed, for example agriculture tools and equipment, and industrial machinery. The machinery industry is listed as a priority industry by the Industrial Policy 2010.

The method of product space analysis to assess structural transformation possibilities is based on exports. It fails to capture the possibilities associated with import-substituting sectors. For example, Nepal's pharmaceutical industry caters significantly to the domestic market in certain generic drugs (albeit in limited segments, mostly therapeutic drugs of oral dosage forms – production of formulations from imported pharmaceutical starting material).[35] However, it has not been able to significantly break into export markets, although industrialists say export potential exists.[36] Preparations are underway by several producers to export some pharmaceutical products.[37] Note that pharmaceutical products have quite high sophistication, connectivity with other products and Strategic Value, with relatively high potential contribution to structural transformation. The product space analysis does not recognize the country as possessing capabilities in pharmaceutical production, as production is almost exclusively for the domestic market. For this reason, they appear middle-distance or faraway from the current capabilities in the Open Forest. This is neither an argument for or against targeting pharmaceuticals (although the Industrial Policy lists them as a priority industry, and given Nepal's endowment of medicinal plants and heritage of traditional medicine, *Ayurveda* medicines may be a niche area in which Nepal can develop competitive advantage). The point is that a comprehensive view of structural transformation must also take into account the import-competing sectors. These are important in their own right as tradable sectors and also for holding some possibilities for exports.

As noted in the limitations section earlier, the methods employed in this paper do not capture within-product sophistication, or quality of a product. While greater horizontal

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34 This cannot be adequately captured by analysis at the SITC (Rev. 2) 4-digit level.

35 See Ministry of Health and Population/Government of Nepal and World Health Organization, Nepal pharmaceutical country profile, September 2011; Budhathoki, Sushila, "Drug drive: The rising business of pharmaceutical companies in Nepal", Cover story, *New Business Age*, August 2012.

36 Umesh Lal Shrestha, President, Nepal Association of Pharmaceutical Producers and Managing Director, Quest Pharmaceuticals Pvt Ltd, in an interview to *Karobar* national business daily ("Nepali pharmaceuticals are of good quality yet low-priced", 8 February 2011, p.12).

37 Oli, Sujan. "Four firms preparing to export pharmaceuticals within six months", *Arthik Abhiyan*, 18 September 2012, p.1.

diversification and across-product sophistication are important, vertical diversification and quality upgrading of existing exports are equally important. Within apparel, for instance, "products exported by rich countries (or processes undertaken by them) – are likely to be more skill and technology intensive, and yield higher wages and margins, than standardized products exported by poor countries" (Lall *et al.,* 2005). The case for vertical product diversification and quality upgrading is also critical for targeted products. NTIS gives top priority to agro-food products, which are mostly unsophisticated products with little connectedness with other products (see product space analysis above). However, there is a window of opportunity for leveraging agro-food production for industrialization purpose in the NTIS product-specific action matrix. It recognizes the need to achieve horizontal and vertical product diversification, value addition and processing with regard to the identified agro-food commodities. For example, in the case of cardamom, it strategizes exploring avenues for product diversification, catering to spice, essential oil, cardamom paper, incense, and color extraction industries. It saw high potential for diversification into ginger-based products (jam, jelly, candy, sauce, oleoresin). At present, even simple drying of ginger is not generally done in Nepal. In the case of herbs and essential oils, NTIS identifies the need to initiate R&D efforts towards processed products, such as perfumes, food flavoring elements, and fragrances. It also sees the need to introduce a policy to intensify the use of raw herbs in the production of essential oils and herbal products. Product diversification opportunities in the tea sector are to be explored, based on taste and quality preferences.

Through value addition, processing and vertical product diversification, there is scope for not just increasing exporting earnings, but also producing more complex products based on agro-forestry resources. This holds true for both NTIS and Trade Policy products, as well as other agriculture and forest products that may be identified in future. Not all products are the same, in that both medicinal plants and essential oils are targeted by NTIS. However, essential oils (based on medicinal plants) are far more interconnected with other products than medicinal plants.

On average, processed agro/forestry/food products are more sophisticated and carry greater potential for structural transformation than do primary commodities. Focusing on such products that are relatively nearby, Nepal current's export basket could offer a feasible path to structural transformation without compromising the objectives of mass employment creation and poverty alleviation. Table 21 compares summary statistics of PRODY, Path and Strategic Value of processed agro products not currently exported by Nepal with comparative advantage. However, the products lie at a near-to-medium distance from Nepal's current export basket (RCA>1) with those of non-processed agro products, whether exported by Nepal or not.

To enhance industrialization in the long term, capabilities must be increased to competitively produce more sophisticated manufactured products, using domestic primary agro-forest resources. These are highly connected with other products (e.g. perfumery instead of just essential oils from aromatic plants, *Ayurveda* medicine from medicinal plants/herbs, dye from cardamom, diverse paper products based on handmade paper made of local plants).

Table 21. Processed vs. non-processed agricultural products

Processed (with near-to-medium distance from current export basket)						
	No. of products	**Mean**	**Median**	**Standard Deviation**	**Min**	**Max**
PRODY	39	11,742.74	11,708.03	4,799.96	3,919.23	24,747.86
Path	39	135.17	135.49	25.22	74.16	186.34
Strategic value	39	10,557.23	10,682.18	2,356.89	4,554.49	16,064.73
Non-processed						
PRODY	59	8,321.57	6,280.79	6,256.56	1,371.40	33,442.19
Path	59	97.31	102.04	36.25	2.89	159.78
Strategic value	46	7,424.54	7,304.57	3,100.12	180.99	14,594.91

Source: Author's calculation.

Note: Classification as processed and non-processed broadly follows that adopted by United States Department of Agriculture, which excludes fish products. HS codes specified by USDA are converted to SITC codes. Strategic Values for non-processed products are calculated only for the 46 products that lie in the Open Forest.

The strategy of promoting exports of products based on agro-forestry resources is in itself not wrong, given the country's resource endowment. But failure to adopt policy measures to encourage manufacturing of agro-forestry-based products increases the risk of falling into the commodity-dependence trap. To avoid that trap, success of export promotion strategies must be measured in terms of progress in exports of commodity-based manufactured products versus unprocessed commodities. Even when manufacturing process is limited by the very nature of the product, emphasis must be laid on quality upgrading and branding to capture higher value. After all, seemingly homogenous agriculture products (such as tea and coffee) can be vertically differentiated based on their intrinsic quality and priced accordingly.[38] NTIS, Trade Policy and future trade policies and strategies must be implemented in that direction.

Taking the cash incentive scheme for exports as an example – it was introduced in 2010/11 and continued in 2011/12 with a budget of NPR 300 million (about $4 million). The budget for the schemeremains mostly unspent due to procedural rigmarole, among other things. Notably, under the budget exporters are entitled to 2 to 4 per cent of their convertible currency export earnings based on the rate of value addition.[39] The programme is not confined to NTIS/Trade Policy-identified products only. Overhalf of the firms that were

[38] See, for example, Rollo (2012) for an analysis of the determinants of Tanzanian export prices.

[39] It covers only exports to countries other than India. The cash incentive is 2 per cent, 3 per cent or 4 per cent depending on whether the rate of value addition is 30-50 per cent, 50-80 per cent or above 80 per cent.

awarded the incentive (in 2011/12)[40] are agro-food exporters. This is most likely because domestic value addition should be naturally high for agro-food products, including unprocessed ones (Kharel, 2012). Simplifying the procedures for granting the cash incentive could increase the utilization of the scheme and many exporters demanded a flat rate of incentive irrespective of value addition. However, procedural problems had to be balanced against the need to encourage as much domestic value addition as possible. The Ministry of Commerce and Supplies suggested providing cash incentive at a flat rate, irrespective of value addition, or product-specific rates.[41]

But apart from procedural issues, it is not clear whether provision of the incentive will actually induce the exporters concerned to export more (ibid.). Addressing critical domestic supply-side constraints to exports requires provision of facilities in the nature of public good or service (e.g. strengthened laboratories, quality inputs, research and extension). Using cash incentive scheme budget to alleviate these constraints in a targeted manner is an option worth exploring, as exporters/producers are unable to overcome the constraints individually (ibid.).

Additionally, policymakers should also be mindful of the possibility the scheme may create a bias against production and export of processed agro-forest products, including agro-forest-based industrial products (ibid.). This is since exports of agriculture and forest products in raw form are likely to qualify for 4 per cent cash incentive by virtue of them being produced/naturally growing within the country.

Another issue related to the incentive regime is the proposed Special Economic Zone (SEZ), where enterprises are entitled to a range of tax and non-tax incentives and facilities. While the construction of two SEZs is progressing, and the GoN has announced its plan to develop six more, the SEZ Bill is still pending in parliament. Interestingly, NTIS 2010 calls for the removal (in the draft SEZ Bill) of the 75 per cent export requirement for enterprises based in the zone. As the primary purpose of establishing SEZs is to promote exports (as mentioned in Industrial Policy 2010), the proposal to remove the 75 per cent export requirement could detract from the potential of using SEZs as an instrument to increase exports. This is in the context of an extremely poor export performance of Nepal. Furthermore, as the facilities and concessions granted to firms located in the zones entail cost to the government and represent scarce resources to be utilized most judiciously (Kharel, 2012).

A dedicated special export zone or a special export zone located within an SEZ can address this issue, but this is not being considered. NTIS 2010 also recommends that a positive list be replaced with a negative list specifying the types of industries that SEZs cannot host. However, if exports are to be sustainable and broad-based conferring greater benefits on the economy, the SEZs should be used as an instrument of encouraging higher (genuine) sophistication and domestic content of exports (not just increasing the quantum

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40 Rijal, Krishna. 2012. "Cash incentives to 57 export-oriented firms," *Arthik Abhiyan*, 2 August, p.1 and 5.

41 "Flat rate or commodity-based rate recommended for export incentives", *Republica* (online), 11 November 2012.

of exports), and the facilities provided therein should be aimed at encouraging the acquisition of the required production and export capabilities. This would call for some judicious discriminationon grounds of tradability of goods and services, backward integration, value addition and degree of transformation in the production process, despite the associated administrative difficulties.

Technology is a major factor behind export sophistication and, by implication, export location. Other major economic factors are marketing, logistics and proximity, fragment ability, information and familiarity, natural resources, infrastructure, and value chain organization (Lall *et al.,* 2005). Policy factors – such as trade and industrial policies, trading blocs and trade preferences – also play a role in determining patterns of specialization and export sophistication, and location (ibid.).

Supply-side constraints (SSCs) affect both the quantum of exports and the type of goods exported. Critical SSCs traditionally facing Nepal include inadequate infrastructure, low human capital and inadequacy of trade facilitation measures (including the cost of being landlocked) (see Adhikari, 2011). These should be distinguished from deteriorating industrial relations, frequent strikes and shutdowns. As well as deteriorating security situation that have vitiated the overall business/investment climate and brutalized the manufacturing sector since 2006.

The growth diagnostics framework for identifying the binding constraints to growth, considers low export sophistication, low export diversification and very limited export sophistication possibilities (low Open Forest) as “symptoms” of coordination failure and self-discovery externalities (Hausmann *et al.,* 2005 and 2008). However, in the context of Nepal, these also appear to be symptoms of other constraints – notably those concerning infrastructure, human capital and finance. This acts to keep possibilities of export sophistication and diversification at low levels. For example, a producer’s reluctance or inability to upgrade his capabilities to produce more sophisticated goods – say, moving from simple processing of aromatic plants to extracting essential oils from them, to manufacturing perfumery – could be due to lack of resources to purchase the required machinery or lack of knowledge of such possibilities. This is rather than, say, the concern that competitors will also follow suit after seeing his success.

Finally, the manufacturing export sector is a part of the national manufacturing sector, that is characterized by low productivity and whose performance in the recent decade has been alarmingly poor. As seen in Section 4, despite structural change in the Nepali economy being growth-enhancing in the recent decade, overall productivity growth has been low. Productivity growth in manufacturing has been negative. Due to weak manufacturing performance and the limited capacity of other sectors to absorb surplus labour, the shift in labour from agriculture to more productive sectors has been slow. Policy measures aimed at expediting structural transformation of the economy must foremost be directed at shoring up the ailing manufacturing sector.

Conclusion

This paper reports on the investigation into the nature of recent economic growth in Nepal. It uses some of the analytical tools and insights from recent literature on the importance of structural transformation as a facilitator of long-term growth. In particular, it examines the extent Nepal's recent trade policy initiatives take into account the long-term potential to assist economic growth. This is through the encouragement of production and export of goods and services, which could facilitate the shift of economic activities towards more complex and sophisticated products. In turn, it has the potential to set the economy on a sustainable long-term growth trajectory.

The analysis shows that while economy-wide structural change – reallocation of labour across sectors – has contributed positively to productivity growth in Nepal in a recent decade, overall productivity growth has been low. More so, productivity growth in manufacturing has been negative, and due to weak manufacturing performance and the limited capacity of other sectors to absorb surplus labour, the shift in labour from agriculture to more productive sectors has been slow. To address the root causes of these problems, attention should be drawn to symptoms of de-industrialization and demand appropriate policy measures. This would also further expedite structural transformation of Nepal's economy.

Although, trade has been recognized as an engine of growth at the policy level, export performance has been weak, particularly so in the past decade. This is despite policy measures, over the last two decades, to integrate the Nepali economy into the global economy, mainly through economic liberalization. Nepal's export performance has been moribund, in terms of value and growth. More so, its merchandise export basket remains low in technological sophistication and poorly diversified. Structural transformation, as measured by the rate of increase in the sophistication of the export basket, has slowed sharply in the last decade. Further, opportunities for producing and exporting new and more sophisticated goods (as represented by the export basket) are limited. The expansion of such opportunities has slowed down significantly. The challenge that Nepal faces on the export front is two-fold – a) to increase the export earnings and employment by increasing the export of existing products, given the current industrial and export structures and capabilities. This is so as to reduce the ever-widening trade imbalance and increase income and employment levels, and b) to upgrade the industrial and export structures, and capabilities to be able to produce and export (or expand) the production and export of more sophisticated products requiring a greater number of capabilities.

Considerations of export potential, socio-economic impact and utilization of domestic agro-forestry resources underlie the choice of products for priority development and promotion in the Government of Nepal's policy documents, notably Trade Policy (TP) 2009 and Nepal Trade Integration Strategy (2010). While Trade Policy 2009 provides the overall trade-related policy direction, it is NTIS 2010 that is to guide the government's trade-related priorities until 2015. NTIS accords top priority to agro-food products. Our analysis shows that NTIS products differ in their sophistication and potential for structural

transformation, but overall they are below-average on these parameters. Iron and steel products have mostly high-to-medium sophistication and connectedness and above-average Strategic Value, and most of them lie in the "core" of the product space. However, agriculture products like tea, lentils, ginger, cardamom and medicinal herbs are at the low end. Handmade paper, some pashmina and wool products, honey and essential oils offer better prospects. Trade Policy products (that is, products that are exclusive to Trade Policy) are also overall below-average, but fare better than some NTIS products, particularly when iron and steel products are excluded from the NTIS product set. Leather goods, paper products, processed leather, vegetable seeds, towel and non-wood handicraft hold prospects that are above average, as well as surpassing quite a few NTIS products. There is some scope to better the prospects of achieving greater export sophistication and diversification by drawing in some of the products identified by Trade Policy, but excluded from NTIS.

The choice of products for targeting is limited by the concentration of Nepal's effective exportable products in the periphery of the product space, with low sophistication and low connectedness. In turn, this is responsible for most of the unexploited "nearby" products being relatively low in sophistication, connectedness and Strategic Value. This would involve producing and exporting the "nearby" products, which requires capabilities similar to the existing capabilities. However, there exist some unexploited nearby products with relatively high potential for further export diversification, which should be considered while targeting products. Of course, this is subject to the condition that certain minimum demand, supply-side and competitiveness conditions are met. In addition, some of the "other" export potential products identified by NTIS, but not accorded priority (such as dairy products and cement) carry greater potential for structural transformation than the "main" NTIS products, excluding iron and steel. In future, it is necessary that the structural transformation dimension also inform trade policymaking and implementation.

Given Nepal's resource endowment, the strategy of promoting exports of products based on agro-forestry resources is justified. But unless this is accompanied by policy measures to encourage manufacturing of agro-forestry-based products, in the long-term such a strategy increases the risk of falling into the commodity-dependence trap. To avoid that trap, success of export promotion strategies must be measured in terms of the progress made in increasing the share of commodity-based manufactured productsover time. This is due to processed agro/forestry/food products generally being more sophisticated, and having greater potential for structural transformation than primary commodities. NTIS, Trade Policy and future trade policies and strategies must be oriented towards that direction. This ought to be so not only for NTIS products, but also Trade Policy products and other agriculture and forest products that may be identified in future. Focusing on such products that are relatively nearby, Nepal current's export basket could offer a feasible path to structural transformation without compromising the immediate objectives of mass employment creation and poverty alleviation. From a long-term perspective, in order to enhance industrialization, capabilities must be increased to competitively produce more sophisticated manufactured products, using domestic primary agro-forest resources. These are highly connected with other products (e.g. perfumery instead of just essential oils from

aromatic plants; *Ayurveda* medicine from medicinal plants/herbs; dye from cardamom; diverse paper products based on handmade paper made from local plants).

Supply-side constraints affect both the quantum (value and volume) and sophistication of exports. The Government's latest trade strategy identifies sector-specific and cross-cutting constraints to exports. It then charts out a course of actions to alleviate them. In making the effort to alleviate, attention must be paid to product sophistication and diversification constraints, not just production and exportation of the same type of goods.

Notwithstanding the importance of producing and exporting more sophisticated products, policymakers must not lose sight of the actual extent (or nature) of value addition and manufacturing that takes place inside the economy. Sophistication of a final product alone may shed little light on these aspects. Vertical production diversification and quality upgrading of existing exports are also important. Furthermore, it must be noted that the method of product space analysis to assess structural transformation possibilities is based on exports. It fails to capture the possibilities associated with import-substituting sectors. A comprehensive view of structural transformation, therefore, must also take into account the import-competing sectors. These are important as tradable sectors, and full of possibilities for future exports.

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Appendix

Table A1. Top 30 "nearby" products in descending order of Strategic Value (year 2010)

SITC code	Product	Leamer group	Path	PRODY	PRODY tercile	Path tercile	Contribution to open forest (PRODY* density)	Distance	Strategic value
8932	Sanitary or toilet art. of materials of div. 58	Labour intensive	195.22	13,541.54	medium	high	2,289.36	nearby	15,076.17
6421	Boxes, bags & oth. packing containers, of paper/papbd	Forest products	182.21	14,854.13	medium	high	2,576.47	nearby	14,184.04
6924	Casks, drums, boxes of iron/ steel for packing goods	Capital intensive	183.55	12,609.02	medium	high	2,187.44	nearby	14,059.19
6417	Paper & paperboard, corrugated, creped, crinkled etc.	Forest products	183.28	10,462.18	medium	high	1,814.01	nearby	13,886.84
6794	Castings or iron or steel, in the rough state	Capital intensive	185.55	11,749.49	medium	high	2,065.54	nearby	13,790.18
8212	Furniture for medical, surgical, dental etc. practice	Labour intensive	176.70	13,331.69	medium	high	2,296.04	nearby	13,489.34
6975	Sanitary ware for indoor use, and parts	Capital intensive	173.04	15,926.95	high	high	2,716.29	nearby	13,319.42
6973	Domestic-type, non-electric heating, cooking appar.	Capital intensive	179.19	12,795.86	medium	high	2,324.09	nearby	13,104.04
6517	Yarn of regenerated fibres, not for retail sale	Capital intensive	178.03	9,639.35	low	high	1,804.43	nearby	13,042.27

Table A1. ***(continued)***

SITC code	Product	Leamer group	Path	PRODY	PRODY tercile	Path tercile	Contribution to open forest (PRODY* density)	Distance	Strategic value
6560	Tulle, lace, embroidery, ribbons, & other small wares	Capital intensive	171.36	12,836.79	medium	high	2,497.21	nearby	12,899.75
484	Bakery products (e.g. bread, biscuits, cakes) etc.	Cereals, etc.	170.66	14,416.13	medium	high	2,619.15	nearby	12,820.16
7758	Electro-thermic appliances, n.e.s.	Machinery	167.83	14,429.25	medium	high	2,637.38	nearby	12,548.79
620	Sugar confectionery and other sugar preparations	Tropical agriculture	165.64	10,445.02	medium	high	1,773.48	nearby	12,542.11
8124	Lighting fixtures and fittings and parts	Capital intensive	165.62	14,004.12	medium	high	2,567.28	nearby	12,400.53
6512	Yarn of wool or animal hair (including wool tops)	Capital intensive	162.09	12,826.38	medium	high	2,278.88	nearby	12,360.81
6536	Fabrics, woven contain. 85 per cent of discont. regener. fibr.	Capital intensive	163.92	10,978.14	medium	high	2,110.75	nearby	12,254.98
7752	Household type refrigerators & food freezers	Machinery	166.96	13,599.29	medium	high	2,490.03	nearby	12,210.56
8211	Chairs and other seats and parts	Labour intensive	172.04	10,686.91	medium	high	2,105.14	nearby	12,161.61

Table A1. ***(continued)***

SITC code	Product	Leamer group	Path	PRODY	PRODY tercile	Path tercile	Contribution to open forest (PRODY* density)	Distance	Strategic value
6664	Tableware & other articles of porcelain or china	Labour intensive	163.76	9,012.59	low	high	1,728.93	nearby	12,012.98
6732	Bars & rods, of iron/steel; hollow mining drill st.	Capital intensive	164.60	7,426.31	low	high	1,317.53	nearby	11,938.29
8219	Other furniture and parts	Labour intensive	168.16	11,803.49	medium	high	2,311.17	nearby	11,936.50
6651	Containers, of glass, used for conveyance or packing	Labour intensive	167.34	9,161.98	low	high	1,699.10	nearby	11,896.34
6129	Other articles of leather or of composit. leather	Capital intensive	157.30	10,377.48	medium	high	1,952.18	nearby	11,747.61
6259	Other tyres, tyre cases, inner tubes	Capital intensive	164.39	8,756.15	low	high	1,677.47	nearby	11,671.19
6519	Yarn of text. fibres, n.e.s., incl. yarn of glass fib.	Capital intensive	158.30	7,461.56	low	high	1,421.60	nearby	11,666.84
7731	Insulated, elect. wire, cable, bars, strip and the like	Machinery	160.92	7,533.37	low	high	1,484.09	nearby	11,656.13
6416	Building board of wood pulp or of vegetable fibre	Forest products	157.94	13,516.99	medium	high	2,386.73	nearby	11,635.39
583	Jams, fruit jellies, marmalades, fruit puree, cooked	Tropical agriculture	162.12	7,027.30	low	high	1,337.97	nearby	11,493.51

Table A1. ***(continued)***

SITC code	Product	Leamer group	Path	PRODY	PRODY tercile	Path tercile	Contribution to open forest (PRODY* density)	Distance	Strategic value
6130	Furskins, tanned/dressed, pieces/cuttings of furskin	Capital intensive	158.88	16,585.08	high	high	3,271.88	nearby	11,422.45
6349	Wood, simply shaped, n.e.s.	Forest products	152.35	9,271.73	low	high	1,592.64	nearby	11,330.38

Source: Author's calculation, see text.

Table A2. Top 30 products in descending order of Strategic Value (year 2010)

SITC code	Product	Leamer group	Path	PRODY	PRODY tercile	Path tercile	Contribution to Open Forest (PRODY* density)	Distance	Strategic Value
5335	Colour. preptns of a kind used in ceramic, enamelli.	Chemical	196.55	18,099.09	high	high	2,307.83	far away	17,717.46
6632	Natural or artificial abrasive powder or grain	Labour intensive	194.49	18,839.34	high	high	2,423.08	far away	17,615.70
7267	Other printing mach. for uses ancillary to printing	Machinery	174.30	21,054.27	high	high	2,200.40	far away	17,527.86
7492	Taps, cocks, valves etc. for pipes, tanks, vats etc.	Machinery	189.17	17,626.42	high	high	2,209.09	far away	17,306.65
7269	Parts of the machines of 726.31, 726.4-, 726.7-	Machinery	176.80	20,564.04	high	high	2,337.46	far away	17,207.22
6418	Paper & paperboard, impregnat. coat. surface-coloured	Forest products	189.02	19,418.90	high	high	2,430.43	far away	17,197.90
7849	Other parts & accessories of motor vehicles	Machinery	193.79	17,158.54	high	high	2,166.88	far away	17,185.51
7429	Parts of the pumps & liq. elevators of 742—	Machinery	176.21	18,779.22	high	high	2,127.31	far away	17,088.95
7439	Parts of the machines of 743.5-, 743.6-	Machinery	181.99	16,500.97	high	high	1,975.90	far away	17,027.87
6996	Miscellaneous articles of base metal	Capital intensive	207.69	15,704.52	high	high	2,418.90	middle	17,006.43

Table A2. ***(continued)***

SITC code	Product	Leamer group	Path	PRODY	PRODY tercile	Path tercile	Contribution to open forest (PRODY* density)	Distance	Strategic value
6785	Tube & pipe fittings (joints, elbows) of iron/steel	Capital intensive	207.19	15,323.85	high	high	2,385.44	middle	16,929.91
7449	Parts of the machinery of 744.2-	Machinery	199.53	16,022.39	high	high	2,239.96	middle	16,886.23
7139	Parts of int. comb. piston engines of 713.2-/3-/8-	Machinery	194.09	16,920.96	high	high	2,314.52	middle	16,883.36
8935	Art. of electric lighting of materials of div. 58	Labour intensive	198.18	15,538.38	high	high	2,341.37	middle	16,768.43
6210	Materials of rubber (e.g. pastes, plates, sheets, etc.)	Capital intensive	198.81	15,040.43	high	high	2,219.33	middle	16,665.21
7493	Transmission shafts, cranks, bearing housings etc.	Machinery	171.15	17,263.96	high	high	1,855.28	far away	16,647.64
7132	Int. combustion piston engines for propelling veh.	Machinery	167.49	17,148.64	high	high	1,787.76	far away	16,576.36
7428	Other pumps for liquids & liquid elevators	Machinery	174.12	16,345.75	high	high	1,842.59	far away	16,505.85
7212	Harvesting & treshing machinery and parts	Machinery	183.58	18,719.55	high	high	2,339.47	far away	16,488.80
7413	Ind. & lab. furnaces and ovens and parts	Machinery	178.57	17,122.77	high	high	2,119.06	far away	16,388.38

Table A2. ***(continued)***

SITC code	Product	Leamer group	Path	PRODY	PRODY tercile	Path tercile	Contribution to open forest (PRODY* density)	Distance	Strategic value
7234	Construction and mining machinery, n.e.s.	Machinery	171.63	14,324.30	medium	high	1,632.89	far away	16,386.08
7188	Engines & motors, n.e.s. such as water turbines etc.	Machinery	186.10	17,844.67	high	high	2,358.53	far away	16,367.01
7368	Work holders, self-opening dieheads & tool holders	Machinery	172.69	18,167.42	high	high	2,001.33	far away	16,365.09
7442	Lifting, handling, loading mach. conveyors	Machinery	181.05	17,010.07	high	high	2,138.61	far away	16,332.11
7219	Agric. mach. & appliances, n.e.s. and parts	Machinery	179.47	20,207.11	high	high	2,559.10	far away	16,322.78
7783	Electr. equip. for internal combustion engines, parts	Machinery	170.56	15,925.70	high	high	1,846.94	far away	16,299.60
7436	Filtering & purifying mach. for liquids & gases	Machinery	175.48	17,104.32	high	high	2,080.48	far away	16,283.89
2331	Synth. rubb. lat.; synth. rubb. factice deriv. from oils	Tropical agriculture	175.08	9,595.75	low	high	1,130.67	far away	16,266.49
6953	Other tools for use in the hand	Capital intensive	189.71	14,733.62	medium	high	2,200.75	middle	16,174.98
6991	Locksmiths wares, safes, strong rooms of base metal	Capital intensive	189.13	16,414.08	high	high	2,416.89	middle	16,155.87

Source: Author's calculation, see text.

Table A3. NTIS products

SITC code	Product	NTIS group	Leamer group	Also in Trade Policy?	PRODY	Path	PRODY tercile	Path tercile	Strategic Value	Distance
483	Macaroni, spaghetti and similar products	Insant noodle	Cereals, etc.	No	13,574.83	91.50	medium	low	6,955.17	
542	Beans, peas, lentils & other leguminous vegetables	Lentils	Tropical agriculture	Yes	4,339.02	105.04	low	low	6,996.98	
616	Natural honey	Natural honey	Tropical agriculture	Yes	9,330.78	133.60	low	medium	9,379.04	nearby
741	Tea	Tea	Tropical agriculture	Yes	1,371.40	86.31	low	low	5,889.44	
752	Spices (except pepper and pimento)	Cardamom/ ginger	Tropical agriculture	Yes	3,207.49	104.23	low	low	6,647.25	
2820	Waste and scrap metal of iron or steel	Iron and steel products	Raw materials	No	6,290.71	134.81	low	medium	9,881.07	nearby
2924	Plants, seeds, fruit used in perfumery, pharmacy	Medicinal herbs	Animal products	Yes	3,909.24	98.21	low	low	6,088.21	
5513	Essential oils, concretes & absolutes; resinoids	Essential oils	Chemical	Yes	5,244.98	127.73	low	medium	8,986.14	
6412	Printing paper & writing paper, in rolls or sheets	Handmade paper	Forest products	Yes	20,158.88	171.62	high	high	14,714.97	middle
6583	Travelling rugs and blankets, not knitted/ crocheted	Pashmina products	Capital intensive	Yes	8,175.97	144.30	low	medium	9,502.38	

Table A3. ***(continued)***

SITC code	Product	NTIS group	Leamer group	Also in Trade Policy?	PRODY	Path	PRODY tercile	Path tercile	Strategic Value	Distance
6712	Pig iron, cast iron and spiegeleisen, in pigs, blocks	Iron and steel products	Capital intensive	No	6,647.54	117.97	low	medium	8,769.10	middle
6713	Iron or steel powders, shot or sponge	Iron and steel products	Capital intensive	No	10,002.32	105.91	medium	low	8,844.98	far away
6716	Ferro-alloys	Iron and steel products	Capital intensive	No	13,126.03	121.97	medium	medium	8,271.48	nearby
6724	Puddled bars and pilings; ingots, blocks, lumps etc.	Iron and steel products	Capital intensive	No	11,361.39	135.62	medium	medium	10,881.86	middle
6725	Blooms, billets, slabs & sheet bars of iron or steel	Iron and steel products	Capital intensive	No	6,710.47	132.79	low	medium	9,731.96	middle
6727	Iron or steel coils for re-rolling	Iron and steel products	Capital intensive	No	8,405.86	145.82	low	medium	11,284.76	middle
6731	Wire rod of iron or steel	Iron and steel products	Capital intensive	No	8,747.24	170.97	low	high	13,280.49	middle
6732	Bars & rods, of iron/steel; hollow mining drill st.	Iron and steel products	Capital intensive	No	7,426.31	164.60	low	high	11,938.29	nearby
6733	Angles, shapes & sections & sheet piling, of iron/st.	Iron and steel products	Capital intensive	No	12,322.83	182.66	medium	high	14,331.19	middle
6744	Sheets & plates, rolled >4.75 mm of iron/steel	Iron and steel products	Capital intensive	No	10,024.73	179.40	medium	high	13,791.27	middle

Table A3. *(continued)*

SITC code	Product	NTIS group	Leamer group	Also in Trade Policy?	PRODY	Path	PRODY tercile	Path tercile	Strategic Value	Distance
6745	Sheets & plates, rld. thickns. 3 mm to 4, 75 mm irn/stl.	Iron and steel products	Capital intensive	No	12,127.31	180.25	medium	high	14,778.09	middle
6746	Sheets & plates, rolled; thickness of less than 3 mm	Iron and steel products	Capital intensive	No	12,105.81	169.18	medium	high	13,445.87	middle
6747	Tinned sheets and plates, of steel	Iron and steel products	Capital intensive	No	13,147.33	157.56	medium	high	13,037.03	middle
6749	Other sheets and plates, of iron or steel, worked	Iron and steel products	Capital intensive	No	14,363.66	157.16	medium	high	13,073.81	
6760	Rails and railway track construction material	Iron and steel products	Capital intensive	No	13,937.68	159.82	medium	high	14,089.85	far away
6770	Iron/steel wire/wheth/not coated, but not insulated	Iron and steel products	Capital intensive	No	11,951.71	181.76	medium	high	13,921.51	
6781	Tubes and pipes, of cast iron	Iron and steel products	Capital intensive	No	12,931.14	145.67	medium	medium	12,291.38	middle
6782	seamlesstubes and pipes; blanks for tubes & pipes	Iron and steel products	Capital intensive	No	10,939.27	167.16	medium	high	13,713.96	middle
6783	Other tubes and pipes, of iron or steel	Iron and steel products	Capital intensive	No	13,034.23	181.49	medium	high	14,125.68	
6785	Tube & pipe fittings (joints, elbows) of iron/steel	Iron and steel products	Capital intensive	No	15,323.85	207.19	high	high	16,929.91	middle
6793	Steel & iron forgings & stampings, in rough state	Iron and steel products	Capital intensive	No	14,865.17	189.09	medium	high	15,521.88	middle

Table A3. *(continued)*

SITC code	Product	NTIS group	Leamer group	Also in Trade Policy?	PRODY	Path	PRODY tercile	Path tercile	Strategic Value	Distance
6794	Castings or iron or steel, in the rough state	Iron and steel products	Capital intensive	No	11,749.49	185.55	medium	high	13,790.18	nearby
6911	Structures & parts of struc.; iron/steel; plates	Iron and steel products	Capital intensive	No	13,657.89	193.44	medium	high	14,782.34	
6921	Reservoirs, tanks, vats and similar containers	Iron and steel products	Capital intensive	No	13,472.55	203.59	medium	high	15,887.46	middle
6924	Casks, drums, boxes of iron/steel for packing goods	Iron and steel products	Capital intensive	No	12,609.02	183.55	medium	high	14,059.19	nearby
6931	Stranded wire, cables, cordages and the like	Iron and steel products	Capital intensive	No	11,323.75	171.04	medium	high	12,745.52	
6932	Wire, twisted hoop for fencing of iron or steel	Iron and steel products	Capital intensive	No	8,837.42	124.40	low	medium	9,590.97	middle
6935	Gauze, cloth, grill of iron steel or copper	Iron and steel products	Capital intensive	No	12,741.14	167.43	medium	high	13,644.21	
6940	Nails, screws, nuts, bolts etc. of iron, steel, copper	Iron and steel products	Capital intensive	No	15,655.73	165.65	high	high	15,288.89	far away
6973	Domestic-type, non-electric heating, cooking appar.	Iron and steel products	Capital intensive	No	12,795.86	179.19	medium	high	13,104.04	nearby
6974	Art. commonly used for dom. purposes, pot scourers	Iron and steel products	Capital intensive	No	10,507.25	123.06	medium	medium	8,657.60	

Table A3. *(continued)*

SITC code	Product	NTIS group	Leamer group	Also in Trade Policy?	PRODY	Path	PRODY tercile	Path tercile	Strategic Value	Distance
6975	Sanitary ware for indoor use, and parts	Iron and steel products	Capital intensive	No	15,926.95	173.04	high	high	13,319.42	nearby
6992	Chain and parts thereof, of iron or steel	Iron and steel products	Capital intensive	No	14,492.18	182.00	medium	high	15,367.24	middle
6993	Pins & needles, fittings, base metal beads, etc.	Iron and steel products	Capital intensive	No	12,664.65	154.09	medium	high	14,002.18	middle
6994	Springs & leaves for springs, of iron/steel/copper	Iron and steel products	Capital intensive	No	16,376.32	141.15	high	medium	13,215.29	far away
6997	Articles of iron or steel, n.e.s.	Iron and steel products	Capital intensive	No	14,708.04	187.79	medium	high	15,607.88	middle
8121	Boilers & radiators for central heating	Iron and steel products	Capital intensive	No	17,100.74	180.83	high	high	14,976.54	middle
8421	Overcoats and other coats, men,s	Wool products	Labour intensive	Yes	6,894.52	137.94	low	medium	8,584.60	
8424	Jackets, blazers of textile fabrics	Wool products	Labour intensive	Yes	8,109.45	128.03	low	medium	8,033.28	
8431	Coats and jackets of textile fabrics	Wool products	Labour intensive	Yes	7,420.63	132.83	low	medium	8,168.26	
8432	Suits & costumes, women's, of textile fabrics	Wool products	Labour intensive	Yes	7,141.74	139.00	low	medium	8,683.87	
8435	Blouses of textile fabrics	Wool products	Labour intensive	Yes	6,388.06	115.49	low	low	6,757.63	

Table A3. ***(continued)***

SITC code	Product	NTIS group	Leamer group	Also in Trade Policy?	PRODY	Path	PRODY tercile	Path tercile	Strategic Value	Distance
8439	Other outer garments of textile fabrics	Wool products	Labour intensive	Yes	6,398.12	115.05	low	low	6,890.70	nearby
8451	Jerseys, pull-overs, twinsets, cardigans, knitted	Wool products	Labour intensive	Yes	7,176.82	112.53	low	low	6,643.61	nearby
8452	Dresses, skirts, suits etc., knitted or crocheted	Wool products	Labour intensive	Yes	9,148.28	126.88	low	medium	7,852.64	
8459	Other outer garments & clothing, knitted	Wool products	Labour intensive	Yes	7,563.43	111.61	low	low	6,709.46	
8471	Clothing accessories of textile fabrics	Pashmina products	Labour intensive	Yes	4,814.31	118.11	low	medium	7,869.40	
8472	Clothing accessories, knitted or crochetem, n.e.s.	Wool products	Labour intensive	Yes	6,232.33	137.57	low	medium	8,800.10	
8484	Headgear and fittings thereof, n.e.s.	Wool products	Labour intensive	Yes	7,167.00	100.35	low	low	7,160.62	
8972	Imitation jewellery	Silver jewellery	Labour intensive	Yes	13,733.01	115.95	medium	low	8,966.17	nearby
8973	Jewellery of gold, silver or platinum	Silver jewellery	Labour intensive	Yes	8,006.96	98.70	low	low	6,488.86	nearby

Source: Author's calculation, see text.

Note: Blank "distance" cells mean that the product is not in the Open Forest.

Table A4. Trade Policy products

SITC code	Product	Trade Policy group	Leamer group	PRODY	Path	PRODY tercile	Path tercile	Strategic Value	Distance
541	Potatoes, fresh or chilled, excl. sweet potatoes	Fresh vegetables	Tropical agriculture	10,573.11	134.72	medium	medium	10,036.92	nearby
545	Other fresh or chilled vegetables	Fresh vegetables	Tropical agriculture	5,164.89	111.65	low	low	7,318.41	nearby
546	Vegetables, frozen or in temporary preservative	Fresh vegetables	Tropical agriculture	9,090.29	135.91	low	medium	9,193.83	nearby
571	Oranges, mandarins, clementines and other citrus	Orange	Tropical agriculture	8,169.07	103.77	low	low	7,168.19	nearby
711	Coffee, whether or not roasted or freed of caffeine	Coffee	Tropical agriculture	1,812.91	64.62	low	low	3,792.50	nearby
2614	Silk worm cocoons suitabl. for reeling & silk waste	Silk products	Cereals, etc.	1,576.46	63.90	low	low	4,929.39	
2925	Seeds, fruit & spores, nes, of a kind used for sowing	Vegetable seeds	Animal products	12,201.77	121.42	medium	medium	9,272.25	nearby
2926	Bulbs, tubers & rhizomes of flowering or of foliage	Floriculture	Animal products	10,317.39	91.81	medium	low	7,231.63	nearby
2927	Cut flowers and foliage	Floriculture	Animal products	4,076.19	74.46	low	low	5,330.02	nearby
6113	Calf leather	Processed leather	Capital intensive	6,191.60	128.08	low	medium	8,713.38	nearby
6114	Leather of other bovine cattle and equine leather	Processed leather	Capital intensive	8,413.08	126.28	low	medium	8,600.82	

Table A4. ***(continued)***

SITC code	Product	Trade Policy group	Leamer group	PRODY	Path	PRODY tercile	Path tercile	Strategic Value	Distance
6115	Sheep and lamb skin leather	Processed leather	Capital intensive	3,253.27	97.00	low	low	6,176.41	nearby
6116	Leather of other hides or skins	Processed leather	Capital intensive	2,503.84	109.55	low	low	7,065.60	
6118	Leather, specially dressed or finised	Processed leather	Capital intensive	10,891.87	140.79	medium	medium	11,288.56	nearby
6121	Articles of leather or of composition leather	Leather goods	Capital intensive	16,321.95	176.45	high	high	15,526.73	middle
6122	Saddlery and harness, or any material for animals	Leather goods	Capital intensive	11,242.10	133.53	medium	medium	10,404.13	nearby
6129	Other articles of leather or of composit. leather	Leather goods	Capital intensive	10,377.48	157.30	medium	high	11,747.61	nearby
6354	Manufactures of wood for domestic/decorative use	Handicraft (wood)	Forest products	5,536.48	115.20	low	low	7,392.37	
6411	Newsprint	Paper products	Forest products	20,806.53	110.68	high	low	9,624.18	far away
6413	Kraft paper and paperboard, in rolls or sheets	Paper products	Forest products	17,950.03	161.78	high	high	13,188.05	middle
6415	Paper and paperboard, in rolls or sheets, n.e.s.	Paper products	Forest products	18,526.86	173.58	high	high	14,270.82	middle
6417	Paper & paperboard, corrugated, creped, crinkled etc.	Paper products	Forest products	10,462.18	183.28	medium	high	13,886.84	nearby

Table A4. ***(continued)***

SITC code	Product	Trade Policy group	Leamer group	PRODY	Path	PRODY tercile	Path tercile	Strategic Value	Distance
6418	Paper & paperboard, impregnat. coat. surface-coloured	Paper products	Forest products	19,418.90	189.02	high	high	17,197.90	far away
6421	Boxes, bags & oth. packing containers, of paper/papbd	Paper products	Forest products	14,854.13	182.21	medium	high	14,184.04	nearby
6422	Writing blocks, envelopes, etc. correspondence cards	Paper products	Forest products	15,115.28	183.81	high	high	14,852.15	
6423	Registers, exercise books, note books, etc.	Paper products	Forest products	10,073.57	141.56	medium	medium	10,518.95	
6424	Paper and paperboard, cut to size or shape, n.e.s.	Paper products	Forest products	15,599.70	190.87	high	high	16,131.59	middle
6428	Art. of paper pulp, paper, paperboard, cellu. wadding	Paper products	Forest products	14,071.13	181.26	medium	high	14,596.65	middle
6511	Silk yarn & yarn spun from noil/other silk waste	Silk products	Capital intensive	8,838.03	89.21	low	low	7,088.16	nearby
6521	Cotton fabrics, woven, unbleached, not mercerized	Towel	Capital intensive	3,658.41	116.84	low	medium	7,289.40	nearby
6522	Cotton fabrics, woven, bleach. merceriz. dyed, printed	Towel	Capital intensive	8,295.30	144.96	low	medium	9,896.62	
6541	Fabrics, woven, of silk, of noil or other waste silk	Silk products	Capital intensive	8,087.67	82.29	low	low	6,733.89	nearby
6549	Fabrics, woven, n.e.s.	Towel	Capital intensive	10,757.39	114.32	medium	low	9,014.21	

Table A4. ***(continued)***

SITC code	Product	Trade Policy group	Leamer group	PRODY	Path	PRODY tercile	Path tercile	Strategic Value	Distance
6560	Tulle, lace, embroidery, ribbons, & other small wares	Towel	Capital intensive	12,836.79	171.36	medium	high	12,899.75	nearby
6577	Wadding. textil. fabrics for use in machinery/plant	Towel	Capital intensive	15,767.07	176.93	high	high	15,901.78	far away
6592	Carpets, carpeting and rugs, knotted	Woolen carpet	Capital intensive	1,728.10	74.04	low	low	4,824.88	
6666	Statuettes & oth. ornaments, & articles of adornment	Handicraft (non-wood)	Labour intensive	10,323.48	137.44	medium	medium	10,025.22	
6673	Oth. precious & semi-precious stones, unwork. cut etc.	Gems and jewellery	Labour intensive	4,970.44	85.74	low	low	5,814.00	nearby
6978	Household appliances, decorative art., mirrors etc.	Handicraft (non-wood)	Capital intensive	6,854.79	106.81	low	low	8,211.38	
8310	Travel goods, handbags, brief-cases, purses, sheaths	Leather goods	Labour intensive	7,843.86	97.19	low	low	6,914.61	nearby
8422	Suits, men's, of textile fabrics	RMG	Labour intensive	8,585.71	140.88	low	medium	9,078.77	
8423	Trousers, breeches etc. of textile fabrics	RMG	Labour intensive	5,758.79	110.52	low	low	6,656.95	
8429	Other outer garments of textile fabrics	RMG	Labour intensive	6,372.41	114.18	low	low	6,636.24	nearby
8433	Dresses, women's, of textile fabrics	RMG	Labour intensive	5,718.43	125.13	low	medium	7,560.81	

Table A4. ***(continued)***

SITC code	Product	Trade Policy group	Leamer group	PRODY	Path	PRODY tercile	Path tercile	Strategic Value	Distance
8434	Skirts, women's, of textile fabrics	RMG	Labour intensive	6,825.56	136.04	low	medium	8,342.09	
8441	Shirts, men's, of textile fabrics	RMG	Labour intensive	5,337.75	112.22	low	low	6,669.40	
8442	Under garments, excl. shirts, of textile fabrics	RMG	Labour intensive	4,889.04	104.95	low	low	6,126.59	
8443	Under garments, women, s, of textile fabrics	RMG	Labour intensive	5,518.67	91.12	low	low	5,258.91	
8462	Under garments, knitted of cotton	RMG	Labour intensive	5,315.72	108.39	low	low	6,340.14	nearby
8463	Under garments, knitted, of synthetic fibres	RMG	Labour intensive	4,862.42	118.33	low	medium	7,132.28	nearby
8465	Corsets, brassieres, suspendres and the like	RMG	Labour intensive	6,992.34	118.85	low	medium	7,469.71	nearby
8481	Art. of apparel & clothing accessories, of leather	Leather goods	Labour intensive	5,032.63	129.12	low	medium	8,946.49	nearby
8974	Other articles of precious metal	Gems and jewellery	Labour intensive	9,461.95	104.98	low	low	10,904.11	far away
8999	Manufactured goods, n.e.s.	Leather goods	Labour intensive	5,485.91	72.81	low	low	5,350.79	nearby

Source: Author's calculation, see text.

Note: Blank "distance" cells mean that the product is not in the Open Forest.

II. Logistics performance and trade: An analysis of India's trade in intermediates with Bangladesh and Thailand

By Prabir De and Amrita Saha

Introduction

Logistics is an important determinant in sustaining a country's (or a region's) competitive advantage.[42] Its contribution to growth, economic integration and poverty reduction is well known. Improvements in logistical services help countries produce more sophisticated products and encourage a more dynamic export (import) diversification process. In turn, this contributes to improvements in an economy's growth and development. During the past decade there have been noticeable developments in logistic services due to technology. However, there is evidence of a rising gap between the Least Developing Countries (LDC) and the developing economies. This is in terms of quality of services in Asia and the Pacific region.[43]

Logistic services involve the process of planning, implementing and controlling efficient and cost-effective flow, storage of raw materials, in-process inventory, finished goods and related information, from a point of origin to the point of consumption (destination) to meet customer requirements.[44] Production processes and tasks are becoming increasingly fragmented across national borders. As a result, time-sensitive logistic services, along with information and communication technology (ICT), are the key in facilitating production networks spanning borders.[45] In other words, logistic services play a catalytic role by ensuring just-in-time delivery of goods and services, either as inputs to production process or as final output networks. Efficiency in logistical services contributes

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42 Refer to for example, World Bank (2012), Planning Commission (2011), to mention a few.

43 Based on a worldwide survey of operators on the ground – such as global freight forwarders and express carriers – the Logistics Performance Index (LPI) of the World Bank measures the logistics "friendliness" of 155 countries. It helps countries identify the challenges and opportunities they face in their trade logistics performance and what they can do to improve. For example refer to World Bank (2012). Appendix 1 presents the global ranks of selected Asia-Pacific countries for the year 2012. The contrast is, while Singapore and Hong Kong, China occupy the first and second global rank in LPI, countries like Mongolia, Myanmar, Cambodia, and Lao People's Democratic Republic fall in the bottom group in LPI. This shows wide intra-regional variations in logistics performance.

44 There is no clear consensus on definition of logistics. In literature, it overlaps in many cases with transportation, even though there is a clear difference between the two. In most ASEAN and South Asian countries, there is still a lack of understanding of what makes up logistics and how a logistics policy should be developed. Logistics development policy frequently becomes just a transport investment infrastructure plan, but logistics is much more than just transport infrastructure. Developing a national logistics policy requires a holistic approach that encompasses traders, service providers, infrastructure, and rules and regulations. Refer, for example, Hollweg and Wong (2009), Sourdin and Pomfret (2012).

45 This is what Baldwin termed as "the 2nd unbundling". The 2nd unbundling is the international division of labour in terms of production processes and tasks. Refer to Baldwin (2011)

to the expansion of trade and production networks within or across countries, as well as building their productive capacities in networked countries (Ando and Kimura, 2009; Jones and Kierzkowski, 2001; Kimura, 2012). Efficiency in logistic services is also dependent, to a large extent, on 'Behind the Border' measures of government policy and regulation, which are driven by efficiency and equity concerns. It is therefore important to have a regional logistics sector policy to facilitate the trade and production linkages across Asia's borders.[46]

In this study, our objective is to empirically explore the role of logistics in enhancing production linkages through trade in intermediate products. Two case studies of trade in intermediate goods are undertaken: (i) India's export of textile yarn to Bangladesh; and (ii) India's import of air conditioning equipment from Thailand. Here, yarn and air conditioning equipment are selected owing to a steady rise in trade of these two products, which are facilitated by regional and bilateral FTAs.[47] Bangladesh buys yarn from India, and India buys air conditioning equipment from Thailand. These can facilitate the development of integrated production networks.

The remaining part of the study is organized as follows. Section 2 undertakes a review of the existing literature and identifies the gaps. Section 3 presents the data and methodology. Section 4 discusses some stylized facts about India's trade with Bangladesh and Thailand in yarn and air conditioning equipment. Also discussed are the overall trends in intra-industry trade between them. Section 5 undertakes an assessment of logistics in Asia-Pacific countries including Bangladesh, India and Thailand. Section 6 presents the major analytical findings, and Section 7 concludes the paper.

A. Logistics services and production networks: Literature review

Manufactured goods are the largest and most rapidly growing portion of world trade. Studies show that a country's global competitiveness is improved by more efficient supply chains and better access to logistics services. More so, it creates the conditions for mutually beneficial production linkages across borders.[48] As production is increasingly shared across borders, simplification of trade processes and procedures would help improve the time and costs associated with logistics, thereby improving export competitiveness.[49]

On the other hand, higher trade costs and service inefficiency may discourage fragmentation of production. While reduction in transaction costs through efficient logistics

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[46] This is also not to deny that framing a regional logistics sector policy has been slow in South and Southeast Asia, compared to national logistics sector policies adopted by several developing countries in recent years, Refer, for example, to Findlay (2009), Sourdin and Pomfret (2009).

[47] Preferential tariff reductions are given under, for example, SAFTA in case of India – Bangladesh trade, and ASEAN-India FTA and India-Thailand FTA in case of India – Thailand trade.

[48] Refer to, for example, Arnold (2010)

[49] See, for example, Duval and Utoktham (2011), ESCAP (2011), to mention a few.

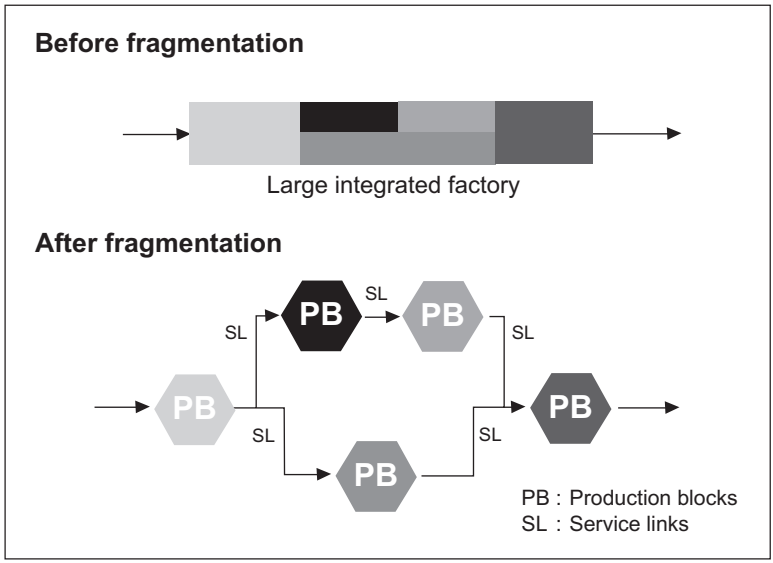
services, liberalization of trade in services and investment policy assists cross-border production linkages. Here, liberalization of trade in services is defined as the demand of any services that arises directly from trade itself (in this context international trade), and some examples of trade in services are transportation, communication, insurance, banking etc. According to Deardorff (2001), this liberalization permits rationalization of service activities along the lines of comparative advantage. He cites the case of US-Mexico cross-border transportation services as an example. Before the North American Free Trade Agreement (NAFTA), Mexican truckers were not allowed to enter US territory and vice versa. Thus, if goods are to be shipped from Mexico to the US, then Mexican trucks would carry the goods up to Mexico-US border checkpoint, unloaded from Mexican registered truck, reloaded on to a US registered truck and carried to the destination. As a result, the consignment faced a number of transaction costs in the form of time, customs delay, and regulatory costs and so on. After NAFTA, liberalization of such transportation services has allowed a consignment to be shipped in a Mexican truck up from its origin in Mexico to its US destination. This method has reduced transport costs and time, as well as helping to reduce the final price of goods. Hummels (2007) also elaborates on this in relation to sea and air transportation.

Logistical services constitute an essential part of international trade that usually involves progression in communication, transportation, logistics, finance, etc. Communication and transport are not only vital intermediate inputs to international trade, but can also be final exports. The competitiveness of the manufacturing firms in open economies is determined in part by access to low-cost and high-quality producer services (Francois and Hoekman, 2010). Efficiency in logistic services can thereby generate benefits for merchandise trade flows by directly reducing the associated transaction costs, and indirectly improving competitiveness of firms (Mattoo *et al.,* 2001; Deardoff, 2001). Hesse and Rodrigue (2004) discuss improvement in logistics as including four core elements; traditional transport costs, organization of the supply chain, transactional and physical environments in which freight distribution evolves. This enables private firms to expand their opportunities more efficiently. Within this, a product (or its component) inputs cross international borders several times during the process of its production, in accordance with related economic incentives. In such a scenario, service link costs can have a multiplicative effect on the total cost of producing a final product (Hiratsuka, 2008; Kimura and Kobayashi, 2009).

Owing to diversity in the range of logistical services facilitating trade, efficient regulation of logistic services is sector specific. In telecommunications this may refer to pro-competitive regulation, while in the financial service sector it will concern prudential regulation (Mattoo, Rathindran and Subramanian, 2001). In transport, these may be reflected in lower freight, documentation and administrative costs in customs procedures. As supply chains become more complex, and expand over a larger space, logistical requirements become more sophisticated and demanding, increasing pressure on underlying infrastructure (Brooks, 2008; 2010).

As noted in Kimura and Kobayashi (2009), the key to attracting fragmented production blocs is to (i) improve locational advantages by, for example, developing special economic zones (SEZs). This with at least an improved local level investment climate, and (ii) reduce the cost of service links that connect remotely located production blocs by improving trade and transport facilitation. Figure 1 presents graphical links between production blocks and service links. In fragmentation of production, an efficient and improved service link is important for expansion of production networks across a region.

Figure 1. Production blocks and logistics service links



Source: Kimura and Kobayashi (2009).

East Asia has recorded high intra-regional trade shares owing, in particular, to rapidly expanding intra-regional trade in parts and components. This is particularly so for Association of Southeast Asian Nations (ASEAN), where production network exports is over 60 per cent of total manufacturing exports in the last decade (Athukorala, 2010). Their progress in recent decades is attributed, at least in part, to technological changes in service industries, where there has been more rapid and effective transportation and communication. The ICT revolution and time-sensitive logistics infrastructure is considered to have played a major role in the "2nd unbundling" of manufacturing production in Asia, which began in the 1980s (Kimura, 2012).[50] For example, a positive relationship has developed between competition and privatization in telecom sectors for 12 developing East Asian countries. Mishra *et al.* (2011) suggests that increasing sophistication in service exports carries important implications for countries in Asia. Particularly so for countries

[50] The term "2nd unbundling" describes international division of labour in terms of production processes and tasks was coined by Baldwin (2011).

stuck in a middle-income trap (Malaysia, Viet Nam etc.), or for those that wish to sustain their rapid growth (India, Sri Lanka, etc.). But the World Bank's Logistics Performance Index (LPI) indicates that the systems of logistics in South Asia must be developed further to successfully meet the challenges of product fragmentation. However, rigorous evidence on the impact of improved logistical services on cross-border production linkages and production networks is sparse.

This is designed to make a contribution to this under-researched area.

B. Data and methodology

The authors aim to answer the following research questions in this study.

- How do we measure logistical service performance?
- Does logistical service performance play a catalytic role in expanding the flow of intermediates between India and Bangladesh, and India and Thailand?
- What is the causality between logistical service performance and industrial fragmentation?

We aim to understand how changes in logistic efficiency affect changes in import demand among sectors that generate production networks. To do so, a quantitative analysis of this relationship will be conducted by specifying labour model based on the following constant elasticity of substitution (CES) equation.[51]

$$U_i = \left(\sum_j \lambda_j x^{1/\theta} \right)^{\theta} \quad (1)$$

where *i* and *j* are importing and exporting countries, respectively, $\theta = \sigma / (1 - \sigma)$. We treat λ as a quality shifter specific to exporter *j*. In other words, it represents the number of unique varieties being produced by exporter *j*.

We write the import demand for a product as follows:

$$q_{ij} = E_i \left(\frac{\lambda_j}{p_j} \right)^{\sigma} t_{ij}^{-\sigma} \quad (2)$$

where q_{ij} is the value of import of *i* from *j*, *t* is trade cost component which captures logistics efficiency. *E* is real expenditures on a product (expenditures divided by the price level), which we do not observe but proxy it by country's GDP.[52] Similarly, λ/p are not really

[51] Labour Substituting scarce factors of production by relatively more abundant ones is a key element of economic efficiency and a driving force of economic growth. A measure of that force is the elasticity of substitution between capital and labour, which translates into a constant elasticity of trade with respect to trade cost.

[52] The reason is that if all goods are consumed as a constant fraction of GDP and price levels do not vary, but we do not see the expenditure shares or the price levels. In particular, the main way that international production sharing shows up here is that *E* varies a lot across countries as a function of what they are producing – a country makes lot of cars it demands an unusually large amount of car parts and components.

observable due to poor quality of measures of *p*, and it is also contaminated by quality differences.[53] Unfortunately, prices net of quality differences and quality itself are not available. We proceed as follows:

First, we take logs and use a vector of importer and exporter fixed effects. We get equations (3) and (4) below:

$$\ln q_{ij} = \ln E_i + \sigma \ln \left(\frac{\lambda_j}{p_j} \right) - \sigma \ln t_{ij} \tag{3}$$

$$\ln q_{ij} = A_i + A_j - \sigma \ln t_{ij} \tag{4}$$

Second, we replace t_{ij} by z_{ij}, which is the logistics performance index (LPI). We write the trade cost vector as follows:

$$\ln q_{ij} = A_i + A_j - \sigma \ln Z_{ij} \tag{5}$$

Since our purpose is to assess the impact of LPI on trade over time, two years are considered, namely, 2000 and 2010. We rewrite the equation (2) as follows:

$$\frac{q_{ij\,2010}}{q_{ij\,2000}} = \frac{E_{i\,2010} \left(\frac{\lambda_{j\,2010}}{p_{j\,2010}} \right)^{\sigma} z_{ij\,2010}^{-\sigma}}{E_{i\,2000} \left(\frac{\lambda_{j\,2000}}{p_{j\,2000}} \right)^{\sigma} z_{ij\,2000}^{-\sigma}} \tag{6}$$

By taking logs, we get:

$$\ln \frac{q_{ij\,2010}}{q_{ij\,2000}} = \ln \left(\frac{E_{i\,2010}}{E_{i\,2000}} \right) + \sigma \ln \left(\frac{\frac{\lambda_{j\,2010}}{p_{j\,2010}}}{\frac{\lambda_{j\,2000}}{p_{j\,2000}}} \right) - \sigma \ln \left(\frac{z_{ij\,2010}}{z_{ij\,2000}} \right) \tag{7}$$

We incorporate importer and exporter fixed effects, and rewrite it as follows:

$$\ln \frac{q_{ij\,2010}}{q_{ij\,2000}} = A_i + A_j - \sigma \ln \left(\frac{z_{ij\,2010}}{z_{ij\,2000}} \right) \tag{8}$$

Now, controlling for other exogenous variables, we rewrite the equation (8) as follows:

$$\ln \frac{q_{ij\,2010}}{q_{ij\,2000}} = A_i + A_j - \sigma \ln \left(\frac{z_{ij\,2010}}{z_{ij\,2000}} \right) - \sigma \ln X'_{ij} + \varepsilon_{ij} \tag{9}$$

where *i* and *j* are importing and exporting countries. We use country dummy (= 1 when *i* is importer (exporter), and 0 otherwise). The parameters to be estimated are denoted by σ, and ε_{ij} is the error term.

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53 For example, a high price for a product may reflect higher production costs, or it may just reflect quality differences.

Whether the trade between two or more economies will rise and be facilitated towards fragmentation will depend on the potential of intra-industry trade between them. Following Mikic and Gilbert (2007), we attempt to assess the magnitude and emerging trend of the intensity of intra-industry trade (IIT). Here, data is sourced from COMTRADE.

We measure logistic services across countries by generating an index based on a selected set of indicators. This uses multi-dimensional factor analysis (principal component analysis). Data is sourced from WDI.

To understand the relationship between logistic service efficiency and trade in intermediates, a panel data regression is carried out with equation (9) as the baseline. Co-integration technique is also used to assess the direction of causality between logistics performance and trade.

We use 2000 and 2010 data to empirically estimate this relationship for Bangladesh's import of yarn from India, and import of air conditioning equipment by India from Thailand. We consider only the stage of yarn supply to Bangladesh's ready-made garment producers and India's import of air conditioning equipment from Thailand. We do not go further to explore in detail other characteristics of the supply chain, such as whether they comprise a specific production network as discussed in recent literature.[54]

C. India's trade with Bangladesh and Thailand

India's trade with Bangladesh and Thailand is influenced by its Free Trade Agreements (FTAs), such as SAFTA in the case of Bangladesh, and the India-Thai FTA – ASEAN FTA, in the case of Thailand.[55] India's yarn exports to Bangladesh and air-conditioning equipment (ACE) imports from Thailand are major components of their bilateral trade (Table 1).

India's imports of ACE from Thailand grew substantially during the last decade, comprising 12.35 per cent of India's total imports from Thailand in 2010. ACEs are part of India-Thailand EHS, where India has offered tariff concessions and reduced the customs duty to zero. India's export of yarn to Bangladesh accounted for about 35 per cent of India's total exports to Bangladesh.

We now study these trade flows disaggregated in terms of intermediates, capital and consumption goods, using the Broad Economic Categories (BEC) classification.[56] In 2010, India's total imports of "Transport Equipment and Parts and Accessories thereof"

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[54] The usual caveat is that one needs to link the supplier of inputs with users of the product in a backward linkage framework.

[55] SAFTA was implemented among eight South Asian countries on 1 July 2006, whereas India – Thai EHS was implemented on 1 March 2004, and India – ASEAN FTA came in force on 1 January 2010.

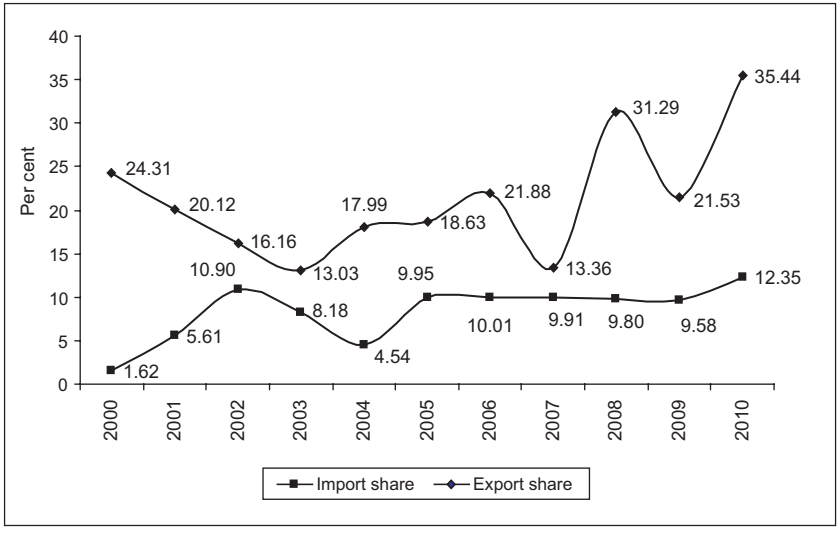
[56] Refer Appendix 2 for the BEC Codes and corresponding BEC-HS correspondences. Details on this methodology can be accessed at: http://www.icrier.org/pdf/amrita_saha.pdf. A limitation of this consists of the fact that a single intermediate maybe an input for several final goods. It only traces the evidence of possibilities of production networks. This can be useful when supported by surveys with firms involved in these networks.

Table 1. India's imports of ACE from Thailand and export of yarn to Bangladesh: 2000-2010

Year	India's Import of ACE from Thailand	India's Total Import from Thailand	India's Export of Yarn to Bangladesh	India's Total Export to Bangladesh
	(Million USD)			
2000	5.42	335.38	209.12	860.33
2001	22.71	404.38	201.36	1,000.63
2002	42.50	390.02	183.00	1,132.54
2003	45.11	551.54	208.34	1,599.55
2004	35.31	777.38	292.38	1,624.82
2005	112.00	1,125.16	308.49	1,656.05
2006	161.30	1,612.10	358.13	1,636.98
2007	214.17	2,162.16	346.59	2,594.56
2008	251.67	2,567.24	805.60	2,574.66
2009	257.12	2,683.95	469.66	2,181.10
2010	470.61	3,810.14	1,070.86	3,021.79
CAGR (%)	56.25	27.51	17.74	13.39

Source: Based on COMTRADE. For corresponding HS codes, please refer Appendix 2.

Figure 2. Trends in trade shares: India's export of yarn to Bangladesh and import of ACE from Thailand



from Thailand amount to $482 million. Matched with the corresponding HS codes for ACE, it is noted that more than 97 per cent of total transport equipment imported from Thailand in 2010 comprised of ACEs. In terms of the BEC, these can be classified under intermediate goods used in manufacturing capital or consumption goods. These may be used in producing several consumption goods classified under BEC-522 i.e. the non-industrial transport equipment and capital goods under BEC-521, as well as industrial transport equipment.

In the same year, India exported globally $2.2 billion worth of industrial transport equipment and $0.8 billion worth of non-industrial transport equipment. It is also noted that India's imports of ACE from Thailand seem to be primarily driven by Japanese MNEs. These may indicate early stages of production networks involving Japan, Thailand and India. However, this has not been investigated in detail.

Similarly, while some Indian firms involved in yarn manufacture appear to be also involved in spinning, weaving and finishing of textiles, we do not have adequate data to confirm the existence of strong production networks. Yarn (cotton and polyester), as well as fabric (mainly denim), are almost exclusively exported by India to Bangladesh through road transport (by trucks).[57] This suggests that logistical performance may have a major impact on cross-border production linkages work involving India and Bangladesh.

1. Intra-industry trade (IIT) and vertical fragmentation of production

The IIT index measures the degree of overlap between imports and exports in the same commodity category, with a value of 1 indicating pure intra-industry trade and a value of 0 indicating pure inter-industry trade.[58]

Table 2 presents the common set of traded goods between India and Bangladesh, for which relatively high IIT index scores are observed.[59] The estimated scores indicate that IIT index levels are higher in manufactured products than in primary products, reflecting the greater role of economies of scale in the production of those products.

The IIT scores suggest that there may be production-sharing opportunities, in a static sense, in 11 products with varying potential (table 3). This potential varies from the textile and clothing sector (most concentration) to iron and steel (least concentration). Whereas, electrical machinery and equipment, and mechanical appliances occupy the middle portion (medium concentration) of the value chain. The index scores also indicate that there are only two sectors in which intra-industry trade accounts for a moderate share between India and Bangladesh. This is namely textile and clothing, and electrical

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57 There are some shipments from India's western part to Bangladesh by ocean.

58 Before calculating IIT, data coordinates at HS nomenclature H2 were matched for both the countries. The traditional way to measure the degree of intra-industry trade is the Grubel-Lloyd Index (G-L Index). For further details of IIT, please refer to Mikic and Gilbert (2007, p. 76).

59 Appendix 3 presents the calculated IIT scores.

Table 2. Intra-Industry trade index (2007): Common set of products at 6-digit HS

HS Code	Product	IIT India	IIT Bangladesh
230220	RICE BRAN OIL	0.935	0.836
721550	BARS & RODS OTHRTHN FREE-CUTNG STL NT FRTHR WRKD THN COLD FRMD/COLD FINSHD	0.923	0.421
850720	OTHER LEAD-ACID ACCUMULATORS	0.922	0.557
600622	OTHR KNITED OR CROCHETD FBRCS OF COTTON, DYED	0.771	0.929
960719	OTHER SLIDE FASTENERS	0.770	0.719
610510	MEN'S/BOYS' SHIRTS OF COTTON	0.758	0.819
621790	PARTS OF GARMENTS/CLOTHNG ACCESSORIES	0.729	0.463
848390	PARTS OF TRANSMISSION SHAFTS, CRANKS, BEARING HOUSINGS, GEARS OR CLUTCH	0.703	0.778
854419	WINDING WIRES OF OTHR METLS/ SUBSTANCES	0.505	0.633
620319	SUITS OF OTHER TEXTILE MATERIALS	0.486	0.704
521211	OTHR UNBLCHED WOVEN FABRICS OF COTTON WEIGHING NOT MORE THAN 200 G/M2	0.417	0.770

Note: IIT index was calculated for bilateral trade between India and Bangladesh.

Table 3. IIT in textile and clothing sector, 2010 (Exporter – India, Importer – Bangladesh)

HS code	Product	IIT
5608	Knotted netting of twine, cordage or rope; made up fishing nets and other made up nets, of textile materials	0.14
5208	Woven fabrics of cotton, containing 85% or more by weight of cotton, weighing not more than 200 g/m^2	0.20
5211	Woven fabrics of cotton, containing less than 85% by weight of cotton, mixed mainly or solely with man-made fibres, weighing more than 200 g/m^2	0.24
5408	Woven fabrics of artificial filament yarn, including woven fabrics obtained from materials of heading No. 54.05	0.32
5210	Woven fabrics of cotton, containing less than 85% by weight of cotton, mixed mainly or solely with man-made fibres, weighing not more than 200 g/m^2	0.33
5402	Synthetic filament yarn (other than sewing thread), not put up for retail sale, including synthetic monofilament of less than 67 decitex	0.41
5403	Artificial filament yarn (other than sewing thread), not put up for retail sale, including artificial monofilament of less than 67 decitex	0.42
5204	Cotton sewing thread, whether or not put up for retail sale	0.48

Source: Calculated using Tradesift, University of Sussex.

machinery and mechanical appliances sectors at the 6-digit HS level. In the category of textile and clothing – cotton sewing thread (HS 5204), artificial filament yarn (HS 5403) and synthetic filament yarn (HS 5402) have relatively higher IIT scores. In other sectors, intra-industry trade is small or negligible.

In the case of India's import of ACE from Thailand, we find relatively higher and rising IIT index score in air, vacuum pumps, compressors, ventilating fans, etc. (HS 8414). This increased from 0.344 in 2000 to 0.409 in 2010 with a peak of 0.590 in 2007 (Table 4). In sharp contrast, IIT index scores of air conditioning equipment, machinery (HS 8415) and compression-ignition engines (diesel, etc.) (HS 8408) are very low.

Table 4. IIT in air conditioning equipment (Importer – India, Exporter – Thailand)

	Compression-ignition engines (diesel, etc.), (HS 8408)	Air, vacuum pumps, compressors, ventilating fans, etc. (HS 8414)	Air conditioning equipment, machinery (HS 8415)
2000	0.548	0.344	0.031
2001	0.007	0.214	0.013
2002	0.017	0.145	0.020
2003	0.044	0.247	0.031
2004	0.173	0.061	0.051
2005	0.019	0.205	0.064
2006	0.002	0.276	0.013
2007	0.008	0.590	0.003
2008	0.029	0.563	0.003
2009	0.036	0.448	0.001
2010	0.023	0.409	0.008

Source: Calculated using Tradesift, University of Sussex.

To identify the vertical IIT, the indices at a high disaggregated level (HS 6) are compared with those at a low disaggregated level (HS 2). IIT indices that are low at HS 6 and high at HS 2 are a necessary (although not sufficient) condition for the existence of vertical trade. This is because they suggest that the countries trade different products in the same sector. The usual caveat is that when the IIT index is observed to be low at HS 6 but high at HS 2, one should check on case-by-case basis whether the different products are differentiated as final products or as parts and components. This is against final products to minimise aggregation bias. Tables 5 and 6 present the vertical IIT trade potential between India and Bangladesh, and between India and Thailand, respectively. The textile and clothing sector appears to offer significant vertical trade opportunities. This is most

importantly felt in the wadding and nonwoven yarns (HS 56) category. However, the vertical IIT potential in the case of ACE, at present, seems lower than in some of the other sectors.

Table 5. Vertical trade potential between India and Bangladesh*

Reporter	Partner	HS 2	Commodity (HS 2)	IIT (HS 2)	IIT** (HS 6)	Potential (HS 2 – HS 6)
India	Bangladesh	03	Fish, crustacean, mollusc, and others	0.970	0.787	0.183
India	Bangladesh	09	Coffee, tea, MATN, and spices	0.801	0.560	0.241
Bangladesh	India	03	Fish, crustacean, mollusc, and others	0.200	0.003	0.197
Bangladesh	India	08	Edible fruits and nuts	0.180	0.001	0.179
Bangladesh	India	14	Vegetable plaiting materials	0.770	0.012	0.758
Bangladesh	India	19	PREP. of cereal, flour, starch, and milk	0.160	0.012	0.149
Bangladesh	India	25	Salt, sulphur, earth, stone, and plastering materials	0.830	0.140	0.691
Bangladesh	India	31	Fertilizers	0.950	0.194	0.756
Bangladesh	India	33	Essential oils, resinoids, perfumery, and cosmetics	0.800	0.476	0.324
Bangladesh	India	39	Plastics and articles thereof	0.440	0.326	0.114
Bangladesh	India	53	Other vegetable textile fibres	0.020	0.000	0.020
Bangladesh	India	54	Man-made filaments	0.330	0.019	0.311
Bangladesh	India	55	Man-made staple fibres	0.530	0.288	0.242
Bangladesh	India	56	Wadding, felt, and nonwoven yarns	0.690	0.041	0.650
Bangladesh	India	63	Other made-up textile articles	0.310	0.235	0.075
Bangladesh	India	84	Nuclear reactors, boilers, parts	0.980	0.277	0.703
Bangladesh	India	87	Vehicles of railway, tramway roll-stock	0.080	0.051	0.029

Notes: *IIT indices are calculated for bilateral trade between India and Bangladesh at HS 2 nomenclature. **Average of multiple products at HS 6.

Table 6. Vertical trade potential between India and Thailand*

Reporter	Partner	HS 2	Commodity (HS 2)	IIT (HS 2)	IIT** (HS 6)	Potential (HS 2 – HS 6)
India	Thailand	84	Nuclear reactors, boilers, machinery, etc.	0.33	0.20	0.13
India	Thailand	48	Paper & paperboard, articles of pulp, paper etc.	0.99	0.13	0.86
India	Thailand	15	Animal, vegetable fats and oils, cleavage products etc.	0.98	0.11	0.87
India	Thailand	64	Footwear, gaiters and the like, parts thereof	0.97	0.11	0.86
India	Thailand	51	Wool, animal hair, horsehair yarn and fabric etc.	0.97	0.05	0.92
India	Thailand	87	Vehicles other than railway, tramway	0.97	0.21	0.76

Notes: *IIT indices are calculated for bilateral trade between India and Thailand at HS 2 nomenclature. **Average of multiple products at HS 6.

D. Measuring logistics performance

In this section we briefly summarize the methodology and data sources for constructing a logistics performance index (LPI) covering 20 Asia-Pacific countries, and the results.

There are several aspects of logistics which complement each other, such as telecommunication, transport, financial infrastructure and human resource quality. While these indicators correlate among themselves in some cases, none of them adequately capture the overall logistics performance. A country may have a very good network of roads but poor telecommunication infrastructure, for example. Therefore, the statistical technique of principal component analysis (PCA) is helpful in constructing a unique single index based on information across different variables that reflect different aspects of infrastructure.

PCA finds linear combinations of the original variables to construct the principal components (or factors) with a variance greater than any single original variable.

$$LPI_{it} = \sum W_{jt} X_{jit} \quad (10)$$

where LPI_{it} = Logistics Performance Index of the i-th country (20 countries) in t-th time (namely, 2000 to 2010), W_{jt}= weight of the j-th aspect of logistics in t-th time, and X_{jit} = value of the j-th aspect of logistics for the i-th country in t-th time point.

The variables used in the construction of the composite index and their measurements, are as follows (variables are normalized for economy size).

1. Transportation

The following four indicators have been employed for capturing the availability and quality of transport infrastructure; (i) air transport is captured with the help of passengers carried per 1,000 population and air freight taken per 1,000 population, (ii) road infrastructure is captured by the length of roads network per 100 square kilometre (cm^2.) of surface area, and percentage share of paved roads, (iii) railway infrastructure is captured

Table 7. LPI scores and ranks

Sr. No.	Country	2000		2005		2010	
		Score	Rank	Score	Rank	Score	Rank
1	Australia	5.143	6	5.334	6	5.487	6
2	Bangladesh	1.269	17	1.476	17	2.130	17
3	Cambodia	1.014	20	1.204	20	2.081	19
4	China	2.489	9	3.383	9	4.213	9
5	Hong Kong, China	8.299	2	9.730	2	10.418	1
6	India	1.776	14	1.993	13	2.882	13
7	Indonesia	2.168	11	2.310	11	3.665	10
8	Japan	5.463	5	5.495	5	6.080	5
9	Korea, Rep. of	5.923	3	5.929	3	7.011	3
10	Lao PDR	1.223	19	1.276	19	2.121	18
11	Malaysia	3.699	7	4.410	7	5.255	7
12	Mongolia	1.545	15	1.730	15	2.313	15
13	Myanmar	1.234	18	1.312	18	1.543	20
14	New Zealand	5.843	4	5.895	4	6.454	4
15	Pakistan	1.312	16	1.603	16	2.289	16
16	Philippines	1.865	12	2.121	12	3.150	12
17	Singapore	10.082	1	10.121	1	10.402	2
18	Sri Lanka	2.354	10	2.523	10	3.571	11
19	Thailand	3.314	8	3.736	8	4.498	8
20	Viet Nam	1.821	13	1.867	14	2.843	14
	Spearman rank correlation coefficient	0.992* (2000-2005)		0.995* (2005-2010)		0.985* (2000-2010)	

*Significant at 1%

through length of railway lines per 100 sq km of surface area, and (iv) port infrastructure is captured by container port traffic per 10,000 population.

2. Information and communication technology

ICT infrastructure is measured with teledensity and density of internet users. Total number of telephones lines per 1,000 inhabitants is a measure of teledensity. Number of internet users per 1,000 inhabitants measures IT penetration in logistics.

3. Financial services

Domestic credit provided to the private sector (logistic service providers) by the banking sector (as per cent of GDP) is employed as a measure of financial infrastructure.

4. Human resource quality

Adult literacy rate is taken as a measure of human resource quality.

The data sources include various issues of *World Development Indicators* of the World Bank.

Appendix 4 provides the detailed list of these variables, while Appendix 5 presents the factor loadings, estimated through PCA. Weights are found to be robust, as factor loadings for each year explain about 58 to 65 per cent of the observation.

LPI scores and ranks for the 20 countries in 2000, 2005 and 2010 are computed following the methodology outlined above, and summarized in Table 7. Patterns emerging from Table 7 are as expected. Note that:

First, Asia and the Pacific are comprised of a heterogeneous group characterized by wide gaps in logistics performance. Relatively richer economies occupy the top positions in LPI, whereas the LDCs are at the bottom. For example, Myanmar, Cambodia, Lao People's Democratic Republic and Bangladesh occupy the bottom ranks in logistics performance. Other developing countries occupy the middle portion of the ladder. In general, the rankings in logistics attainment seem to relate to levels of development.

Second, among the 20 Asia-Pacific countries, six (Bangladesh, Cambodia, Hong Kong, China, Lao People's Democratic Republic, Mongolia and Viet Nam) have improved their ranks between 2000 and 2010. Among those showing improvement, the most impressive was Viet Nam which moved up 5 places (from 13 to 8). Myanmar moved down, while seven countries remained in the same positions. The logistics gap between the relatively developed and the LDCs in Asia and the Pacific region appears to have widened during this period.

E. Does Improvement in Logistical Services Lead to Higher Trade in Intermediate Goods?

Equation (9) was estimated for both India's export of yarn and imports of ACE as the dependent variable, to represent external and internal factors that influence trade in production-networked goods across borders. This estimation is with LPI, for both partner and reporter countries, and a set of control variables, the exchange rate (er), population (pop), manufacturing value added (mva), GDP and per capita consumption of electricity (pce).The panel data model considers a set of 19 Asia-Pacific countries.[60] Data was sourced from WDI.

As there is a strong correlation between GDP and trade, there will a definite problem if both of these variables are taken together. Hence, the regression models reflects attempt to avoid the obvious multi-collinearity problem. Also, the data structure shows non-linearity so that double log regressions give better results than non-transformed variable-based regressions. Variables being in natural logarithms, estimated coefficients show CES elasticity. The elasticity is useful as an indicator of the effect of trade barriers on trade volumes. The estimated baseline results are presented in table 8.

Table 8. Baseline regression (OLS): Fixed effect model

Variable	Traditional	FEM	Traditional	FEM
	India's Export of Yarn		India's Import of ACE	
	ln_export	ln_export	ln_import	ln_import
ln_lpi_r	1.130*	0.266*	-2.634***	0.146*
	(0.632)	(0.213)	(0.993)	(0.151)
ln_lpi_p	-1.079	0.778*	2.260***	0.860*
	(0.936)	(0.661)	(0.682)	(0.668)
ln_er	-0.321***	-1.191	-0.00188	-1.715
	(0.0756)	(1.904)	(0.0719)	(2.17)
ln_pce	-1.612***	-0.217*	-0.933***	-0.145
	(0.277)	(1.412)	(0.219)	(1.172)
ln_mva	0.194	1.918	6.942***	2.542
	(0.225)	(1.689)	(0.274)	(2.982)
ln_gdp	1.442***	0.215	0.859***	0.226
	(0.136)	(1.327)	(0.113)	(0.915)
Observations	209	209	209	209
R-squared	0.358	0.952	0.844	0.937
Country effect	No	Yes	No	Yes
Year effect	No	Yes	No	Yes

Notes: Robust standard errors in parentheses

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

[60] We took all the countries listed in table 7, except Brunei Darussalam. This is due to data limitation.

Most variables have expected signs, and adjusted R-squared values range from 0.36 to 0.96.

Note that in all regressions the classical linear regression is dominated by fixed-effect model. Hence, the ordinary regression results reported in table 8 are not statistically tenable, particularly in the case of India's export of yarn.[61] Robustness is improved in the case of fixed-effect model, explaining about 95 per cent of the variations in observation for export of yarn and 94 per cent for import of ACE.

Baseline regressions suggest that logistical performance and trade in the selected intermediate goods are positively associated. With these being equal, the improvement of logistics would lead to an increase in trade. Coefficients of LPI have positive signs in FEM for both reporting country as well as partner country.

Controlling for country fixed-effects, the estimated elasticity indicates that a 10 per cent improvement in logistical performance in India increases its export of yarn to Bangladesh by about 3 per cent. Whereas, improvement of logistics, to the same extent, in Bangladesh increases India's export of yarn to Bangladesh by almost 8 per cent.

In the case of India's import of ACE from Thailand, estimated elasticity indicates that 10 per cent improvement in India's logistics may increase India's imports by 9 per cent. Whereas, a 10 per cent improvement in logistics in Thailand may increase its exports of ACE to India by about 1.5 per cent.

1. Robustness checks

The relationships described above cannot be interpreted as causal until the possibility of endogeneity has been ruled out in the baseline regressions. To address this issue, a dynamic GMM estimator (system-GMM) – also known as Arellano-Bover/Blundell-Bond linear dynamic panel-data estimation – was used to analyse changes across countries and over time.[62] The estimator also effectively deals with reverse causality by including lagged dependent variables to account for the persistence of the inequality and/or trade openness indicators.[63]

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61 Selection of model, whether a random-effect or a fixed-effect regression, was done based on Hausmann test.

62 First introduced by Arellano and Bond (1991).

63 Following Arellano and Bover (1995), and Blundell and Bond (1998), a system-GMM was taken in place of a difference-GMM. Arellano and Bover (1995) and Blundell and Bond (1998) revealed a potential weakness of the difference-GMM estimator. They showed that lagged levels can be poor instruments for first-differenced variables, particularly if the variables are persistent. In their modification of the estimator, they suggested the inclusion of lagged levels along lagged differences. In contrast to the original difference-GMM, they termed this the expanded estimator system-GMM.

Table 9. Arellano-Bover dynamic panel-data estimation (System GMM)

DV = ln_export	Coefficient	SE	DV = ln_import	Coefficient	SE
ln_export L1	0.239*	0.069	ln_import L1	0.107*	0.030
ln_export L2	0.044	0.083	Ln_import L2	0.015	0.060
ln_lpi_p	0.980***	0.346	ln_lpi_r	0.584**	0.357
ln_lpi_r	0.654**	0.264	ln_lpi_p	0.168	0.021
ln_er	-0.257	0.242	ln_er	-0.109	0.118
ln_pce	-1.044**	0.434	ln_pce	0.500	0.758
ln_mva	0.095	0.601	ln_mva	0.836	0.846
ln_gdp	1.533***	0.173	ln_gdp	1.812**	0.395
Wald chi^2 ($Prob > chi^2$)	2,112.95 (0.00)			2,956.59 (0.00)	
Sargan test, chi^2 ($Prob > chi^2$)	2.71 (0.342)			1.63 (0.265)	
Arellano-Bond test 1, Prob > z	0.004			0.003	
Arellano-Bond test 2, Prob > z	0.893			0.675	
Instruments	60			60	
Observations	171			171	

Notes: Dynamic panel counts White period instrument weighting matrix, White period standard errors and co-variance (d.f. corrected). The estimation uses orthogonal deviation. L1 and L2 equal lags 1 and 2, respectively. SE stands for standard errors. *** p <0.01, ** p <0.05, * p <0.1

One of the main advantages of the system-GMM estimator is that it does not require any external instruments other than the variables already included in the dataset. It uses lagged levels and differences between two periods as instruments for current values of the endogenous variable, together with external instruments. More importantly, the estimator does not use lagged levels or differences by itself for the estimation. Instead, it employs them as instruments to explain variations in infrastructure development. This approach ensures that all information will be used efficiently, and that focus is placed on the impact of regressors (such as trade) on logistics, and not vice versa.

Also, the Arellano-Bond estimates, presented in table 9, remove the weak instrumental variables and poor efficiency problems, as they utilize more moment conditions. Table 9 provides system-GMM estimates when the dependent variable is Indian export of yarn and India's import of ACE interchangeably. The Wald chi^2 statistics indicate the estimated results are robust and statistically significant. To test the appropriateness of the instruments used, the Sargan J-statistics of over-identifying restrictions in table 9 is used. The Sragan J-statistics show that the applied instruments are valid. The Arellano-

Bond tests for serial correlation support the model specification. If the model is well specified, we expect to reject the null of no autocorrelation of the first order (AB1), and accept the hypothesis of no autocorrelation of the second order (AB2). It is apparent that past exports determine, to some extent, the present level of exports (first period lagged export is statistically significant). However, logistical performance has a strong influence on the export of yarn or import of ACE over time. In support of the previous findings (table 8), system-GMM estimates suggest persistence of export (import), since the initial level of export (import) appears to be an important instrument in the evolution of production-networked trade over space and time. Thus, the results of system-GMM support the static panel result.

Therefore, we conclude that improvements in logistical services are associated with increased trade in yarn between India and Bangladesh, and in ACE between India and Thailand. However, to ascertain the causation between logistical performance and trade, we need to look at the causality.

2. Co-integration and causality

Table 10 presents the results of the Im, Pesaran and Shin (IPS) panel unit root test at level. IPS test is usually applied for heterogeneous panel to test the series for the presence of a unit root.[64] We found that the null hypothesis of having panel unit root is generally rejected in all but two variables at level form and various lag lengths. Only two of the variables are non-stationary on the basis of the IPS test. The results of the panel unit root tests confirm that the two variables are non-stationary at level. Table 10 also presents the results of the tests at first difference for IPS test. It is observed that for all the series the null hypothesis of unit root test is now rejected at 95 per cent critical value (1 per cent level). Hence, based on IPS test, there is strong evidence that all the series are integrated of order one, denoted I (1).

Table 10. Im, Pesaran and Shin (IPS) panel unit root test (Period: 2000-2010)

Variable	Level	1st Difference
Export of yarn	4.3469	
Import of ace	4.1241	
lpi_p	-0.878	-8.3574
lpi_r	-1.2862	
gdp	11.1182	
mva	0.1723	-8.3376
pce	1.7857	
er	3.1842	

[64] Appendix 6 presents the basic equations of IPS.

Next, we tested for co-integration using the four panel co-integration tests developed by Westerlund (2007).[65] The underlying idea is to test for the absence of co-integration by determining whether the individual panel members are error correcting. This is to investigate whether long-run steady state or co-integration exist among the variables. Since the variables are found to be integrated in the same order I (1), we continue with the panel co-integration tests carried out for constant plus time trend. The postulated relationship between the variables allows for a linear time trend. The results are in tables 11(a) and table 11(b). Results strongly reject the hypothesis that the series are not co-integrated, thereby showing existence of a long-run relationship among the relevant variables.

Table 11(a). India's exports of yarn to Bangladesh: Westerlund panel co-integration test (Period: 2000-2010)

Statistic	Value	z-value	p-value
gdp (partner)			
Gt	-4.963	-14.149	0
Ga	-21.352	-6.195	0
Pt	-18.876	-11.259	0
Pa	-85.544	-55.89	0
mva (1st diff)			
Gt	-11.421	-49.2	0
Ga	-23.013	-7.284	0
Pt	-33.568	-28.372	0
Pa	-34.816	-18.872	0
er			
Gt	-6.299	-21.399	0
Ga	-13.448	-1.016	0
Pt	25.939	40.94	0
Pa	5.263	10.374	0
lpi_p (1st diff)			
Gt	-12.438	-54.722	0
Ga	-21.123	-6.045	0
Pt	-0.59	10.039	0
Pa	-2.456	4.741	0
lpi _r			
Gt	-4.587	-12.108	0
Ga	-26.657	-9.671	0
Pt	-8.86	0.407	0
Pa	19.693	-7.837	0

[65] Appendix 7 presents the basic equations of Westerlund.

Table 11(b). India's exports of yarn to Bangladesh: Westerlund panel co-integration test (Period: 2000-2010)

Statistic	Value	z-value	p-value
gdp (partner)			
Gt	-6.076	-20.189	0
Ga	-24.845	-8.484	0
Pt	-20.045	-12.621	0
Pa	-24.635	-11.443	0
mva (1st diff)			
Gt	-2.128	1.235	0.892
Ga	280.156	191.38	1
Pt	-9.967	-0.882	0.189
Pa	-28.718	14.423	0
er			
Gt	-4.728	12.872	0
Ga	1.556	8.816	1
Pt	-13.451	-4.94	0
Pa	-20.965	-8.765	0
lpi_p (1st diff)			
Gt	-2.477	-0.656	0.256
Ga	-118.824	-70.068	0
Pt	-8.297	1.063	0.856
Pa	-15.949	-5.105	0
lpi_r			
Gt	-5.87	-19.071	0
Ga	-130.242	-77.55	0
Pt	-11.751	-2.961	0
Pa	-23.23	-10.42	0

Table 12. Panel Granger causality test between trade and LPI

Variables	F-Test				Null Hypothesis		Result
	A (X causes Y)		B (Y causes X)		A (X causes Y)	B (Y causes X)	Granger Causality
	F-Statistic	F-Critical	F-Statistic	F-Critical	F-Critical		
Export of yarn and lpi_p	0.759	0.09	0.782	0.08	Reject	Reject	Bidirectional
Export of yarn and lpi_r	0.970	0	0.961	0	Reject	Reject	Bidirectional
Import of ace and lpi_p	0	62.2	0	52.6	Do Not Reject	Do Not Reject	No Causality
Import of ace and lpi_r	0.772	0.08	0.605	0.27	Reject	Reject	Bidirectional

Finally, we test for causality based on the Granger causality framework.[66] By estimating an equation in which Y is regressed on lagged values of Y and lagged values of an additional variable X, we can evaluate the null hypothesis that X does not Granger cause Y. If one or more of the lagged values of X is significant, we are able to reject the null hypothesis that X does not Granger cause Y. The test results presented in table 12 indicate a two-way causality between LPI and trade. This, in combination with previous results, indicates that improvement in logistics in either trading partner would increase trade and vice versa. This is despite the magnitudes of the effects being different between the trading partners.

Summary and implications

This is a study of the impact of improved logistic services on India' trade in two important intermediate goods – yarn exports to Bangladesh and ACE imports from Thailand.

Both Bangladesh and Thailand are India's FTA partners, and trade in yarn and air-conditioning equipment has been growing rapidly. India's yarn exports to Bangladesh and India's imports of ACE from Thailand have been studied from the point of view of intra-industry trade (IIT) potential. The computed IIT scores indicate that intra-industry trade accounted for a moderate share of total trade between India and Bangladesh in the textile and clothing sector. India's export of cotton sewing thread (HS 5204), artificial filament yarn (HS 5403) and synthetic filament yarn (HS 5402) to Bangladesh had relatively high IIT scores. According to the index scores, the textile and clothing sector offers substantial

[66] The usual caveat is that we intentionally ignore running any further panel regression at this point. Ideally, one may carry a panel regression (e.g. FMOLS), as the variables in questions are co-integrated. Since our interest is to investigate the causal direction, we concentrated only on Granger causality. Refer Appendix 8 for a briefed note on Granger causality model.

vertical IIT trade opportunities between the two countries. This is most importantly felt in the Wadding and nonwoven yarns (HS 56), suggesting potential for further intra-industry trade between the two countries. On the other hand, in the case of India's import of ACE from Thailand, IIT index score was relatively high and rising. This is in air, vacuum pumps, compressors, ventilating fans etc. (HS 8414). However, at present the vertical IIT potential in ACE does not appear to be very high.

We then explored the likely impact of improved logistical services on a country's trade in these two product categories (yarn and ACE), by first developing an index of logistical performance (LPI). The estimated LPI scores in this study indicate that Asia and the Pacific region are comprised of a heterogeneous group, which is characterized by wide gaps in logistics performance. Relatively richer economies occupy the top positions in LPI, whereas the bottom positions are occupied by the LDCs. For example, Myanmar, Cambodia, Lao People's Democratic Republic and Bangladesh occupy the bottom positions in logistics performance. Other developing countries occupy the middle portion of the ladder. The logistics gap between the relatively developed and the LDCs in Asia and the Pacific region appears to have widened more than between 2000 and 2010.

We then proceeded to econometrically estimate the relationship between logistical performance and trade in the selected products, using both panel regressions and system-GMM. The result of system-GMM does not reject the static panel data modeling results. This has enabled us to conclude that improvement in logistic services is associated with significant increases in trade. We then tested for causality, and found that it runs in both directions – while better logistics increases trade, more trade tends to also have a positive impact on logistical performance.

In terms of policy, this study suggests that efficient performance in logistics contributes positively to trade in these two products (yarn and ACE), which are important intermediate goods in manufacturing. This also has the potential to enhance greater cross-border production linkages, including integrated production networks. Thus, the improvement in logistics implies that there are mutual gains for countries in the region. More so, there is room for cooperation to reduce the high logistics gaps, with implementation of regional logistics sector policy.

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Appendix 1

World Bank LPI, 2012

Country	LPI Rank	LPI Score	Customs	Infras-tructure	International shipments	Logistics com-petence	Tracking & tracing	Time-lines
Australia	18	3.73	3.60	3.83	3.40	3.75	3.79	4.05
Bangladesh	*	*	*	*	*	*	*	*
Cambodia	101	2.56	2.30	2.20	2.61	2.50	2.77	2.95
China	26	3.52	3.25	3.61	3.46	3.47	3.52	3.80
Hong Kong, China	2	4.12	3.97	4.12	4.18	4.08	4.09	4.28
Japan	8	3.93	3.72	4.11	3.61	3.97	4.03	4.21
India	46	3.08	2.77	2.87	2.98	3.14	3.09	3.58
Indonesia	59	2.94	2.53	2.54	2.97	2.85	3.12	3.61
Korea, Rep. of	21	3.70	3.42	3.74	3.67	3.65	3.68	4.02
Lao PDR	109	2.50	2.38	2.40	2.40	2.49	2.49	2.82
Malaysia	29	3.49	3.28	3.43	3.40	3.45	3.54	3.86
Mongolia	140	2.25	1.98	2.22	2.13	1.88	2.29	2.99
Myanmar	129	2.37	2.24	2.10	2.47	2.42	2.34	2.59
New Zealand	31	3.42	3.47	3.42	3.27	3.25	3.58	3.55
Pakistan	71	2.83	2.85	2.69	2.86	2.77	2.61	3.14
Philippines	52	3.02	2.62	2.80	2.97	3.14	3.30	3.30
Singapore	1	4.13	4.10	4.15	3.99	4.07	4.07	4.39
Thailand	38	3.18	2.96	3.08	3.21	2.98	3.18	3.63
Viet Nam	53	3.00	2.65	2.68	3.14	2.68	3.16	3.64
Sri Lanka	81	2.75	2.58	2.50	3.00	2.80	2.65	2.90

Note: * Data not available.

Source: The World Bank, Washington, D.C.

Appendix 2

HS codes considered calculating the export of yarn to Bangladesh

HS code	Product Description	HS code	Product Description
5205	Cotton yarn (other than sewing thread), containing 85% or more by weight of cotton, not put up for retail sale	5603	Nonwovens, whether or not impregnated, coated, covered or laminated
5201	Cotton, not carded or combed	5202	Cotton waste (including yarn waste and garnetted stock)
5208	Woven fabrics of cotton, containing 85% or more by weight of cotton, weighing not more than 200 g/m^2	5607	Twine, cordage, ropes and cables, whether or not plaited or braided and whether or not impregnated
5509	Yarn (other than sewing thread) of synthetic staple fibres, not put up for retail sale	5107	Yarn of combed wool, not put up for retail sale
6006	Other knitted or crocheted fabrics	5508	Sewing thread of manmade staple fibres, whether or not put up for retail sale
5407	Woven fabrics of synthetic filament yarn, including woven fabrics obtained from materials of heading 54.04	5007	Woven fabrics of silk or of silk waste
5209	Woven fabrics of cotton, containing 85% or more by weight of cotton, weighing more than 200 g/m^2	5404	Synthetic monofilament of 67 decitex or more and of which no cross-sectional dimension exceeds 1 mm; strip and the like (for example, artificial straw) of synthetic textile materials of an apparent width not exceeding 5 mm
5402	Synthetic filament yarn (other than sewing thread), not put up for retail sale, including synthetic	5003	Silk waste (including cocoons and unsuitable for reeling, yarn waste and garnetted stock)
5510	Yarn (other than sewing thread) of artificial staple fibres, not put up for retail sale	5604	Rubber thread and cord, textile covered; textile yarn, and strip and the like of heading 54.04 or 54.05, \ impregnated, coated, covered or sheathed with rubber or plastics
5504	Artificial staple fibres, not carded, combed or otherwise processed for spinning	5002	Raw silk (not thrown)

6001	Pile fabrics, including “long pile” fabrics and terry fabrics, knitted or crocheted	5403	Artificial filament yarn (other than sewing thread), not put up for retail sale, including artificial monofilament of less than 67 decitex
5512	Woven fabrics of synthetic staple fibres, containing 85% or more by weight of synthetic staple fibres	5505	Waste, noils, garnetted stock of manmade fibers
5212	Other woven fabrics of cotton	5606	Gimped yarn, and strip and the like of heading 54.04 or 54.05, gimped (other than those of heading 56.05 and gimped horsehair yarn); chenille yarn (including flock chenille yarn); loop wale-yarn
5515	Other woven fabrics of synthetic staple fibres	5601	Wadding of textile materials and articles thereof; textile fibres, not exceeding 5 mm in length (flock), textile dust and mill neps
5206	Cotton yarn (other than sewing thread), containing less than 85% by weight of cotton, not put up for retail sale	5406	Man-made filament yarn (other than sewing thread), put up for retail sale
5408	Woven fabrics of artificial filament yarn, including woven fabrics obtained from materials of heading 54.05	5609	Articles of yarn, strip or the like of heading 54.04 or 54.05, twine, cordage, rope or cables, not elsewhere specified or included
5503	Synthetic staple fibres, not carded, combed or otherwise processed for spinning	5516	Woven fabrics of artificial staple fibers
5112	Woven fabrics of combed wool or of combed fine animal hair	5608	Knotted netting of twine, cordage or rope; made up fishing nets and other made up nets, of textile materials
5513	Woven fabrics of synthetic staple fibres, containing less than 85% by weight of such fibres, mixed mainly or solely with cotton, of a weight not exceeding 170 g/m^2	5305	Coconut, abaca (Manila hemp or Musa textilis Nee), ramie and other vegetable textile fibres, not elsewhere specified or included, raw or processed but not spun; tow, noils and waste of these fibres (including yarn waste and garnetted stock)

5211	Woven fabrics of cotton, containing less than 85% by weight of cotton, mixed mainly or solely with manmade fibres, weighing more than 200 g/m^2	5514	Woven fabrics of synthetic staple fibres, containing less than 85% by weight of such fibres, mixed mainly or solely with cotton, of a weight exceeding 170 g/m^2
5605	Metallised yarn, whether or not gimped, being textile yarn, or strip or the like of heading 54.04 or 54.05, combined with metal in the form of thread, strip or powder or covered with metal	5602	Felt, whether or not impregnated, coated, covered or laminated
5903	Textile fabrics impregnated, coated, covered or laminated with plastics, other than those of heading 59.02	5306	Flax yarn
5210	Woven fabrics of cotton, containing less than 85% by weight of cotton, mixed mainly or solely with manmade fibres, weighing not more than 200 g/m^2	5005	Yarn spun from silk waste, not put up for retail sale
5806	Narrow woven fabrics, other than goods of heading 58.07; narrow fabrics consisting of warp without weft assembled by means of an adhesive (bolducs)	5109	Yarn of wool or of fine animal hair
5401	Sewing thread of manmade filaments, whether or not put up for retail sale	5308	Yarn of other vegetable textile fibres; paper yarn
5309	Woven fabrics of flax	5111	Woven fabrics of carded wool or of carded fine animal hair
5501	Synthetic filament tow	5507	Artificial staple fibres, carded, combed or otherwise processed for spinning
5207	Cotton yarn (other than sewing thread) put up for retail sale	5103	Waste of wool or of fine or coarse animal hair, including yarn waste but excluding garnetted stock
5204	Cotton sewing thread, whether or not put up for retail sale	5502	Artificial filament tow
5203	Cotton, carded or combed		

HS codes considered calculating the import of ACE from Thailand

HS code	Product Description
8415	Air conditioning machines, comprising a motor-driven fan and elements for changing the temperature and humidity, including those machines in which the humidity cannot be separately regulated
8408	Compression-ignition internal combustion piston engines (diesel or semi-diesel engines)
8414	Air or vacuum pumps, air or other gas compressors and fans; ventilating or recycling hoods incorporating a fan, whether or not fitted with filters

BEC codes

BEC	Good	Description
53	Primary/Semi Processed	Transport equipment and parts and accessories thereof
51	Final	Passenger Motor Cars

BEC	Good	Description
22	Final	Processed Industrial Supplies
21	Primary/Semi Processed	Primary Industrial Supplies

Production structure of Indian firms in yarn manufacture and air conditioning equipment

Commodity	Number of factories				Value of Output in Rupees Lakhs				Net Value Added in Rupees Lakhs			
	2004	2006	2007	2009	2004	2006	2007	2009	2004	2006	2007	2009
Yarn*	11,342	11,942	11,425	13,417	11,108,327	14,460,645	15,951,148	20,594,695	1,387,909	2,756,030	3,602,741	2,747,245
Air Conditioning Equipment**	4,050	4,047	4,149	4,481	3,238,332	5,378,400	6,836,824	9,611,648	671,973	1,181,872	1, 472,233	2,437,654

For 2004-2007: NIC-1998 3-digit codes matched with corresponding ISIC Revision 2 codes and HS-1996 4-Digit Codes. *Includes 171 (Spinning, Weaving & Finishing of Textiles), 172 (Manufacture of other Textiles), 243 (Manufacture of Man-made Fibers); **Includes 291 (Manufacture of General Purpose Machinery) further disaggregated to 2911 (Manufacture of engines and turbines, except aircraft, vehicle and cycle engines), 2912 (Manufacture of pumps, compressors, taps and valves), 2919 (Manufacture of other general purpose machinery). **For 2008 onwards**: NIC-2008 3-digit codes matched with corresponding ISIC Revision 2 codes and HS 1996 4-digit codes. *Includes 131 (Spinning, Weaving & Finishing of Textiles), 139 (Manufacture of other Textiles), 203 (Manufacture of Man-made Fibers); **Includes 281 (Manufacture of General Purpose Machinery) further disaggregated to 2911 (Manufacture of engines and turbines, except aircraft, vehicle and cycle engines), 2912 (Manufacture of pumps, compressors, taps and valves), 2919 (Manufacture of other general purpose machinery).

Appendix 3

Calculated IIT scores
(Exporter – India, Importer – Bangladesh)

Year	Product	Product Name	IIT
2001	5609	Articles of yarn, strip or the like of heading 54.04 or 54.05, twine, cordage, rope or cables, not elsewhere specified or included	0.99
2004	5202	Cotton waste (including yarn waste and garnetted stock)	0.93
2000	5601	Wadding of textile materials and articles thereof; textile fibres, not exceeding 5 mm in length (flock), textile dust and mill neps	0.91
2000	5602	Felt, whether or not impregnated, coated, covered or laminated	0.89
2007	5608	Knotted netting of twine, cordage or rope; made up fishing nets and other made up nets, of textile materials	0.89
2003	5202	Cotton waste (including yarn waste and garnetted stock)	0.84
2007	5601	Wadding of textile materials and articles thereof; textile fibres, not exceeding 5 mm in length (flock), textile dust and mill neps	0.81
2003	5204	Cotton sewing thread	0.75
2008	5608	Knotted netting of twine, cordage or rope; made up fishing nets and other made up nets, of textile materials	0.71
2009	5403	Artificial filament yarn (other than sewing thread), not put up for retail sale, including artificial monofilament of less than 67 decitex	0.67
2003	5603	Nonwovens, whether or not impregnated, coated, covered or laminated	0.65
2004	5608	Knotted netting of twine, cordage or rope; made up fishing nets and other made up nets, of textile materials	0.65
2006	5512	Woven fabrics of synthetic staple fibres, containing 85% or more by weight of synthetic staple fibres	0.65
2000	5401	Sewing thread of manmade filaments, whether or not put up for retail sale	0.64
2005	5505	Waste, noils, garnetted stock of manmade fibers	0.59
2001	5103	Waste of wool or of fine or coarse animal hair, including yarn waste but excluding garnetted stock	0.58
2004	5103	Waste of wool or of fine or coarse animal hair, including yarn waste but excluding garnetted stock	0.53

2007	5007	Woven fabrics of silk or of silk waste	0.51
2009	5404	Synthetic monofilament of 67 decitex or more and of which no cross-sectional dimension exceeds 1 mm; strip and the like (for example, artificial straw) of synthetic textile materials of an apparent width not exceeding 5 mm	0.49
2010	5204	Cotton sewing thread	0.48
2006	5606	Gimped yarn, and strip and the like of heading 54.04 or 54.05, gimped (other than those of heading 56.05 and gimped horsehair yarn); chenille yarn (including flock chenille yarn); loop wale-yarn	0.45
2001	5608	Knotted netting of twine, cordage or rope; made up fishing nets and other made up nets, of textile materials	0.45
2004	5505	Waste, noils, garnetted stock of manmade fibers	0.45
2005	5602	Felt, whether or not impregnated, coated, covered or laminated	0.44
2005	6001	Pile fabrics, including “long pile” fabrics and terry fabrics, knitted or crocheted	0.43
2010	5403	Artificial filament yarn (other than sewing thread), not put up for retail sale, including artificial monofilament of less than 67 decitex	0.42
2007	5210	Woven fabrics of cotton, containing less than 85% by weight of cotton, mixed mainly or solely with manmade fibres, weighing not more than 200 g/m^2	0.41
2010	5402	Synthetic filament yarn (other than sewing thread), not put up for retail sale, including synthetic	0.41
2008	5202	Cotton waste (including yarn waste and garnetted stock)	0.41
2007	5202	Cotton waste (including yarn waste and garnetted stock)	0.41
2007	5208	Woven fabrics of cotton, containing 85% or more by weight of cotton, weighing not more than 200 g/m^2	0.40
2008	5210	Woven fabrics of cotton, containing less than 85% by weight of cotton, mixed mainly or solely with manmade fibres, weighing not more than 200 g/m^2	0.38
2008	5007	Woven fabric of silk or of silk waste	0.37
2002	5407	Woven fabrics of synthetic filament yarn, including woven fabrics obtained from materials of heading 54.04.	0.36
2003	5607	Twine, cordage, rope and cable	0.34
2006	5601	Wadding of textile materials and articles thereof; textile fibres, not exceeding 5 mm in length (flock), textile dust and mill neps	0.33

2010	5210	Woven fabrics of cotton, containing less than 85% by weight of cotton, mixed mainly or solely with manmade fibres, weighing not more than 200 g/m^2	0.33
2010	5408	Woven fabrics of artificial filament yarn, including woven fabrics obtained from materials of headin	0.32
2009	5609	Articles of yarn, strip or the like of heading 54.04 or 54.05, twine, cordage, rope or cables, not elsewhere specified or included	0.31
2003	5309	Woven fibers of flax	0.30
2005	5103	Waste of wool or of fine or coarse animal hair, including yarn waste but excluding garnetted stock	0.30
2006	5406	Manmade filament yarn (other than sewing thread), put up for retail sale	0.28
2009	5204	Cotton sewing thread, whether or not put up for retail sale	0.27
2007	5512	Woven fabrics of synthetic staple fibres, containing 85% or more by weight of synthetic staple fibres	0.24
2010	5211	Woven fabrics of cotton, containing less than 85% by weight of cotton, mixed mainly or solely with manmade fibres, weighing more than 200 g/m^2	0.24
2002	5201	Cotton, not carded or combed	0.22
2008	5602	Felt, whether or not impregnated, coated, covered or laminated	0.20
2010	5208	Woven fabrics of cotton, containing 85% or more by weight of cotton, weighing not more than 200 g/m^2	0.20
2009	5608	Knotted netting of twine, cordage or rope; made up fishing nets and other made up nets, of textile materials	0.20
2006	5007	Woven fabric of silk or of silk waste	0.18
2004	5513	Woven fabrics of synthetic staple fibres, containing less than 85% by weight of such fibres, mixed mainly or solely with cotton, of a weight not exceeding 170 g/m^2	0.18
2008	5204	Cotton sewing thread	0.17
2007	5513	Woven fabrics of synthetic staple fibres, containing less than 85% by weight of such fibres, mixed mainly or solely with cotton, of a weight not exceeding 170 g/m^2	0.16
2005	5202	Cotton waste (including yarn waste and garnetted stock)	0.15
2008	5607	Twine, cordage, rope and cable	0.14
2005	5003	Silk waste (including cocoons and unsuitable for reeling, yarn waste and garnetted stock)	0.14

2008	5601	Wadding of textile materials and articles thereof; textile fibres, not exceeding 5 mm in length (flock), textile dust and mill neps	0.14
2010	5608	Knotted netting of twine, cordage or rope; made up fishing nets and other made up nets, of textile materials	0.14
2009	5601	Wadding of textile materials and articles thereof; textile fibres, not exceeding 5 mm in length (flock), textile dust and mill neps	0.11
2009	5607	Twine, cordage, rope and cable	0.11
2003	5408	Knotted netting of twine, cordage or rope; made up fishing nets and other made up nets, of textile materials	0.11
2005	5211	Woven fabrics of cotton, containing less than 85% by weight of cotton, mixed mainly or solely with manmade fibres, weighing more than 200 g/m^2	0.11
2009	5806	Narrow woven fabrics, other than goods of heading 58.07; narrow fabrics consisting of warp without weft assembled by means of an adhesive (bolducs)	0.11
2008	5512	Woven fabrics of synthetic staple fibres, containing 85% or more by weight of synthetic staple fibres	0.10
2008	5505	Waste, noils, garnetted stock of manmade fibers	0.10
2009	5402	Synthetic filament yarn (other than sewing thread), not put up for retail sale, including synthetic	0.10

Appendix 4

List of logistics performance indicators

Sr. No.	Category	Indicator	Data Source
1	Transport services	Air transport, freight (million ton-km), taken per 1,000 population	World Development Indicators (WDI), World Bank
2		Air transport, passengers carried, taken per 1,000 population	
3		Container port traffic (TEU: 20 foot equivalent units), taken per 1,000 population	
4		Rail lines (total route-km), taken per 100 sq km of area	
5		Roads, paved, taken as % of total roads	
6		Roads, total network (km), taken per 100 sq km of area	
7	ICT services	Internet users, taken per 100 population	
8		Mobile cellular subscriptions, taken per 100 population	
9		Telephone lines, taken per 100 population	
10	Financial services	Domestic credit to private sector, taken as % of GDP	
11	Human resource quality	Literacy rate, adult total (% of people ages 15 and above)	

Appendix 5

PCA weights

Indicators	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Air freight transport	0.324	0.327	0.322	0.319	0.324	0.324	0.324	0.345	0.333	0.335	0.353
Air passengers transport	0.341	0.339	0.343	0.331	0.344	0.348	0.348	0.366	0.349	0.348	0.331
Container port traffic	0.312	0.320	0.323	0.320	0.318	0.315	0.315	0.325	0.310	0.309	0.318
Rail lines	0.044	0.296	0.281	0.272	0.274	0.267	0.270	0.278	0.264	0.272	0.013
Roads, paved	0.281	0.270	0.272	0.277	0.277	0.279	0.280	0.360	0.277	0.280	0.279
Roads, total network	0.292	0.252	0.244	0.236	0.241	0.237	0.238	0.243	0.237	0.228	0.278
Internet users	0.327	0.308	0.317	0.333	0.330	0.326	0.320	0.332	0.321	0.324	0.346
Mobile cellular subscriptions	0.380	0.354	0.359	0.361	0.355	0.357	0.359	0.370	0.348	0.342	0.350
Telephone lines	0.363	0.336	0.338	0.339	0.334	0.337	0.340	0.354	0.341	0.334	0.334
Domestic credit to private sector	0.292	0.284	0.279	0.286	0.281	0.281	0.278	0.275	0.292	0.294	0.318
Literacy rate	0.219	0.195	0.201	0.205	0.203	0.205	0.208	0.224	0.209	0.217	0.233
Eigen value	6.381	7.139	7.029	6.987	7.046	6.941	6.943	6.512	6.960	6.831	7.037
Proportion explained (%)	58.000	64.900	63.900	63.520	64.050	63.100	63.120	59.200	63.270	62.100	63.980

Appendix 6

Im, Pesarn, and Shin (IPS) Unit Root Test

Im, Pesaran and Shin (IPS) proposes a test for the presence of unit roots in panels, and begin by specifying a separate ADF regression for each cross-section with individual effects and no time trend:

$$\Delta y_{it} = \alpha_i + \rho_i y_{i,t-1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{i,t-j} + \varepsilon_{it}$$

Where $i = 1, \ldots, N$ and $t = 1, \ldots, T$

IPS uses separate unit root tests for the *N* cross-section units. Their test is based on the Augmented Dickey-fuller (ADF) statistics averaged across groups. After estimating the separate ADF regressions, the average of the *t*-statistics for p_1 from the individual ADF regressions, $t_{iT_i}(p_i)$:

$$\bar{t}_{NT} = \frac{1}{N} \sum_{i=1}^{N} t_{iT}(p_i \beta_i)$$

The *t*-bar is then standardized and it is shown that the standardized *t-bar* statistic converges to the standard normal distribution as N and $T \rightarrow \infty$. IPS (1997) shows that *t-bar* test has better performance when N and T are small.

Appendix 7

Cointegration test of Westerlund

The underlying idea in Westerlund (2007) is to test for the absence of co-integration by determining whether the individual panel members are error correcting. Consider the following error-correction model:

$$D.y_{it} = c_i + a_{i1}*D.y_{it-1} + a_{i2}*D.y_{it-2} + ... + a_{ip}*D.y_{it-p}$$

$$+ b_{i0}*D.x_{it} + b_{i1}*D.x_{it-1} + ... + b_{ip}*D.x_{it-p}$$

$$+ a_i (y_{it-1} – b_i*x_{it-1}) + u_{it}$$

Where, a_i provides an estimate of the speed of error-correction towards the long run equilibrium $y_{it} = - (b_i/a_i) * x_{it}$ for that series i. The Ga and Gt test statistics test H0: $a_i = 0$ for all i versus H1: $a_i < 0$ for at least one i. These statistics start from a weighted average of the individually estimated a_i's and their t-ratio's, respectively. The Pa and Pt test statistics pool information over all the cross-sectional units to test H0: $a_i = 0$ for all i versus H1: $a_i < 0$ for all i. Rejection of H0 should therefore be taken as rejection of co-integration for the panel as a whole.

Appendix 8

Granger causality

Testing causality, in the Granger sense, involves using F-tests to test whether lagged information on a variable Y provides any statistically significant information about a variable X, in the presence of lagged X. If not, then "Y does not Granger-cause X." Refer to Granger (1969), which was popularized by Sims (1972). There are many ways in which to implement a test of Granger causality. On particularly simple approach uses the autoregressive specification of a bivariate vector autoregression. Assume a particular autoregressive lag length p, and estimate the following unrestricted equation by ordinary least squares (OLS):

$$x_t = c_1 + \sum_{i=1}^{p} \alpha_i x_{t-i} + \sum_{i=1}^{p} \beta_i y_{t-i} + u_t$$

$$H_D = \beta_1 = \beta_2 = ... = \beta_p = 0$$

Conduct an F-test of the null hypothesis by estimating the following restricted equation also by OLS:

$$x_t = c_t + \sum_{i=1}^{p} y_i x_{t-i} + e_t$$

Compare their respective sum of squared residuals.

$$RSS_1 = \sum_{t=1}^{T} \hat{u}_t^2 \quad RSS_D = \sum_{t=1}^{T} \hat{e}_t^2$$

If the test statistic is greater than the specified critical value, then reject the null hypothesis that Y does not Granger-cause X.

$$S_1 = \frac{(RSS_D - RSS_1)/p}{RSS_1 / (T\text{-}2p\text{-}1)} \sim F_{p,\ T\text{-}2p\text{-}1}$$

It is worth noting that with lagged dependent variables, as in Granger-causality regressions, that the test is valid only asymptotically. An asymptotically equivalent test is given by:

$$S_1 = \frac{T(RSS_D - RSS_1)}{RSS_1} \sim x^2\ (p)$$

Another caveat is that Granger-causality tests are very sensitive to the choice of lag length and to the methods employed in dealing with any non-stationarity of the time series.

III. An analysis of export performance of manufacturing and service sector enterprises in Sri Lanka

By JeevikaWeerahewa, Sarath S. Kodithuwakku and Rifana Buhary

Introduction

Recent theoretical and empirical literature on international trade places renewed emphasis on the importance of firm level factors as determinants of firms' export behaviour. This followed the highly influential Melitz (2003) trade model that highlighted the importance of firm heterogeneity in determining industry-level trade responses to various shocks.

A large body of empirical evidence indicates that exporting firms are typically larger, have higher productivity, survive longer, and pay higher wages than non-exporters. Pöschl *et al.* (2009) found that size and performance premia (labour productivity and wage) of exporting firms are significantly higher than those of non-exporters in Austria. Aw *et al.* (1999), from a study conducted in Chinese Taipei, revealed that firms with higher productivity, *ex-ante*, show a higher tendency to enter into the export market, whereas exporters with low productivity show a higher tendency to exit from the export market. From a study of Korean firms, they also found that the differences in productivity do not affect the entry into or exit from export markets. Salomon and Shaver (2005) revealed that domestic and export sales are interdependent and the factors that influence them are also different. This was found using estimates of a two-stage least square model for firms in the manufacturing sector of Spain, covering Spanish-owned firms and foreign-owned firms during 1990-1997. Salomon and Shaver (2005) discovered that domestic and export sales complement each other (that is domestic sales positively affect export sales), as Spanish-owned firms and export sales appear to be driven by pre-existing strengths in the domestic market. However, for foreign-owned firms, domestic and export sales appear to be substitutes (that is, domestic sales negatively affect export sales). It appears that foreign-owned firms, when managing their domestic sales in the larger context of the multinational network, make trade offs between sales in domestic and foreign markets.

Exporting itself appears to have a positive influence on subsequent firm productivity. It is argued that this may be due to exporting firms gaining access to technical expertise from their buyers in terms of new product designs and production methods (Grossman and Helpman, 1991; World Bank, 1993).

Export performance is influenced by managerial influences (i.e. firm characteristics, competencies and strategy) and the nature of the external environment (see Cavusgil and Zou, 1994). Yoshino (2008) provides a good assessment on how domestic supply constraints and other firm characteristics explain the geographical orientation of firms' exports as well as the overall market diversification of African manufacturing exports. Comprehensive reviews on the determinants of export performance are found in Aaby and

Slater (1989), Bilkey (1978), Cheety and Hamilton (1993), Madsen (1987) and Zou and Stan (1998).

Athukorala and Jayasuriya (1988) and Athukorala *et al.* (1995) studied the export performance of Sri Lankan manufacturing firms in mid 1980s and 1990s. However, despite the major changes in both internal and external environments, as far as the authors' are aware, there are no recent studies of the export behaviour of Sri Lankan firms. The objectives of this study are to address this gap in the literature. Also, the study aims to (i) characterize exporting and non-exporting firms in the manufacturing and services sectors of Sri Lanka and (ii) assess the extent to which different firm characteristics and the external environment within which the firms operate, (i.e. various domestic supply constraints) explain export performance of the firms (whether the firm sells products directly or indirectly in the export market).

The rest of the paper is organized as follows. The next section presents the model used to assess determinants of export performance. In the following section, data used for the estimation are described. In Section 4 exporting versus non-exporting firms are characterized. Section 5 presents the results of the estimation, and the final section presents conclusions and policy implications.

A. A model to assess determinants of export performance

1. Measurement of export performance

Shoham (1996) defines export performance as the result of a firm's actions in the export markets. Export performance of a firm is commonly measured by (a) export propensity, (b) export sales and (c) export intensity. Export propensity is generally defined as the likelihood of a firm becoming an exporter (Estrin *et al.,* 2008). It is calculated as the proportion of exporting firms within the total number of firms. Zou and Stan (1998) identified export sales as the most frequently used measure of export performance. Exporting firms have two basic options as export channels – direct exports and indirect exports. Exporting firms often choose indirect exports to minimize transaction costs (Peng and York, 2001). Hence, the sum of direct and indirect sales in the export market is counted as total export sales. Export intensity is measured as the share of export sales in total sales (Estrin *et al.,* 2008; Salomon and Shaver, 2005; Pöschl *et al.,* 2009).

2. Determinants of export performance: An estimation model

The degree of export performance of a firm is determined by both internal and external factors. Internal determinants of export performance are justified by the resource-based theory, which conceives a firm as a unique bundle of tangible and intangible resources (assets, capabilities, processes, managerial attributes, information and knowledge). These unique resources are controlled by the firm, enabling it to conceive and implement strategies aimed at improving its efficiency and effectiveness (Barney, 1991; Daft, 1983; Wernefelt, 1984). External determinants of export performance are also justified

by the industrial organization theory, which argues that the external factors determine the firm's strategy, in turn determines economic performance (Scherer and Ross, 1990). The logic is that the external environment imposes pressures to which a firm must adapt in order to survive and prosper (Collis, 1991).

We chose the two-stage Heckman estimation procedure for our econometric analysis to avoid the potential selection bias, a common problem in studies of export behaviour of firms. This is because the selected sample firms include those that have already made the decision to export. The procedure involves a probit model in the first stage (selection stage) and an OLS in the second stage (outcome stage). The presence of the selection bias of variables is recognized in the probit model, and correction is done in the second stage by inserting the calculated correction factor (i.e. inverse Mills ratio) in the OLS as an instrument.

The Heckman two-step method used in this study is presented below, where equation 1 is the selection equation and 2 is the outcome equation.

Equation 1: The decision to export (i.e. export propensity) is modeled as a dichotomous choice.

$$P(X_i > 0) = 1 \quad \text{if } \xi_i > 0;$$
$$0 \quad \text{otherwise}$$

$$\xi_i = \alpha + \beta_1 * BP_i + \beta_2 * FC_i + \beta_3 * MC + \beta_4 * S_i + \beta_5 * Y + \beta_6 * Z + \beta_7 * BC_i + \varepsilon_i$$

Equation 2: The decision of value of export sales or export intensity as an OLS

$$X_i = \alpha + \beta_1 * BP_i + \beta_2 * FC_i + \beta_3 * MC + \beta_4 * S_i + \beta_5 * Y + \beta_6 * Z + \beta_7 * BC_i + \varepsilon_i$$

The first stage explains the probability that firm *i* exports, where the dependent variable is a dummy that is equal to one if a firm exports, zero otherwise. The dependent variable at the second stage is exports, X_i. Two equations were estimated, using two specifications for X_i, the logarithmic value of export value and export intensity of the firm.

BP_i is a vector of variables of business performance. The other independent variables include firm characteristics (FC_i), management characteristics (MC), size dummies (S_i), industry dummies (Y), provincial dummies (Z) and behind the border constraint dummies (BC_i). ε_i is an error term assumed to be independently and identically distributed.

B. Data description

1. Enterprise survey of the World Bank: Coverage

The World Bank's Enterprise Surveys provide a unique source of information that can be used to analyse the degree of export performance and its determinants. The most recent survey was conducted in 2011 and it covered 836 enterprises in the manufacturing and service sectors from all the nine provinces of Sri Lanka. The sample was selected

using stratified random sampling. Three levels of stratification were used: industry, size, and province. (See Appendix 1 for details on sampling method.)

2. Data used for measurement of export performance

Export intensity was measured as the proportion of exports (both direct and indirect) in the firm's total sales. The value of exports was measured by multiplying the export intensity by the sales value. Export market share of the firm is the percentage of export sales in total exports. The basic measure of labour productivity used is value-added per worker. This is measured as the total sales of the firm less the cost of the raw materials and intermediate inputs used to produce the output, divided by the number of production workers in the firm.

3. Data used for the estimation of the model

The firm-specific characteristics include variables such as age of the firm, legal status and possession of internationally recognized quality certification. The number of years of experience is included as a management characteristic. Size of the firm is measured using number of employees. Industry dummies are defined using standard classifications in the Enterprise Surveys. Provincial dummies are included to take into account geographical variations in exports. "Behind the Border constraints" (included as dummy variables) included the managers' perceptions about the major problems impacting on the business environment with respect to customs and regulations, business licensing and permits, access to finance, corruption, courts, crime, electricity, inadequately educated workforce, labour regulations, informal sector competition, political instability, tax administration and tax rates. These were assumed to be beyond the control of the managers, while managerial perceptions about problems that can be addressed are hypothesized to enhance export performance.

C. Characterization of exporting firms versus non exporting firms

1. Export propensity of firms

Figure 1(a) shows that a higher percentage of non-exporters are found among small and medium firms, while large firms include nearly equal numbers of exporters and non-exporters. Figure 1(b) clearly shows that exporters are concentrated in firms located in the Southern, Central and Western provinces. Industry-wise categorization depicted in figure 1(c) indicates that food industry has a comparatively higher number of exporters compared to other industries.

Figures 2(a)-2(c) show the kernel density functions of total sales, labour productivities and wages, in log terms, for exporters and non-exporters, respectively. Though total sales, labour productivities and wages of both exporters and non-exporters appear to be distributed normally, the curves of the exporters are shifted to the right compared to those of non-exporters. The average labour productivity of exporters is on average 46 per cent higher than that of non-exporters, and exporting firms pay 45 per cent higher wages.

Figure 1(a). Exporters vs non-exporters by size

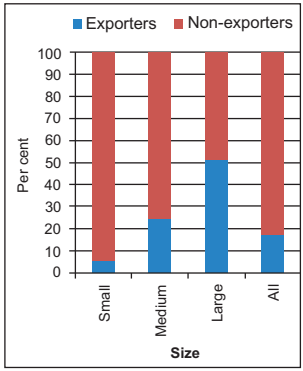


Figure 1(b). Exporters vs non-exporters by province

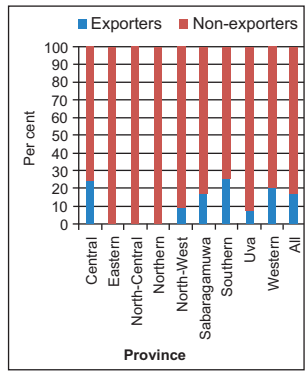


Figure 1(c). Exporters vs non-exporters by industry

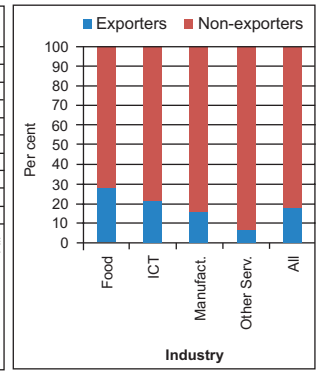


Figure 2(a). Kernal density of log sale

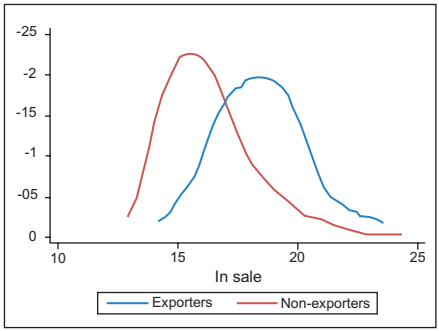


Figure 2(b). Kernal density of log labour productivity

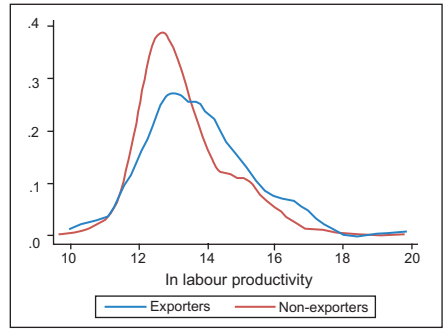
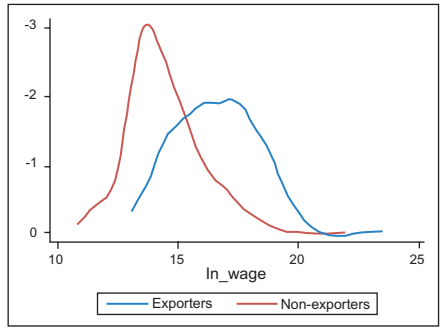


Figure 2(c). Kernal density of log wage



2. *Characteristics of exporting firms*

Exporting firms constitute only 10.65 per cent of the sample, indicating that only a small proportion of firms in Sri Lanka are exporters. Of the exporters, 40 per cent are large firms, 44 per cent are medium and 16 per cent are small firms (table 1) and the proportion of export firms in total firms of large, medium and small firms export are 30 per cent, 14 per cent and 3 per cent respectively. Table 2 provides details of firm heterogeneity by industry. Of the exporting firms, 36 per cent are in manufacturing, 34 per cent are in food, 24 per cent are in information communication technology (ICT) related industries and 7 per cent are in other service industries.

Table 1. Heterogeneity of firms by size

Size	Number of Firms	Share of Firms	Number of Export Firms	Export propensity (Share of Export Firms out of Total Firms)	Share of Export Firms out of Total Export Firms
Large	119	14.23	36	30.25	40.45
Medium	278	33.25	39	14.03	43.82
Small	439	52.51	14	3.19	15.73
Total	836	100.00	89	10.65	100.00

Small > = 5 and < = 19 workers; Medium > = 20 and < = 99; Large > = 100 workers

Table 2. Heterogeneity of firms by industry

Industry	Number of Firms	Share of Firms	Number of Export Firms	Export propensity (Share of Export Firms out of Total Firms)	Share of Export Firms out of Total Export Firms
Food	121	14.47	30	24.79	33.71
Health	124	14.83	0		
ICT	120	14.35	21	17.50	23.60
Manufacturing	231	27.63	32	13.85	35.96
Other services	116	13.88	6	5.17	6.74
Tourism	124	14.83	0		
Total	836	100.00	89	10.65	100.00

Table 3 presents the results of the analysis of export performance of various industries located in various geographical locations. Food industry firms, of which 41 per cent are exporters, are mostly located in Southern and Central provinces. ICT and other service industries are mainly concentrated in the Western province and they are mostly domestic market oriented.

There is considerable variation in the proportion of export sales in total sales, i.e. export intensity, among firms by location and industry (table 3). Textile exporting firms in the Western, Central, Sabaragamuwa and North-West provinces export 100 per cent of their total production. Food exporting firms in all provinces export nearly all their total production, with the exception of firms in the North-West province. Firms that produce and export fabricated metal products in the Central province have low export intensities. In contrast, firms in the Southern province exporting non-metallic mineral products only target the foreign market.

Table 3. Export propensity, intensity by industry and province

Industry	Sub-category	Province	No. of Export Firms	Export propensity (%)	Export intensity (%)
Food	Food	Southern	11	40.74	97.61
		Central	7	41.18	98.24
		North-West	2	15.38	82.29
		Sabaragamuwa	5	29.41	100.00
		Uva	1	100.00	100.00
		Western	4	16.67	99.90
Light manufacturing	Fabricated metal products	Western	3	8.33	79.46
		Central	1	8.33	1.00
	Machinery and equipment	Western	4	14.29	20.67
Other manufacturing	Basic metals	Central	1	100.00	95.00
	Non-metallic mineral products	Southern	3	75.00	100.00
		North-West	3	25.00	64.40
	Paper	Western	1	50.00	25.00
	Plastics and rubber	Southern	1	100.00	25.00
		Central	1	100.00	7.00
	Textiles	Southern	3	37.50	91.63
		Western	3	50.00	100.00
		Central	3	75.00	100.00
		Sabaragamuwa	2	33.33	100.00
		North West	1	100.00	100.00

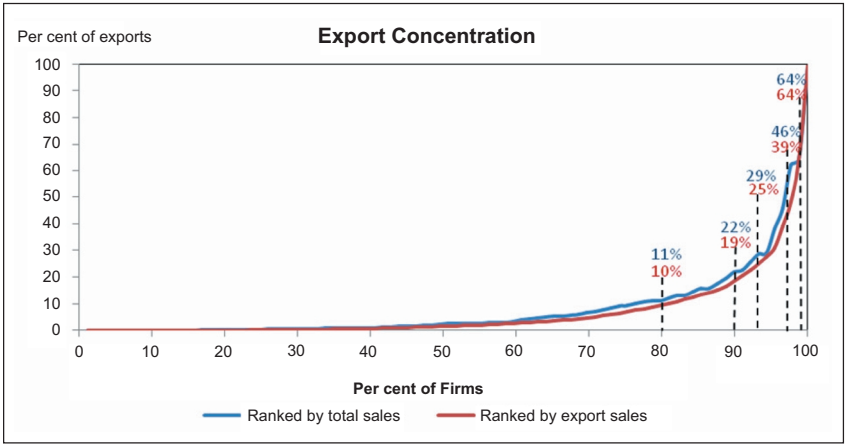
Table 3. ***(continued)***

Industry	Sub-category	Province	No. of Export Firms	Export propensity (%)	Export intensity (%)
	Tobacco	Sabaragamuwa	1	33.33	80.00
	Wood	Western	1	33.33	25.00
ICT	IT	Western	15	21.43	33.41
	Electronics	Western	6	16.22	10.60
Other services	Wholesale	Western	1	20.00	79.00
	Retail	Western	1	11.11	25.00
		Central	1	12.50	100.00
	Transport	Western	2	66.67	91.67
	Construction	Western	1	50.00	10.00

The data on export performance by ownership and size class revealed that of 43 firms with some foreign ownership, 10 are exporters and they account for 27 per cent of total exports. Interestingly, the top 10 per cent of the exporters are responsible for more than 80 per cent of aggregate exports. In other words, a few firms – "superstar exporters" – are responsible for the bulk of exports.

The concentration of exports across export oriented firms is shown in Figure 3 using Lorenz curves. The figure depicts that the contribution by small firms to the total export value is insignificant. The two curves, i.e. total sales and total exports almost coincide, indicating the strong correlation of exports and overall size of the firms.

Figure 3. Export concentration by value of exports and total sales



D. Results of the estimation of Heckman Model

Descriptive statistics of the variables used in the two-stage Heckman selection model are reported in table 4.

Table 4. Descriptive statistics of variables used in the Heckman estimation

Variable	Category	Description	Obs.	Mean	SD	Range
Sales		Total annual sales (Rs. Million)	647	323	2 130	0.4-35 000
Export		Total annual export (Rs. Million)	89	504	1 920	0.05-16 000
Export intensity		Export intensity (per cent)	89	65.45	38.52	1-100
Age		Firm age (years)	820	20.14	17.22	0-167
Manager experience		Years of experience (years)	695	18.10	10.94	1-50
Size	Large	0 if the firm size is small	836			0-1
	Medium					
Province	Western	0 if the province is Eastern, North-Central, North-West, Northern, Sabaragamuwa and Uva	836			0-1
	Central					
	Southern					
Industry	Food	0 if the industry is health, tourism and other services	836			0-1
	ICT					
	Manufacturing					
Legal status	Company	0 if the legal status is sole proprietorship and other	836			0-1
	Partnership					
Biggest obstacle	Custom	0 if the biggest obstacle is corruption, courts, crime, inadequately educated workforce, labour regulations, informal sector competition and tax rate	683			0-1
	License					
	Electricity					
	Access to finance					
	Political instability					
	Tax administration					
Quality certification	1 if the firm has quality certification		694			0-1

The estimation results are summarized in table 5. As indicated earlier, two sets of models are estimated with different specifications for the dependent variable in the outcome equation, while the selection equation is the same in both models. The same set of independent variables is used in both selection and outcome equations in the two models.

In general, the results of the estimation of the first stage of the Heckman Model (selection model) indicate that (a) large and medium firms (in terms of total sales and number of workers) have a higher export propensity, (b) food, manufacturing and ICT industries have a higher tendency to become exporters, (c) firms in Southern and Central provinces predominate in exporting, (d) the legal status as a company and partnership are associated with the decision to export, and (e) the young firms have a higher likelihood of being exporters (i.e. new firms tend to be more likely to export than older firms).

The estimation results of the second stage of the Heckman Model indicate that the value of exports is significantly influenced by the size of the firm, as measured by sales and type of the industry. Furthermore, results show that a 1 per cent increase in total sales is associated with more than 0.75 per cent increase in exports. According to model 1, the value of exports of firms which possess an internationally recognized quality certification are higher.

Managers' perceptions of the external business environment, such as their views about the degree of political instability, difficulty in obtaining business licences and permits etc., have significant negative effects on the value of exports and export intensity. However, the results indicate such perceptions do not have a statistically significant effect on export market participation.

There is no statistically significant difference on export participation between the firms that perceived access to finance as a major obstacle and the other firms. However, it is very interesting that those firms who decided to engage in exporting despite seeing access to finance as a barrier, demonstrated better performance, in terms of both value and intensity of exports. This may be due to such firms being more proactive in searching for and capitalizing upon export growth opportunities that would eventually ease their financing constraints, however we cannot investigate this issue further with the available data.

Table 5. Results of the Heckman Model estimation

Variable	Category	Export Participation	Log of Value of Export: Model 1	Mills Model 1	Export intensity: Model 2	Mills Model 2
Log (Sales)		0.128** (0.058)	0.751*** (-0.122)		-6.613* (3.463)	
Size	Large	0.773** (0.322)	0.652 (0.613)		31.481* (17.449)	
	Medium	0.534** (0.226)	0.780 (0.509)		26.477* (14.600)	
Industry	Food	1.492*** (0.293)	-0.713 (1.119)		0.424 (32.099)	
	ICT	1.122*** (0.316)	-2.145** (1.031)		-51.414* (29.582)	
	Manufacturing	1.340*** (0.271)	-0.933 (1.068)		-16.833 (30.664)	
Biggest obstacle	Custom regulations	0.155 (0.380)	-0.392 (0.488)		-9.583 (13.797)	
	Electricity	0.432 (0.293)	-0.429 (0.424)		-1.100 (11.974)	
	Access to finance	-0.022 (0.249)	0.727* (0.402)		20.061* (11.499)	
	License	0.161 (0.398)	-1.826*** (0.603)		-39.593** (17.268)	
	Political instability	0.354 (0.581)	-2.515*** (0.784)		-65.725*** (22.161)	
	Tax administration	0.185 (0.299)	-0.577 (0.406)		-10.822 (11.483)	
Province	Central	0.936*** (0.349)	-1.029 (0.764)		-10.737 (21.859)	
	Sabaragamuwa	0.510 (0.380)	-0.166 (0.687)		4.752 (19.704)	
	Southern	0.963*** (0.319)	-0.232 (0.755)		1.344 (21.572)	
	Western	0.411 (0.306)	-0.534 (0.611)		-16.508 (17.601)	
Legal status	Company	0.569** (0.232)	-0.029 (0.493)		1.228 (14.086)	
	Partnership	0.421* (0.235)	-0.475 (0.451)		-14.745 (12.891)	

Table 5. ***(continued)***

Variable	Category	Export Participation	Log of Value of Export: Model 1	Mills Model 1	Export intensity: Model 2	Mills Model 2
Log (Firm age)		-0.245** (0.119)				
Log (Manager experience)		0.166 (0.128)	0.310 (0.192)		8.584 (5.452)	
Quality certification		0.241 (0.233)	0.603* (0.325)		10.970 (9.175)	
Lambda				-0.518 (0.894)		-6.906 (25.479)
Constant		-5.405*** (1.043)	4.415 (4.920)		173.680 (140.570)	
Observations		585	585	585	585	585

Standard errors in parentheses and *** p < 0.01, ** p < 0.05, * p < 0.1

Conclusions and policy implications

This analysis of the export behaviour of firms in Sri Lanka revealed significant differences among exporting and non-exporting firms, as well as among exporting firms themselves. These are likely to generate significant disparities. The Sri Lankan export sector is clearly dominated by a few large firms, who have larger total sales, pay higher wages and have higher labour productivity. The study also found that managers' perceptions of problems in the business environment, associated with 'behind the border' problems, negatively impact on export performance. These highlight the fact that Sri Lanka must improve its domestic business environment and create a more conducive environment for SME's to become involved in export markets.

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Appendix 1

Method of sampling used in the enterprise survey

The sample for Sri Lanka is selected using stratified random sampling. Three levels of stratification are used in this country: industry, establishment size, and region.

Industry stratification is designed as follows. The universe is stratified into 2 manufacturing industries, 1 services industry (retail), and 2 residual sectors as defined in the sampling manual. Each manufacturing industry had a target of 120 interviews. The services industry and the 2 residual sectors had a target of 120 interviews.

Size stratification is defined following the standardized definition for the rollout; small (5 to 19 employees), medium (20 to 99 employees), and large (more than 99 employees). For stratification purposes, the number of employees is defined on the basis of reported permanent full-time workers. This seems to be an appropriate definition of the labour force since seasonal/casual/part-time employment is not a common practice, except in the sectors of construction and agriculture.

Regional stratification is defined in nine regions: Eastern, Western, Southern, Central, Northern, North-Central, North-West, Uva, Sabaragamuwa.

One frame is used for the Enterprise Survey in Sri Lanka. The sample frame containing fresh contacts used in the Sri Lanka is obtained from the Department of Census and Statistics of Sri Lanka (DCS) 2003.

The enumerated establishments are then used as the frame for the selection of a sample with the aim of obtaining interviews at 600 establishments with five or more employees.

The quality of the frame is assessed at the onset of the project through calls to a random subset of firms and local contractor knowledge. The sample frame is not immune from the typical problems found in establishment surveys: positive rates of non-eligibility, repetition, non-existent units, etc. Due to response rate and ineligibility issues, additional sample had to be extracted by DCS and the World Bank in order to obtain enough eligible contacts and meet the sample targets.

Given the impact that non-eligible units included in the sample universe may have on the results, adjustments may be needed when computing the appropriate weights for individual observations. The percentage of confirmed non-eligible units as a proportion of the total number of sampled establishments contacted for the survey is 50 per cent (900 out of 1806 establishments).

Source: World Bank

IV. Evaluation of business association membership on small and medium enterprises' growth performance: Evidence from enterprise survey of Cambodia

By Vathana Roth

Introduction

There is growing attention on small and medium enterprises (SMEs) within academic circles and policy discussions. It is widely argued that SMEs play a vital role in enhancing economic growth and competitiveness, helping to reduce poverty in both developing and industrialized economies. The effects are particularly profound in developing countries, where SMEs contribute a large portion of domestic production and employment (Ayyagari *et al.,* 2011).

However, SMEs face a number of constraints to growth. This has to do with their small size, relatively low bargaining power, difficulty obtaining investment loans, vulnerability to idiosyncratic risks (resultant of vertical and horizontal competing forces), high costs of administrative compliance and weak legal enforcement (e.g. Sukiassyan and Nugent, 2008; Beck *et al.,* 2008; Stephanou and Rodriguez, 2008; Aterido *et al.,* 2009). To cope with these problems, SMEs need specific direct and indirect assistance to improve survival rate by becoming more competitive. Under a SME-tailored policy, there are support programmes, including training, advice, subsidies, for SME owner-managers to take advantage of (Wren & Storey, 2002; Batra and Mahmood, 2003; Bennett, 2008; Zecchini and Ventura, 2009; Han and Benson, 2010; Czarnitzki and Hottenrott, 2011; World Bank, 2010; Chheang *et al.,* 2011). Along with programmes designed to fit the needs of individual SMEs, there are more concentrated and associative programmes to address common constraints. This has been implemented to mobilise collective efforts and pooled resources. Examples of associative networks include business and trade associations, professional and employer associations, federations, networks and clusters.

There are a number of associative organisations, which vary greatly in dynamism and diversity. Spanning regional, national, local and sectoral levels, the enterprise networks' work is through advocacy and representation of members' interests to external parties. The aim is to help members be more competitive and be involved in overall business activities. There is substantial literature that argues that business associations (BAs) provide more benefits to SMEs rather than to large firms. A larger firm's economy of scale and scope enables them to overcome size constraints and stay competitive even without assistance (Bennett, 1998; Bennett and Ramsden, 2007; Perry, 2007).However, there are theoretical and empirical challenges to this claim.

In Cambodia, SMEs have contributed significantly to overall macroeconomic growth, job creation, and, to a lesser extent, innovation and technology adoption. The policy agenda and support programmes are similar to those commonly observed in other economies. SMEs, particularly manufacturing establishments, are important to economic growth and business competitiveness. Cambodian manufacturing SMEs have gradually grown in number, with 33,195 manufacturing establishments in 2007, making up 98.3 per cent of total number of SMEs. Large enterprises (LEs) account for just 1.7 per cent (NIS 2008). Preliminary results of the 2011 economic census reports that MSMEs account for 502,372 (99.9 per cent) of the total 503,008 establishments across the country. Most of these firms are concentrated in Phnom Penh and in major economically active provinces, such as Kampong Cham, Siem Reap, Battambang, Kandal and Takeo (NIS, 2011).

The number of SMEs has risen at an annual rate of about 3.5 per cent since 1998, reaching 32,619 establishments in 2007 (NIS, 2008). Of the total establishments in 2007, SMEs involved in food, beverages and tobacco made up the largest proportion (80.9 per cent). This is followed by those dealing in fabricated metal products and textiles (8.8 per cent), wearing apparel and leather goods (4.5 per cent). In the same year, the number of SME employees increased by 9.0 per cent compared to a year earlier, from 87,072 workers to 94,835. This represents an 18.9 per cent share of total employment (NIS, 2008). The total volume of production generated by SMEs also constantly climbed at an annual growth rate of 30.2 per cent between 1998 and 2007, reaching $636.2 million in 2007. Food, beverages, and tobacco continued to comprise the biggest proportion of total generated value (NIS, 2008).

Cambodian SMEs, however, are still in initial stages of development. This is despite the completion of the first five-year SME Development Framework (2005-2010). Initiatives in the previous plan were designed to address issues and challenges SMEs face. However, rigorous implementation was lacking and unsatisfactory, and progress was slow. Additionally, Cambodia lacks systematically study and evaluation on whether the proposed SME policies, and other related interventions, are having positive impacts on SMEs' operation and competitiveness.

There are a number of public sponsored or privately financed Business Associations (BAs), as well as growing effort from both government and development partners to enhance inter-firm collaboration. But there are no systematic studies on whether this has, or will have, positive impact on participating firms. Therefore, this study aims to examine the potential impacts that SME membership in BAs or CoC would have on a firm's medium and long-term outcomes. The study contributes to the limited, but growing, body of literature[67] on SME development in Cambodia. It also serves stakeholders decision-making by utilising evidence-based impact evaluation.

[67] Some of the qualitative and quantitative studies on Cambodian SMEs are: Harner, 2003; Meas, 2006; Baily, 2007; Shariff and Chea, 2008; Harvie *et al.,* 2010; Chheang *et al.,* 2011.

The rest of the paper is organised as follows. Section 2 reviews and discusses academic studies on the roles of BAs and the benefits they might provide to participating firms. It also highlights theoretical and analytical bases for empirical analysis. Section 3 specifies econometric models and variables measurement to estimate ATE of BA membership on intermediate outcomes and long-term growth performance of SMEs and firms in general. Section 4 provides data source and a brief descriptive analysis. Section 5 discusses main findings and highlights sensitivity analysis. Section 6 outlines study's limitations, and Section 7 concludes the paper and recommends areas for further research.

A. Literature review and theoretical aspects

Moore and Hamalai (1993) defines BAs as a collection of formal membership organizations of individual business people or firms. Managerial modalities of BAs are diverse and encompass a huge variation of strategic services and activities. BAs can be big or small; local, provincial, national, regional or global. They can encompass all firms or just be sector-specific; publicly or privately owned; independent, government-sponsored; have voluntary or obligatory memberships; are of discriminatory membership or are open to all establishments. BAs can offer professional services tailored to the needs of individual members, which demand more investment in human resources, or provide more services for collective purposes, which may give room for members to free-ride (e.g., Moore and Hamalai, 1993).

Potential services of BAs include (but are not limited to) dissemination of market information, government lobby, information on import and export markets, access to finance, updates on laws and regulations, collective procurement and sales. Services could also include experience sharing in management practices, production methods, financial reporting, and short-term vocational and technical training. The majority of associations undertake advocacy work. The availability of various services to members is as significant as the effectiveness of service delivery. This is due to members having higher demands on services deemed more essential.

Two theoretical perspectives can be used to examine and explain the applicability of BAs or other kinds of collective bodies. Its existence is believed to either contribute to members' growth performance or jeopardise socially optimal benefits. These two theory are pluralism and the public choice (see, for example, Becker, 1985; Moore and Hamalai, 1993; Goldsmith, 2000: 40-41). The pluralist theory of interest groups gives importance to BAs, and other formally organized groups, where members can collectively increase political and economic bargaining power and influence public policy to improve the overall business environment. Public choice theorists see such associations as counter-productive and discriminatory due to their rent-seeking behaviour which benefits special interest groups at the expense of the majority.

The pluralists argue that in order to create a business climate conducive to firms' growth, government-private sector collaboration is inevitable. This is to reduce transaction costs of acquiring information on updates and progress of public policies, as well as to

ensure a more symmetric flow of information on rules and regulations. Furthermore, pluralists point to the inability and ineffectiveness of individual firms in influencing government policy. This claim is much more relevant to micro firms and those SMEs whose small size may not give them sufficient voice when they are acting alone. According to pluralists, another benefit of BAs or associative organizations is the expansion and depth of social capital that can be achieved through inter-firm collaboration and networks.

On the other hand, public choice theorists criticize special interest groups and lobbyists, citing their rent-seeking behaviour as having potential to generate socially-not-optimal results. Organized special interest groups can benefit from additional economic rents[68] resulting from policy lobby to favour their specific agendas. Thus, in the view of public choice theorists, BAs and other collective organizations obstruct fair and just business competition. They say that the representative role of BAs draws government to fulfil certain business needs, which are more likely to favour members than society at large. The rent-seeking behaviour may also leave room for bribery and corruption.

In this respect, cautious must be observed when allowing the establishment of associations or special interest groups. However, the enormous number of BAs and other associative organizations – labour unions, industrial clusters, and federations – in both developing and developed economies supports the pluralists' claim that such organizations tend to provide more advantages to members than disadvantages. Even if BAs might generate negative effects under specific circumstances, the impact on overall business activity might not be completely socially disruptive. Also, BAs members have a wide variety of strategic services and activities at their disposal, not just policy lobbying.

Empirically, the benefits of BA membership have been well documented. Considerable literature argues that intended services of BAs are necessary to help member firms resolve collective or individual problems (Levitsky, 1992; Bennett, 1995, 1998; Nadvi, 1999; Doner and Schneider, 2000, 1999; Luna and Tirado, 2008; Goldsmith, 2000). Political and economic benefits of BAs have also been documented in the United States, where BAs are comparatively small, unorganized and fragmented (McCormick *et al*., 2008). Benefits of BAs are even more profound for the smallest firms and SMEs (Wilts and Meyer, 2005).

Levitsky (1992) proposes that the roles of BAs should be enhanced in developing countries. More so, government, private sector and international organizations should provide further assistance for BAs. Doner and Schneider (1999) argues that, rather than impeding market competition and economic growth resulting from collective bargaining power, BAs could provide a wide range of services. This could be from lowering information and transaction costs to upgrading skills and technology of member firms. The collective actions of BAs can be more beneficial for SMEs than for large firms, who can exploit economies of scale (Wilts and Meyer, 2005; Bennett, 1998).

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[68] Goldsmith (2000) defined economic rents as "policy-induced gains that would not exist in a competitive market."

However, there is continuing debate about BAs in terms of service quality, size, efficacy and effectiveness, institutional arrangements, forms of and motives for membership (Bennett and Ramsden 2007). The theory of associative organizations has differentiated two forces that have the potential to drive association membership – "the logic of collective influence" and "the logic of services" (Olson, 1965; Bennett, 1998, 2000; Perry, 2007). The former stresses collective activity in favour of all, or the majority of, members with third parties (such as government agencies) that can impact on members' interests. The latter emphasises service provision to meet specific needs where a BA's secretariat responds to members' requests and enquiries. This allows the BA to assist members in raising and enhancing competitiveness in "niche" markets in which members specialise (Bennett, 1998).

The distinctive features of institutional arrangement of BAs are resources, size, effectiveness, service coverage, quality, membership and membership fees. These differences have implications on the scope and coverage of BAs' services, social, political and economic powers and resources. Levitsky (1992) claims that publicly financed and centralised institutions (staffed and managed by "government appointees") are less effective in providing intended services and training to SMEs. He points out that these institutions often lack human resource capacity and require budgetary resources to properly fulfil their mandates. He proposes that in developing countries, attention and examination should be given to those private sector organizations that can more effectively address the needs of SMEs.

Membership in most CoCs or BAs are often voluntary, however this varies across countries. Germany, France, Austria, the Netherlands and Italy, for instance, require businesses to register with the CoC (Bennett 1995). In Germany, the Chamber of Industry and Commerce and the Chamber of Crafts represent business operators in specific local areas, providing a wide range of services from technical services to government lobbying (Germany Trade and Invest, 2012: 34). These associative organizations are supported by public law status and are publicly financed. Japan uses a mixed structure of voluntary and compulsory membership. However, given strong social ties and pressure, almost all SMEs (95 per cent) are members of associations (Levitsky, 1992). Most associative organizations in the US and UK are privately operated with voluntary memberships. Voluntary or statutory membership could have implications for BAs' service provision and financing sources. Bennett (1995) shows that, given voluntary membership, the UK CoC tends to provide specific services demanded by members, rather than collective services that other members might use. The logic of services is more relevant when membership in BAs is voluntary. This is to guard against free-riding among both members and non-members. However, BAs might face financial constraints as a result of this voluntary membership, as they mainly rely on membership fees.

It is clear that the issues facing the existence and operation of BAs are multifaceted. These issues need to be continually addressed to create a business environment that is more inclusive and fostering fair competitive opportunities for all. As an initial step, this study will attempt to quantify the benefits of private BA membership on firms' outcome

indicators in the Cambodian context. The institutional and financial arrangements of BAs are to be left for subsequent studies.

B. Econometric specifications and variables measurement

1. Econometric specifications

This study adopts a non-experimental approach, using a variety of econometric methods to measure average treatment effects of membership in BAs or CoCs on a number of firms' intermediate and long-term outcomes. This includes propensity score matching (PSM) and PSM with ordinary least squares (OLS) regression. The purpose of using different, but interrelated, approaches to estimation is in order to address inconsistency and bias of coefficients. These might arise from the use of non-experimental data and self-selection or programme placement attributes. It is also necessary to distinguish between before-and-after study and with-or-without enquiry. This study uses the latter.

Propensity score matching has been for the last decade commonly used to estimate the impacts of policy and programme interventions (see, for example, Rosenbaum and Rubin, 1983; Motohashi, 2002; Aert and Czarnitzki, 2004; Criscuolo *et al.,* 2007; Caliendo and Kopeining, 2008; Mole *et al.,* 2008). Consider the outcome equation below:

$$y_i = \beta_o + \sum_k \pi_k X_{ik} + \gamma BAM_i + \varepsilon_i \quad (1)$$

$$i = 1, 2, 3, ..., n;\ k = 1, 2, 3, ..., m$$

where y_i is a set of outcome variables of firms i; X_i is a set of observed firm characteristics influencing their medium and long term growth performance; BAM_i represents dummy membership of firms in BAs; ε_i is the randomly distributed error term indicating the unobservable factors affecting the outcome variables, with zero conditional mean $E(\varepsilon_i|X_i, M_i) = 0$; π_k and γ are parameters to be estimated.

PSM estimates average treatment effects (ATE) of policy or programme impacts between matched treatment and control groups in the region of common support. This is done by using matching methods such as nearest neighbour (NN) and others[69]. Treatment and control groups are matched based on the probability of participation or propensity score of participation estimated from their observed covariates (Khandker e*t al.* 2010; Gertler *et al.* 2011b). Thus, if the independence assumption holds or $E(\varepsilon_i|X_i, BAM_i) = 0$ and if there is a significant overlap of participants and non-participants in the region of common support, the average treatment effects can be written as[70]:

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[69] Other matching methods include caliper, or radius matching, stratification or interval matching, and kernel and local linear matching (Khandker *et al.,* 2010).

[70] The formula was adapted from Khandker *et al.,* 2010: 57.

$$ATE_{PSM} = \frac{1}{N_M}\left[\sum_{i \in M} y_i^M - \sum_{i \in M} \varphi\,(i, j)\; y_j^N\right] \quad (2)$$

where N_m is the number of firms i participating in BAs and φ (i, j) is the weight used to aggregate outcomes for the matched non-participating firms. However, if zero conditional mean error assumption is violated or $E(\varepsilon_i|X_i, BAM_i) \neq 0$ and the overlapping region of common support is significantly small, PSM would produce inconsistent and biased coefficients (Caliendo and Kopeining, 2008; Khandker e*t al.,* 2010; Gertler *et al.,* 2011a). We use kernel and nearest neighbour matching methods to estimate the impacts of BA membership on firms' performance (Oh *et al.,* 2009).

To obtain reliable, consistent, and unbiased coefficients using PSM, the following assumptions must be met: (1) the un-confoundedness assumption or the conditional independence assumption (CIA), where potential outcomes are independent of treatment assignment given observed covariate x_i; and (2) significant overlapping assumption of common support between participants and non-participants. While the violation of the latter is less severe; that of the former, so-called selection or programme placement bias, would be problematic and is technically and practically difficult to address.

Estimation results are more likely to have upward or downward biases due to administrative and self-selection reasons. If a business association administratively selects large and already well-established firms as members, assessment results tend to overstate the benefits received. When small and low productive firms are selected members the benefits are understated. The study assumes that there is no administrative selection, as almost all business association membership in almost all business associations in Cambodia is voluntary.

There is the option of firms choosing to participate in BAs. What encourages a firm's participation in BAs is unknown. There could be unobserved characteristics, affecting outcome variables, which are likely to encourage participation. Some of these attributes (which may not have available data) are productivity growth, firm owner-manager ability and advance firms, in terms of managerial, administrative and financial structure. Results from this are likely to overstate the benefits of business association participation. The opposite is when participating firms are those with low productivity or low owner-managers' ability. This would understate the benefits of BA membership. Our descriptive statistics (Annex tables 3, 4 and 5) provides some relevant information on this issue. Large firms, exporting firms, firms with term loans from financial institutions, 100% foreign-owned and joint venture firms, manufacturing establishments, and firms who know about Special Economic Zone (SEZ) have higher per centages of being BA members than their counterparts. Almost all of these firms have higher performance indicators, except labour productivity and labour cost per worker (Annex table 5).

To tackle selectivity or programme placement or biases of ex-post characteristics, other approaches can be used. This could be difference-in-differences (DID) or instrumental variables. DID would produce consistent and unbiased coefficients of impacts only if we control for observable characteristics of firms and the randomly distributed error

terms that are not dependent on unobservable attributes. The validity of DID holds if, and only if unobservable attributes affecting outcome variables are assumed to be constant over time, However, in practice, this might change. If the error term in DID equation is time-variant, estimated coefficients would still be biased and inconsistent. To address selection bias resulting from time-variant observable attributes, the "Instrumental Variables" technique or the two-stage procedure described by Heckman (1979) can be employed. However, finding good instrumental variable(s) is challenging.

Therefore, PSM is used given the quality of the existing data set. The use of matching is mainly to balance characteristics of participating and non-participating firms, rather than to completely eliminate selection bias. Additionally, in constructing a comparison group for matching, some factors have to be taken into account. First, data on outcome variables of comparison group, matched with those of treatment group, should be from the same set of questions (Caliendo and Kopeining, 2008). This condition is met by using the same set of questions to collect information on participating and non-participating.

Second consideration is the issue of sample size – the total sample size and the ratio of treatment-to-comparison observations. Basically, matching can be done in two ways – with and without replacement. The latter approach would require the comparison group to have a large sample size since one observation of the comparison group can only be matched one time. Whereas, the former approach would demand a relatively smaller sample size. The total sample size in our data is 502, and the ratio of participating-to-non-participating firms is 1:2.6. Since we use matching with replacement (which is common in matching literature) sample size is not a major issue. Lastly, Lee (2006) pinpoints that CIA would imply that covariates x_i, needs to be chosen in a way that it is correlated with the decision to participate and firms' outcome variables. This is when programme placement is voluntary. So, observable characteristics that meet the third requirement need to be found. This can be done by using economic theory or empirical studies.

2. Variables measurement

The choice of variables to be included in subsequent equations is based on economic theory and previous empirical works. Where there is no economic theory to support variable choice, formal statistical tests are used to justify its validity (see, for example, Heckman *et al.,* 1998; Black and Smith, 2004; Caliendo and Kopeining, 2008).

One of the survey questions is "Is your establishment/firm a member of a business association or chamber of commerce?" The study uses this as the main binary explanatory variable, with "1" representing membership and "0" otherwise. Logarithmic form is applied to the final continuous outcome variables and some indicator variables to make distributions approximately normal (For example see Roper and Hewitt-Dundas, 2001; World Bank, 2010; Mole *et al.,* 2008; Motohashi, 2002; Harvie *et al.,* 2010). The definition of firms is based on the government's definition. The firm categories are based on the number of regular employees of the firm in 2006 fiscal year (Annex table 1).

The firm's age is taken from the start of operations in the country to April 2006. Previous studies argue that firm age is positively related to firms' high participation probability in some kind of associative cooperation or production network. This is due to older firms would have more experience in production, therefore understanding the benefits they can take from this kind of collective bargaining. Whereas, younger firms may still be doubtful about the benefits. The study hypothesises that firm age is statistically positively correlated with high probability of participation. We also introduce square of firm age to allow for diminishing returns from participation over time.

Firm size is found to be positively related to the decision to participate in BAs. However, there are arguments about whether small firms are more likely to rely on intermediary support than larger ones (Salisbury, 1984; World Bank, 2010). Salisbury (1984: 74) argues that a sector with small firms is more likely to be attracted to associative bodies where individual small firms can take greater advantage of collective services. This is because small firms, for example, cannot bear the full costs of private consultancy or professional services, by themselves. He also states that large firms, that can take advantage of economies of scale, are more likely to be able to afford private representations and specialised services. Mitchell (1990: 627-628) shows that large firms tend to have direct contact with government rather than rely on business or professional associations for representation. Bennett (1999: 256) also argues that large firms are more likely to influence government decisions directly rather than rely on the representation of associative bodies. Bennett (1995: 261) shows that the smallest firms are more likely to become CoC members than larger ones. Bennett (2000) partly proves Salisbury's (1984) argument that the demand for collective services is greater for small firms. Alternatively, while analysing the impacts of government-supported training programmes in Chile, Mexico, Colombia and Peru, the World Bank (2010) shows that, common across the countries, larger firms are more likely to be attracted to support programmes compared to smaller ones. These different arguments lead us to empirically test the relationship between firm size and participation probability. This study hypothesises that small firms are more likely to be attracted to BAs or CoC.

The World Bank (2010) also indicates that more manufacturing SMEs tend to participate in programmes compared to services and trade sector SMEs. Bennett (1995: 269) shows that manufacturing firms are between four or eight times likely to be CoC members than non-manufacturing firms. In this study, the surveyed firms are categorised into four sectors – manufacturing, trade, tourism and other (construction, transport, IT and other). The hypothesis is that manufacturing firms, in general, and SMEs, in particular, would be more likely to participate in BAs or CoC. The study also hypothesizes that fully foreign-owned and joint-venture firms and SMEs have a high probability of BA membership than fully domestically-owned firms. This is because foreign-owned firms may have more understanding of the benefits they can obtain from the collective services of BAs. Previous studies have found significant positive relations between exporting firms and SMEs and the decision to participate in production networks or other kinds of associative bodies. This study hypothesize that a firm's decision to become a BA member is higher among exporting firms and SMEs compared to their non-exporting counterparts.

Earlier studies also argue that firms, in general, and SMEs, in particular (with better access to finance), are more likely to participate in BAs or production networks (Harvie *et al.,* 2010). Possible credit rationing by financial institutions, resulting from information imperfections in credit market, can prevent SMEs from accessing term loans or credit line (Stiglitz and Weiss, 1981). Harvie *et al.* (2010) indicates that easier access to finance or high financial leverage increases the probability of SMEs' participation in production networks. However, this study hypothesize that SMEs are more likely to participate in BAs so that they can use membership as some sort of guarantee when they approach banks for term loans or credit line. This is so for SMEs that finds it difficult to access finance due to size constraint and inability to provide required collateral to banks. The study also includes other variables that may have an influence on participation in the selection equation.

C. Data source and descriptive statistics

1. Data source

The study uses the 2007 World Bank Enterprise Surveys of Cambodia. A simple random sample from a combined sampling frame (World Bank, 2007) was employed to select the required observations from each strata defined by four sectors (manufacturing, tourism, trade, and others), as well as three firm sizes. With the elimination of surveyed firms that had less than five regular employees in April 2006, the total sample size was 502, 204 of which have between 5 and 19 workers, 146 have between 20 and 99 workers, and 152 have more than 99 workers. Based on firm categories defined by the government and the number of regular employees in 2006 fiscal year (Annex table 1), there were 361 MSMEs (72 per cent of the total sampled firms) while 141 large enterprises accounted for the remaining 28 per cent.

The survey covered firms that started operating before April 2006 in a number of sub-sectors ranging from textiles, garments, wholesale (including export services) to hotels and restaurants. Surveyed firms are categorised into four sectors – manufacturing, trade, tourism and other (including construction, transport and IT). The survey considers only private-for-profit firms, not government-owned or community-owned establishments. Also, firms who did not keep their own accounts were eliminated. The survey took place in four main areas – Battambang, Siem Reap, Phnom Penh and Kampong Cham. Most surveyed firms (401 or 80 per cent of total sample firms) were located in Phnom Penh and its outskirts in the Kandal province. The remaining firms are in Battambang (9 or 2 per cent), Siem Reap (66 or 13 per cent), Kampong Cham (6 or 1 per cent) and "others" (20 or 4 per cent).

2. Descriptive statistics

Of the total sampled firms, 139 (27.7 per cent) were members of a BA or CoC, while the remaining 363 firms were not. Of the 363 MSMEs, only 47 were members of a BA while the other 314 were not. There were 92 large firms that reported membership, while the other 49 did not. Only 33.8 per cent of MSMEs are members of a BA or CoC compared with

66.2 per cent of large firms, which are mainly garment enterprises. Most studies found that 10 per cent, or even less, of all SMEs are members of associations. This low membership may be due to some of the frequently observed characteristics of MSMEs, in particular family-based proprietorship and the belief of SME owner-managers, that they would have little to gain from an association's collective or specific activities. Large firms, foreign and joint venture firms, manufacturing establishments, firms with large national market share, firms where majority of workers are union members, firms that have more foreign competitors, firms that have term loans with financial institutions, firms in special economic zones (SEZ) tended to have higher levels of membership in BA or CoC (Annex table 4).

Annex Table 5 provides statistical relationships between a number of firms' characteristics and outcome indicators. ANOVA is used to test mean differences of growth performance and each category of characteristics. SMEs and large firms perform comparatively better than micro firms, having more sales, higher production and labour productivity and paying higher total and per worker costs. Large firms have higher levels of outcome variables than SMEs but lower labour productivity and labour cost per worker. The differences are statistically significant at 5 per cent. This is interesting in the sense that large firms, mainly firms in the garments sector, produce more simply because they have more workers. However, each worker is less productive compared to an employee working in SMEs. Other relationships between firms' characteristics and performance also show similar results. With regards to what services participating firms expect from BAs, information and/or contacts on domestic product and input markets is important for micro, small and medium enterprises but less important for large firms (Annex table 6).

Annex Table 8 reports mean differences of a number of firms' outcome indicators (in natural logarithms) and other characteristics between members and non-members of BAs. Mean values of outcome indicators are higher and almost all of these differences are statistically significant. Outcome indicators are annual sales, production, costs of labour, cost of intermediate goods, other costs, labour productivity, and cost per worker of firms participating in BAs or CoC. These results tend to provide a preliminary indication that BA membership has positive impacts on participating firms compared to their non-participating counterparts.

Also, firms with a high-educated workforce tend to be able to self-operate and improve their performance without assistance from BAs. The World Bank (2010) found mixed results on mean differences of programme participation in Chile in 2004.[71] It points out that this could indicate that programmes are more attractive to poorly performing firms and that participation improves their performance relative to what it might have been if they had not participated.

The statistically positive significance (1 per cent level) of mean differences of major outcome indicators still holds for the sub-sample of SMEs (Annex table 9). Participating SMEs appear to benefit from the services of BAs or CoC, given their high mean values of

[71] But note that there was no controlling for other contributing factors.

outcome indicators compared to non-participating SMEs. Approximately 74.85 per cent of surveyed firms are non-exporters while only 25.15 per cent are exporting firms. The Chi^2-square test of independence between exporters and non-exporters and firms' decision to become BA member indicates that 63.5 per cent of exporting firms are members of BAs or CoC, while 36.5 per cent are not. Of the non-exporters, 15.5 per cent are reportedly BA members while 84.5 per cent are not. The difference is statistically significant at 1 per cent level, signifying that exporting firms have a higher probability of participation in BAs than non-exporting ones.

More manufacturing firms (62.7 per cent) are members of BAs compared to firms in the trading sector (7.6 per cent), tourism sector (16.8 per cent) and other sectors (19.3 per cent). The Chi^2 square test of independence between row and column is again statistically significant at 1 per cent level. A large percentage of firms in Phnom Penh (31.2 per cent) are members of BAs compared to Siem Reap (16.7 per cent), Kampong Cham (16.7 per cent) and others (2 per cent). This partly reflects associative organizations being more concentrated in Phnom Penh. As far as equity stakes of firms are concerned, a high percentage of firms that are fully foreign-owned (52.1 per cent) and joint venture (52.1 per cent) are BA members. Only 13.8 per cent of fully domestically-owned firms are members.

D. Regression results and discussion

1. Participation likelihood

Annex table 10 presents results of logistic regression analysis, predicting the likelihood of firms' participation in BA or CoC given their observed covariates. Regressions are run for both the pooled sample (all participating and non-participating firms) and a sub-sample (participating and non-participating MSMEs). In estimation, six different model specifications are used, partly to test the robustness of results. Results reveal that most of the covariates have expected effects (in terms of the sign) on participation probability, though with varying statistical significance.

For the pooled sample, the variable "years in operation" is positively correlated statistically with high probability of participation. This indicates that older firms tend to participate in BA or CoC more than younger ones. Second, large firms are more likely to register membership than MSMEs. This finding contradicts our prior expectation that small firms would have higher participation likelihood as they can use membership as a bargaining tool for business survival and growth. However, the result is consistent with that of previous studies (World Bank, 2010; Harvie *et al.,* 2010).

Non-exporting firms accounted for 74.8 per cent of the total sample, compared to 25.2 per cent of exporting firms. Yet, exporters, who also tend to be fully foreign-owned or joint ventures, are more likely to participate than non-exporting ones. This may be because exporting firms can get business information on foreign markets and advice and support services from BA or CoC (Spence, 2003). It should be emphasised that more needs to be done to encourage domestic producers to be exporters. Of fully domestically-owned firms

78.4 per cent are non-exporters, and 92.3 per cent of output is sold domestically compared to 6.2 per cent that are exported directly and 1.5 per cent that are exported indirectly (World Bank 2007).

The large proportion of non-exporting domestic firms may indicate several possible constraints to exporting (1) long and complicated administrative compliance, (2) limited access to information on foreign markets, (3) products are low quality and do not meet internationally required standards, and (4) limited staff capacity to go international. The problems reported by exporting firms in the survey five years ago remain today. These are lengthy and costly export procedures, informal fees, gifts giving to officials and high cost per export container. Cambodia was ranked 138 out of 183 economies evaluated on ease of conducting business (World Bank, 2012).

Also, more needs to be done to reduce export regulatory and administrative compliance costs. Almost all firms in Cambodia are MSMEs, where production capacity is still low and vulnerable to competition from imports. High costs of doing business also force MSMEs to stay small and informal, further jeopardising their expansion and productivity. Business management structure is predominantly conventional, with individual and/or family as the largest shareholder or owner. Data shows that 49.8 per cent of firms reported having an individual as the largest shareholder or owner, and 32.4 per cent having family as the largest shareholder. One of the risks of family-based firms dominating the business environment is resistance to change in management style, and reluctance to adopt new technologies.

There is merit in pushing domestic producers to eye foreign markets. Previous studies have also documented the need for domestic firms to upgrade their production chain and the potential benefits of exploring opportunities outside home markets. Using Colombian panel data on manufacturing firms, Isgut (2001) finds that exporters tend to be larger, more productive, pay higher wages, are more capital intensive, and have higher labour productivity than non-exporters. Biesebroeck (2003) shows that exporting manufacturing firms in Sub-Saharan African countries tend to be more productive than non-exporters. This is due to exporting firms improving their productivity upon entering foreign markets. He argues that scale economies can be one of the determining factors. Bernard and Jensen (1997) also found that exporting manufacturing firms contributed significantly to the demand for skilled labour and wage increases in US manufacturing plants during the 1980s.

Thus, encouraging domestic producers to export means helping them to get out of their comfort zone and start exploring productivity and profitability opportunities beyond domestic markets. This is especially relevant to Cambodian producers given the intensity of regional and global economic integration that Cambodia is currently taking part in. The effects of the Asian Free Trade Agreement, specifically ASEAN Economic Community, demand further changes in current production practices, management and innovation among domestic producers. This is to become competitive and to stay afloat when domestic markets are opened to an influx of foreign goods and, at a later stage, freer flow of services. The government's current commitment to achieve exports of one million tonnes

of milled rice by 2015 is a starting point to improve production capacity and productivity of domestic rice producers (CEFP, 2011). But, entry into exporting by itself is not enough to enhance productivity, since competitiveness depends on a number of interdependent factors in the whole value chain. A long-term strategy is needed to improve infrastructure, logistic systems, information flow and market access, banking systems, government regulations and procedures and human capital. Additionally, support and initiatives should not be confined to the rice sector as sectoral diversification is a major contributing factor to fast and sustained economic growth.

Manufacturing firms have higher participation probability than firms in trade, tourism and other sectors. This provides an early indication that further efforts should be extended to cultivate the idea of forming more concentrated and specialised form of associative bodies. This could be in the form of industrial clusters among manufacturers in order to gain greater benefits, rather than business information only. The higher its share of the national market, the more likely it is that a firm will participate in BA or CoC. This may be an indication that firms would use membership to better understand market potential and further expand their market share.

We hypothesize that firms that have difficulties in obtaining term loans from financial institutions are more likely to participate in BA or CoC. Nonetheless, the study's logistic regression estimates of the six specifications reveals that firms with term loans have a higher likelihood of participating than those who do not, and it is statistically significant at 1 per cent level. This could be due to a number of reasons. First, becoming a member of an associative organization is not enough in itself to secure term loans from financial institutions. In other words, financial institutions need hard and valuable collateral to guard against risk of default. Second, this can reflect the fact that BA members are well-established firms that have a large number of employees, a big share of domestic markets, and high productivity.[72]

This finding, however, is consistent with that of previous studies (Harvie *et al.,* 2010; Harner, 2003; Dinh *et al.,* 2010; Ayyagari *et al.,* 2008). Recent literature points to the lack of access to financial services or insufficient functioning of the banking system as one of the major constraints to growth of both large and small firms. In the Cambodian context, where regulatory and law enforcement is weak and overall public trust low, achieving sufficient access to formal financing has been and will continue to be a challenge.

The data shows that only 21.7 per cent of surveyed firms reported having term loans (more than 6 months) with financial institutions. This reflects the relatively low utilization of formal financing. From the demand side, firms request financial institutions to increase loan amounts, extend maturity date of term loans and importantly reduce interest rates. From the supply side, banks and other financial institutions usually raise the issue of protecting depositors by screening and targeting the best borrowers, applying strict

[72] This raises the possibility of endogeneity bias in the estimation, though the PSM method can minimize the problem, given its balancing of treatment and control groups.

requirements to fulfil bank procedures. They also raise the issue of the informal nature of the business undertakings of most MSMEs which do not have appropriate financial statements or proper accounting systems. Harner (2003) found that although the demand for medium and long-term loans is high among SMEs in Cambodia, banks are reluctant to lend because (1) current contract and law enforcement is weak, (2) high interest rates on deposits, (3) banks' limited access to long-term capital, (4) unavailability and difficulty gathering information on borrowers to conduct credit worthiness analysis, (5) high liquidity ratios required by the National Bank of Cambodia, and (6) limited staff capacity.

Firms where majority of employees are members of a workers union tend to participate more than firms with fewer employees belonging to the union. This may be because associations can act collectively to efficiently bargain and meet union demands. Recently, there have been protests and strikes by union-member workers, especially in the garment and footwear industries. They were demanding better wage increases, respect for labour law and good working conditions. But finding solutions has been difficult. Relations between employers, the union and the Garment Manufacturers Association of Cambodia, have soured. Although the right to form associative bodies, like a workers' union, is an integral part of Cambodia's law, there are complaints about the large number of unions in Cambodia. The study also finds that the number of licenses, permits and regulations that firms are supposed to meet is highly positively correlated with probability of participation. The study finds that firms who reported knowing about the existence and functioning of special economic zones (SEZs) are more likely to be members. This may imply that BAs or CoC should disseminate more information about the benefits members can get from participating.

For the sub-sample of MSMEs, most estimation results were similar to those from the pooled sample.

2. Average treatment effects (ATE)

Once the propensity score is estimated using logistic regression, two commonly used matching methods are employed – nearest neighbour and kernel. This is to estimate ATE of programme participation. Matching methods use the estimated propensity score of each specification. The nearest neighbour (NN) matching estimates the effects of membership participation. This compares participating firms in the treatment group with non-participating firms in the control group that have similar propensity score. NN matching is often used with small sample size (World Bank, 2010). One of the weaknesses of NN matching is that matching quality can be affected if many firms in the treatment group have high propensity scores, while only a few firms in the control group have high propensity scores. This shortcoming is addressed by using the kernel matching method. It should also be noted that the comparison was performed on participating and non-participating firms who fell in the region of common support. All of the study specifications satisfied the balancing property (Annex table 10). ATE is estimated for the pooled sample of all firms and the sub-sample of MSMEs.

Annex table 11 reports the ATE estimates for the pooled sample. It shows that participating firms generally have higher mean value of final outcome. However, these are statistically significant only for some outcome variables and the signs are not always as expected. Relative to their matched non-participating firms, firms in business associations tended to have higher turnover and production, and to spend more on production and other related costs. But, membership has no significant impact on firms' labour productivity and labour cost per worker. This may be due to two reasons (1) BA still has limited capacity to enhance productivity of members through quality training, and (2) large firm participation is not motivated by the desire to use the association's training services for the improvement of productivity, but for various other benefits.

For the sub-sample of MSMEs, ATE estimates are broadly similar to results from the pooled sample (Annex table 12). Again, membership does not guarantee higher productivity and cost per worker. Matching results also suggest that MSMEs may benefit more from participation than large firms.

It must be emphasised that the positive association between membership participation and firm performance outcomes does not imply causality between participation and high performance. We do not have baseline survey information on the level of outcome variables prior to participating. However, the positive trends are largely consistent with previous studies. Positive trends are also consistent with the pluralists' view that a business association (as a collective body promoting efficiency of members' businesses), is not merely a rent-seeking and special interest group, as claimed by public choice theorists.

E. Limitations

Analysis and, to some extent, results of the study are subject to some important limitations imposed by data constraints. First, the cross-sectional data employed could not provide a full picture of changing characteristics and dynamism of firms over time. That would require panel data. Second, since baseline characteristics of firms are not available, estimating the impacts of BAs on firms' final outcome variables using PSM needs to be regarded with caution (Gertler *et al.,* 2011b: 115).

Conclusion and areas for future research

This study investigates how a business association or a chamber of commerce in Cambodia can assist its members to improve productivity and enhance firms' performance. A growing number of such bodies have been established with a view to promoting members' collective voice and bargaining power. With the emergence of larger enterprises and a number of MSMEs, these associations may be more important in Cambodia than ever. However, BAs are still fragmented and membership awareness is still relatively low. Firms are more inclined to operate independently because they are still sceptical about collective activities. Also, associations face challenges in terms of resources, size, cost effectiveness, human capital and scope and coverage of services.

The study finds evidence that participation in business association tends to be positively associated with better performance across several outcome variables. This is done using propensity score matching, ordinary least squares and a combination of PSM and OLS methods with firm-level cross-sectional data from 2007. These results are stronger for micro, small and medium enterprises. This suggests that business associations may be more beneficial for smaller firms. However, membership appears to have no significant positive impact on labour productivity and payment per worker.

The study suggests that firms, particularly micro enterprises and SMEs, do benefit from collective bodies. These participating firms can take advantage of market information, knowledge sharing and updates on government administrative and regulatory requirements. But there needs to be more study to assess the benefits of BAs services. Also needing more attention, is how these services contribute to further growth and competitiveness of SMEs. Lastly, consideration must be given to whether membership should be voluntary or obligatory, or a mixture of both.

Annex

Table 1. Classification of enterprises in Cambodia

Types	Employees (persons)	Start-up capital (USD)
Micro-enterprises	Fewer than 10	Less than 50,000
Small	Between 11 and 50	Between 50,000 and 250,000
Medium	Between 51 and 100	Between 250,000 and 500,000
Large	100 or more	500,000 or more

Source: RGC (2005: 13)

Table 2. Distribution of participating and non-participating groups by firm size and sub-sector

Sub-sector	Firm Size and BA participation					
	Micro		Small and medium		Large	
	Participant	Non-participant	Participant	Non-participant	Participant	Non-participant
Food	0 (0.0)	0 (0.0)	4 (9.5)	5 (2.7)	1 (1.1)	1 (2.0)
Textiles	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.5)	5 (5.4)	0 (0.0)
Garments	0 (0.0)	0 (0.0)	1 (2.3)	2 (1.1)	68 (74.0)	21 (42.8)
Plastics & Rubber	0 (0.0)	1 (0.7)	0 (0.0)	2 (1.1)	2 (2.2)	1 (2.0)
Basic metals and fabricated metal products	...	1 (0.7)	...	2 (1.1)	...	0 (0.0)
Other manufacturing	1 (20.0)	3 (2.3)	0 (0.0)	8 (4.5)	2 (2.2)	2 (4.1)
Wholesale (including export services)	1 (20.0)	3 (2.3)	6 (14.3)	21 (11.7)	1 (1.1)	2 (4.1)
Retails	...	44 (33.1)	...	25 (13.8)	...	2 (4.1)
Hotels & Restaurants	1 (20.0)	30 (22.6)	12 (28.6)	62 (34.2)	5 (5.4)	9 (18.4)
Other services (travel agencies, tour operators, etc.)	2 (40.0)	16 (12.0)	4 (9.5)	3 (1.6)	0 (0.0)	0 (0.0)
Construction	0 (0.0)	2 (1.5)	2 (4.8)	4 (2.2)	1 (1.1)	0 (0.0)

Table 2. *(continued)*

Sub-sector	Firm Size and BA participation					
	Micro		Small and medium		Large	
	Participant	Non-participant	Participant	Non-participant	Participant	Non-participant
Transport	0 (0.0)	7 (5.3)	5 (11.9)	13 (7.3)	1 (1.1)	0 (0.0)
IT	...	3 (2.3)	...	3 (1.6)	...	0 (0.0)
Other	0 (0.0)	23 (17.2)	8 (19.1)	30 (16.6)	6 (6.4)	11 (22.5)
Total	**5** **(100.0)**	**133** **(100.0)**	**42** **(100.0)**	**181** **(100.0)**	**92** **(100.0)**	**49** **(100.0)**

Source: Author's calculation

Figures in brackets are column percentages of the number of firms reporting membership of BA or CoC.

Table 3. Number of establishments as exporter

Establishment sector	Micro	Small and medium	Large	Total
Exporter	11 (8.7)	18 (14.3)	97 (77.0)	126 (100.0)
Non-exporter	127 (33.9)	204 (54.4)	44 (11.7)	375 (100.00)
Total	138 (40.52)	222 (29.14)	141 (30.34)	501 (100.00)

Source: Author's calculation

Figures in brackets are row percentages of the total.

Table 4. Membership in business association or chamber of commerce by firm's characteristics

Firm's characteristics	Membership in BA or CoC		
	Yes	No	Total obs.
Firm size			
Micro (employees <10)	5	133	138
	(3.6)	(36.5)	(27.5)
Small and medium (11< = employees < = 100)	42	181	223
	(30.2)	(49.9)	(44.4)
Large (employees >100)	92	49	141
	(66.2)	(13.6)	(28.1)
Exporter			
Exporting firm	80	46	126
	(58.0)	(12.7)	(25.2)
Non-exporting firm	58	317	375
	(42.0)	(87.3)	(74.8)
Firm with term loans			
Firm having term loans with financial institutions	40	69	109
	(28.8)	(19.0)	(21.7)
Firm having no term loans with financial institutions	99	294	393
	(71.2)	(81.0)	(78.3)
Firm's equity stake			
100% domestically owned	44	275	319
	(31.7)	(75.8)	(63.6)
100% foreign owned	74	68	142
	(53.2)	(18.7)	(28.3)
Joint venture	21	19	40
	(15.1)	(5.5)	(8.1)
Firm type			
Manufacturing	84	50	134
	(60.4)	(13.7)	(26.7)
Trade	8	97	105
	(5.8)	(26.7)	(20.9)
Tourism	24	120	144
	(17.3)	(33.1)	(28.7)
Other	23	96	119
	(16.5)	(26.5)	(23.7)
Geographical location			
Battambang	0	9	9
	(0.0)	(2.5)	(1.8)

Table 4. ***(continued)***

Firm's characteristics	Membership in BA or CoC		
	Yes	No	Total obs.
Siem Reap	11	55	66
	(7.9)	(15.2)	(13.2)
Phnom Penh	125	276	401
	(89.9)	(76.0)	(79.9)
Kampong Cham	1	5	6
	(0.7)	(1.3)	(1.1)
Other	2	18	20
	(1.5)	(5.0)	(4.0)
Firm age			
0-4	50	170	220
	(36.0)	(46.8)	(43.7)
5-10	67	120	187
	(48.2)	(33.1)	(37.3)
More than 10	22	73	95
	(15.8)	(20.1)	(19.0)
# of competitors as domestic firms			
None	35	16	51
	(25.8)	(4.5)	(10.4)
1	2	4	6
	(1.5)	(1.1)	(1.2)
2-5	21	37	58
	(15.7)	(10.3)	(11.7)
>5	77	302	379
	(57.0)	(84.1)	(76.7)
Firm's information about SEZ			
Yes	97	137	234
	(70.0)	(37.7)	(46.6)
No	42	226	268
	(30.0)	(62.3)	(53.4)

Source: Author's calculation

a) Figures in brackets are column percentages of the number of firms reporting membership of BA or CoC.

b) Pearson Chi^2 was conducted to test column differences of each firm's characteristic on the percentage of firms reporting membership of BA or CoC. All tests are significant, at least, at 5% level.

Table 5. Firm's characteristics and performance

Firm's characteristics	Turnover (log)	Production (log)	Labour productivity (log)	Cost of labour (log)	Labour cost per worker (log)	Other cost (log)	# of employed workers (log)
Firm size							
Micro (employees <10)	10.816 (1.267)***	10.367 (1.300)***	8.463 (1.301)***	8.716 (.856)***	6.806 (.851)***	22.401 (6.952)***	1.906 (.229)***
Small and medium (11< = employees < = 100)	12.721 (1.530)***	12.346 (1.459)***	8.984 (1.337)***	10.607 (1.078)***	7.258 (.826)*	29.491 (8.159)***	3.347 (.612)***
Large (employees >100)	15.759 (1.434)***	15.020 (1.416)***	8.637 (1.257)*	13.519 (1.037)***	7.147 (.850)*	40.837 (7.383)***	6.369 (.885)***
Exporter							
Exporting firm	15.403 (.176)***	14.670 (.171)***	8.766 (.129)	12.937 (.160)***	7.046 (.077)	38.849 (.769)***	5.859 (.161)***
Non-exporting firm	12.301 (.101)	11.886 (.101)	8.738 (.069)	10.241 (.088)	7.122 (.044)	27.991 (.484)	3.110 (.062)
Firm with term loans							
Firm with term loans	13.449 (.220)**	12.979 (.213)**	9.039 (.135)**	11.135 (.190)	7.211 (.086)	31.152 (1.053)	3.905 (.156)
Firm without term loans	12.969 (.121)	12.487 (.117)	8.667 (.068)	10.860 (.106)	7.075 (.043)	30.612 (.511)	3.770 (.094)

Table 5. ***(continued)***

Firm's characteristics	Turnover (log)	Production (log)	Labour productivity (log)	Cost of labour (log)	Labour cost per worker (log)	Other cost (log)	# of employed workers (log)
Firm's equity stake							
100% domestically owned	12.019 (1.796)***	11.643 (1.774)***	8.630 (1.246)	9.976 (1.567)***	6.989 (.798)***	26.259 (8.313)***	2.975 (1.211)***
100% foreign-owned	14.955 (2.110)***	14.282 (1.992)***	8.853 (1.433)	12.653 (1.859)***	7.238 (.954)***	39.297 (8.059)***	5.382 (1.878)***
Joint venture	14.783 (1.950)***	14.185 (1.968)***	9.342 (1.353)***	12.407 (1.499)***	7.568 (.775)***	36.046 (10.462)***	4.759 (1.577)***
Firm type							
Manufacturing	15.183 (2.073)***	14.476 (1.928)***	8.596 (1.201)	12.86 (1.772)***	16.961 (.765)	37.725 (10.335)***	5.899 (1.638)***
Trade	12.176 (2.044)	11.715 (1.998)	9.107 (1.535)***	9.704 (1.309)	7.101** (.678)	26.396 (8.228)	2.604 (.860)
Tourism	12.116 (1.659)	11.720 (1.682)	8.518 (.952)	10.081 (1.686)	6.923 (.863)**	27.926 (8.628)	3.151 (1.138)
Other	12.630 (2.155)	12.197 (2.053)	8.885 (1.547)	10.794 (1.804)	7.495 (.972)	30.065 (9.974)	3.275 (1.358)

Table 5. ***(continued)***

Firm's characteristics	Turnover (log)	Production (log)	Labour productivity (log)	Cost of labour (log)	Labour cost per worker (log)	Other cost (log)	# of employed workers (log)
Geographical location							
Battambang	11.446	11.221	8.269	9.230	6.278	21.682	2.951
	(1.884)	(1.816)	(.963)	(2.261)	(1.218)	(8.290)	(1.465)
Siem Reap	12.393	11.974	8.530	10.454	7.032	28.272	3.422
	(1.636)	(1.716)	(1.009)	(1.610)	(.718)	(7.068)	(1.214)
Phnom Penh	13.310	12.807	8.822	11.111	7.159	31.720	3.930
	(2.423)	(2.276)	(1.383)	(2.101)	(.873)	(10.528)	(1.909)
Kampong Cham	12.066	12.198	9.319	9.299	6.574	25.171	2.723
	(2.778)	(2.716)	(1.221)	(2.142)	(.571)	(11.172)	(1.776)
Other	11.723	11.221	8.083	9.920	6.782	24.702	3.138
	(2.129)	(2.072)	(.797)	(1.876)	(.561)	(10.627)	(1.548)
Firm's information about SEZ							
Yes	13.897	13.329	9.123	11.451	7.273	33.623	4.171
	(.146)***	(.143)***	(.096)***	(.130)***	(.056)***	(.653)***	(.123)***
No	12.356	11.956	8.422	10.453	6.957	28.202	3.476
	(.139)	(.136)	(.071)	(.125)	(.051)	(.607)	(.104)

Source: Author's calculation. Figures in brackets are standard deviations except figures for exporter and firm's information on SEZ, which are standard errors. *** indicates 1% significant level, ** 5% level, * 10% level.

Table 6. Perceived important services members expect from BA or CoC

	(1)	(2)	(3)	(4)	(5)	(6)
Micro (employees < 10)	3 (3.1)	2 (2.1)	5 (6.2)	4 (5.1)	4 (4.8)	4 (3.5)
Small and medium (11 < = employees < = 100)	25 (26.0)	19 (20.0)	25 (30.9)	22 (28.2)	24 (28.6)	34 (30.1)
Large (employees >100)	68 (71.0)	74 (77.9)	51 (62.9)	52 (66.7)	56 (66.7)	75 (66.4)
Pearson Chi^2 of column differences	2.9939	18.4378***	3.9121	1.4023	0.9981	0.0119

Source: Author's calculation

a) Services enterprise received from business association that are most important, includes (1) lobbying government, (2) resolution of disputes (with officials, workers or other firms), (3) information and/or contacts on domestic product and input markets, (4) information and/or contacts on international product and input markets, (5) accrediting standards or quality of products and reputational benefits, and (6) information on government regulations.

b) Figures in brackets are column percentages of the number of firms reporting the importance of each service.

c) *** indicates 1% significant level, ** 5% level, * 10% level.

Table 7. Firm's years of experience since establishment and performance

Firm's years of experience	Turnover (log)	Production (log)	Labour productivity (log)	Cost of labour (log)	Labour cost per worker (log)	Other cost (log)	# of employed workers (log)
1	12.990 (2.503)	12.549 (2.243)	8.487 (1.316)	10.819 (2.069)	6.871 (.839)	31.709 (11.189)	3.915 (1.948)
2	12.995 (2.172)	12.557 (2.103)	8.651 (1.295)	10.960 (2.035)	7.090 (.691)	29.912 (10.199)	3.852 (1.751)
3	12.864 (2.210)	12.413 (2.130)	8.560 (1.370)	10.866 (2.005)	7.061 (.684)	31.681 (8.583)	3.805 (1.814)
4	12.384 (1.979)	12.023 (1.843)	8.934 (1.065)	10.260 (1.913)	7.223 (.940)	28.760 (8.097)	3.036 (1.442)
5	13.040 (2.156)	12.807 (2.172)	8.792 (1.208)	11.342 (1.971)	7.275 (.858)	31.994 (10.157)	3.869 (1.771)
6	12.907 (2.294)	12.437 (2.190)	8.766 (1.534)	10.490 (1.874)	6.880 (.855)	31.265 (10.006)	3.610 (1.646)
7	13.572 (2.479)	12.732 (2.482)	8.497 (1.110)	11.326 (2.189)	6.965 (.893)	34.127 (8.790)	4.360 (2.070)
8	14.126 (2.632)	13.390 (2.430)	8.884 (1.127)	11.753 (2.095)	7.247 (1.004)	32.156 (10.685)	4.506 (2.030)

Table 7. ***(continued)***

Firm's years of experience	Turnover (log)	Production (log)	Labour productivity (log)	Cost of labour (log)	Labour cost per worker (log)	Other cost (log)	# of employed workers (log)
9	13.740 (2.779)	13.114 (2.663)	8.593 (1.399)	11.597 (2.536)	7.064 (.883)	32.729 (12.411)	4.447 (2.170)
>10	13.011 (2.289)	12.554 (2.247)	9.001 (1.380)	10.861 (2.028)	7.312 (.868)	28.557 (10.635)	3.568 (1.659)
Prob >F	0.1091	0.424	0.3013	0.0451**	0.0187**	0.1438	0.0092***
Adj R-Squared	0.0112	0.003	0.0036	0.0168	0.0168	0.0090	0.0257
Obs.	486	466	466	494	494	502	502
Bartlett's test for equal variance (Prob > Chi^2)	0.6250	0.7130	0.4350	0.8480	0.3410	0.1910	0.2430

Source: Author's calculation

a) Firm's years of experience are calculated by subtracting the year of establishment and survey year, which is 2006.

b) Figures in brackets are standard deviations.

c) *** indicates 1% significant level, ** 5% level, * 10% level.

Table 8. Descriptive statistics of main outcome and indicator variables for all firms[a]

Indicator variables	Non-participating firms		Participating firms		Mean difference	T-statistics
	N	Mean	N	Mean	Diff	t
Firm age	363	6.57	139	6.47	-0.01	-0.21
Sales (log)						
2005	325	12.13	124	15.03	2.90	13.57***
2006	350	12.29	136	15.09	2.81	13.92***
Production (log)[b]						
2005	309	11.72	116	14.42	2.70	12.76***
2006	334	11.84	129	14.46	2.62	13.65***
Cost of labour (log)						
2005	326	10.15	125	12.68	2.53	13.99***
2006	355	10.92	137	12.77	2.58	14.99***
Cost of intermediate goods (log)						
2005	331	10.67	126	13.54	2.89	12.35***
2006	358	10.86	138	13.60	2.74	12.31***
Other costs (log)[c]						
2005	329	9.68	123	11.96	2.28	14.07***
2006	354	9.84	134	12.08	2.24	15.89***

Table 8. ***(continued)***

Indicator variables	Non-participating firms		Participating firms		Mean difference	T-statistics
	N	Mean	N	Mean	Diff	t
Productivity (production/labour) (log)						
2005	304	8.59	118	9.11	0.52	3.64***
2006	332	8.66	128	8.91	0.25	1.94***
Labour cost per worker (log)						
2005	325	7.11	124	7.22	0.11	1.20
2006	347	7.09	132	7.27	0.17	2.21**
Number of permanent workers (log)						
2005	344	2.97	130	5.39	2.41	14.51***
2006	359	3.09	139	5.52	2.43	15.26***
Total permanent skilled employees received training (%)	171	67.48	86	60.34	-7.15	-1.39
Foreign nationals of the total	355	0.75	137	8.71	7.97	7.35***
Number of customers (log)	249	1.77	58	1.89	.12	1.59
Senior management time (in dealing with government requirement) (%)						
2004	297	8.81	116	12.11	3.29	1.50
2006	359	8.79	139	13.20	4.41	2.18***
Educational levels of employees						
Primary school (below grade 6) (%)	346	15.61	139	37.46	21.76	7.27***
Up to Lower Secondary (grade 7-9) (%)	360	25.67	136	21.15	-4.53	-2.13***
Up to Upper Secondary (grade 10-12) (%)	359	27.42	135	18.77	-8.65	-4.01***
Up to Universities & institutions (%)	360	28.053	139	19.316	-8.74	-2.85***

Source: Author's calculation

a) Independent t-tests are used to test the mean differences of a number of outcome variables (in logarithms), other characteristics of member firms in BAs and those of non-member firms. Bartlett's test of the null hypothesis of equal variance is calculated.

b) Other costs of production include costs of electricity, fuel, water, communication services, transportation, rents, and repairs and maintenance. Mean differences are the differences between outcome indicators of firms who are members of BAs or Chamber of Commerce and those of firms who are non-members.

c) Values of total sales, production and productivity in 2005 are inflated using Consumer Price Index calculate by the National Institute of Statistics, Cambodia. In 2005, annual average CPI is 115.20 and 120.63 in 2006. July-December 2000 is based year.

*** indicates that the mean differences are significant at 1% level, ** at 5% level and * 10% level.

Table 9. Descriptive statistics of main outcome and indicator variables for SMEs

Indicator variables	Non-participating firms		Participating firms		Mean difference	T-statistics
	N	Mean	N	Mean	Diff	t
Firm age	307	6.73	43	7.37	0.64	0.87
Sales (log)						
2005	260	11.61	39	13.23	1.62	5.97***
2006	295	11.75	41	13.20	1.44	5.46***
Production (log)						
2005	260	11.20	39	12.79	1.59	5.88***
2006	280	11.38	40	12.76	1.38	5.12***
Cost of labour (log)						
2005	277	9.65	40	10.74	1.16	4.84***
2006	299	9.69	43	10.81	1.11	5.26***
Cost of intermediate goods (log)						
2005	279	10.14	41	11.85	1.71	5.55***
2006	299	10.34	43	11.87	1.54	5.03***
Other costs (log)						
2005	279	9.28	40	10.68	1.39	6.50***
2006	300	9.46	42	10.80	1.34	6.58***
Productivity (production/labour) (log)						
2005	255	8.54	39	9.40	0.86	3.41***
2006	272	8.57	40	9.33	0.76	3.24***
Labour cost per worker (log)						
2005	266	7.06	40	7.35	0.28	1.60
2006	292	7.07	43	7.37	0.31	1.87*
Number of permanent workers (log)						
2005	296	2.57	42	3.23	0.65	4.73***
2006	307	2.67	41	3.36	0.68	5.13***
Total permanent skilled employees received training (%)	142	66.88	29	63.48	-3.40	-0.44
Total permanent unskilled employees received training (%)	142	41.69	28	31.89	-9.79	-1.03
Foreign nationals of the total (%)						
Number of customers (log)	223	1.75	34	1.98	0.22	2.52***

Table 9. ***(continued)***

Indicator variables	Non-participating firms		Participating firms		Mean difference	T-statistics
	N	Mean	N	Mean	Diff	t
Educational levels of employees Primary school (below grade 6)	304	16.62	43	14.65	-1.97	-0.50
Up to Lower Secondary (grade 7-9)	304	26.12	43	17.34	-8.77	-2.57***
Up to Upper Secondary (grade 10-12)	304	27.73	43	32.41	4.68	0.99
Up to Universities & institutions	304	29.51	43	35.58	6.06	1.04

Source: Author's calculation

a) Other costs of production include costs of electricity, fuel, water, communication services, transportation, rents, and repairs and maintenance. Mean differences are the differences between outcome indicators of SMEs who are members of BAs or CoC and those of SMEs who are non-members.

b) Values of total sales, production and productivity in 2005 is inflated using Consumer Price Index calculate by the National Institute of Statistics, Cambodia. In 2005, annual average CPI is 115.20 and 120.63 in 2006.

*** indicates that the mean differences is significant at 1% level, ** at 5% level and * 10% level.

Table 10. Logit regression to estimate propensity score of membership participation conditional on observed and selected covariates

Covariates	(1)		(2)		(3)		(4)		(5)		(6)	
	Pooled	MSME	Pooled	MSME	Pooled	MSME	Pooled	MSME	Pooled	MSME	Pooled	MSME
Dependent variable: participation in business association or chambers of commerce (1 = participate)												
Independent variables												
Firm's characteristics												
Firms in operation (years)							.065*	.089*	.082**	.078	.053*	.069*
							(0.063)	(0.067)	(0.048)	(0.180)	(0.075)	(0.081)
Firms in operation (squared years)												
Firm size (1 = MSMEs)	-1.231***		-1.028***		-1.345***		-.945**		-.746		-1.002***	
	(0.000)		(0.003)		(0.000)		(0.028)		(0.137)		(0.004)	
Firm type (1 = domestic)	-.732**	-.610	-.737**	-.509							-.867**	1.085**
	(0.019)	(0.149)	(0.032)	(0.275)							(0.011)	(0.031)
Location (1 = Phnom Penh)	.157	0.022	.157	-.023	.273	.175	-.067	-.672	-.298	-.827		
	(0.677)	(0.963)	(0.693)	(0.964)	(0.510)	(0.745)	(0.887)	(0.341)	(0.585)	(0.292)		
Sector (1 = manufacturing)	.913**	.953*	1.195***	1.098*								
	(0.023)	(0.084)	(0.002)	(0.098)								
Principal also manager (1 = yes)							.963*	.100	2.101***	.154	1.058*	.829
							(0.098)	(0.933)	(0.008)	(0.806)	(0.062)	(0.410)
Largest shareholder is family (1= family)							-.211	.032	.008	.154		
							(0.553)	(0.956)	(0.983)	(0.806)		
Exporting firms (export = 1)	.678*	.367										
	(0.081)	(0.482)										

Table 10. ***(continued)***

Covariates	(1)		(2)		(3)		(4)		(5)		(6)	
	Pooled	**MSME**	**Pooled**	**MSME**	**Pooled**	**MSME**	**Pooled**	**MSME**	**Pooled**	**MSME**	**Pooled**	**MSME**
Product as share of national market (%)							.030** (0.025)	.057*** (0.007)	.026* (0.103)	.048** (0.050)	.026** (0.026)	.031* (0.059)
Total female permanent workers (%)							.015** (0.026)	-.003 (0.762)	.016** (0.054)	-.005 (0.688)		
Product as share of local market (%)							-.035*** (0.004)	-.047** (0.013)	-.034** (0.017)	-.045** (0.031)	.031*** (0.003)	-.031 (0.039)
Own or share generator (1 = yes)							.634* (0.079)	.839 (0.131)	.509 (0.214)	.709 (0.243)		
Mobile phone use in business (1 = yes)							-.826 (0.298)	.265 (0.849)	-.666 (0.471)	1.078 (0.541)		
Workforce use computer (%)							.006 (0.242)	.007 (0.369)	.006 (0.307)	.005 (0.546)		
E-mail use in business (1 = yes)							.798 (0.206)	.390 (0.615)	.534 (0.438)	.130 (0.874)		
Workforce belong to union (%)			.022*** (0.001)	0.037** (0.019)	.022*** (0.003)	.019 (0.301)	.013* (0.079)	.031* (0.102)	.003 (0.682)	.021 (0.394)	0.018** (0.012)	.027* (0.059)
Information on firms' competitors, uppliers and customers # domestic competitors (1 = less than 5)			1.131*** (0.001)	1.643*** (0.001)	1.287*** (0.000)	1.65*** (0.003)	.977** (0.014)	1.295** (0.046)	.807 (0.084)	1.316* (0.070)	.788** (0.016)	.791 (0.114)

Table 10. ***(continued)***

Variables	(1)		(2)		(3)		(4)		(5)		(6)	
	Pooled	MSME	Pooled	MSME	Pooled	MSME	Pooled	MSME	Pooled	MSME	Pooled	MSME
# foreign competitors (1 = less than 5)			-.747** (0.015)	-1.054** (0.018)	-.987*** (0.003)	-1.20** (0.014)	-.148 (0.681)	-.296 (0.608)	-.412 (0.322)	-.237 (0.709)		
# domestic suppliers (1 = less than 5)			-.745** (0.019)	-1.174*** (0.006)	-.395 (0.227)	-1.10** (0.016)	-.360 (0.348)	-1.171** (0.039)	-.345 (0.433)	-1.32** (0.033)		
# foreign suppliers (1 = less than 5)							-.054 (0.898)	-.169 (0.788)	-.068 (0.889)	-.433 (0.517)		
# domestic customers (1 = less than 5)							-.171 (0.671)	.051 (0.929)	-.413 (0.354)	-.113 (0.853)		
Firms' sales sold domestically (%)										.003 (0.791)		
Firms' sales exported directly (%)							.002 (0.633)	-.001 (0.967)	.006 (0.228)			
Firms' financial information Financial statement reviewed (1 = yes)							.278 (0.400)	.357 (0.500)	.288 (0.436)	.039 (0.947)		
Firms' term loans (1 = yes)	.830*** (0.006)	.955** (0.015)	1.105*** (0.000)	1.178*** (0.005)	.858*** (0.008)	1.12*** (0.010)	.840** (0.024)	1.111*** (0.035)	1.171*** (0.007)	1.342** (0.022)	.771** (0.023)	1.089** (0.022)
Information and perceptions on government services delivery and others Investment prospects (1 = optimistic)							.282 (0.553)	.611 (0.449)	.555 (0.321)	.602 (0.533)		
Legal system (1 = major obstacle)							.243 (0.496)	.857 (0.112)	.345 (0.392)	.859 (0.147)		

Table 10. ***(continued)***

Covariates	(1)		(2)		(3)		(4)		(5)		(6)	
	Pooled	MSME	Pooled	MSME	Pooled	MSME	Pooled	MSME	Pooled	MSME	Pooled	MSME
View on gov. services (1 = efficient)							-.451 (0.271)	-.805 (0.235)	-.475 (0.291)	-.537 (0.429)		
Information on SEZ (1 = yes)	1.119*** (0.000)	1.501*** (0.000)	.953*** (0.001)	1.518*** (0.000)	.876*** (0.003)	1.384*** (0.002)	.581* (0.073)	1.285** (0.016)	.751** (0.042)	1.458** (0.012)	.780*** (0.008)	1.267*** (0.004)
# licenses, permits, registrations							.204*** (0.000)	.357*** (0.002)	.261*** (0.000)	.367*** (0.004)	.250*** (0.000)	.427*** (0.000)
Senior management time dealing with government requirement (%)							.002 (0.790)	-.013 (0.268)	-.002 (0.823)	-0.016 (0.187)		
Firms' disputes over payments solved by court (%)							-.026 (0.573)	.022 (0.628)	.021 (0.696)	.081 (0.332)		
Firms seek to lobby government (1 = yes)							.077 (0.839)	.276 (0.641)	.182 (0.681)	.559 (0.398)		
Inspection and meeting with gov. officials (1 = yes)							.509 (0.141)	.272 (0.605)	.569 (0.128)	.257 (0.637)		
Physical capital Hypothetical values of assets (machinery, vehicles, equipment, land if owned, and buildings if owned ($)					.261*** (0.000)	.281*** (0.005)			.160* (0.082)	.078 (0.554)		
Owned land (1 = yes)			-.055 (0.861)	0.110 (0.796)	-.845** (0.016)	-.627 (0.196)			-1.019** (0.030)	-.586 (0.390)		

Table 10. ***(continued)***

	(1)		(2)		(3)		(4)		(5)		(6)	
	Pooled	**MSME**	**Pooled**	**MSME**	**Pooled**	**MSME**	**Pooled**	**MSME**	**Pooled**	**MSME**	**Pooled**	**MSME**
Education												
Firms' formal beyond-the-job training (1 = yes)	.512** (0.050)	.719** (0.053)	.614** (0.030)	.789** (0.049)	.508* (0.082)	.959** (0.023)			.517 (0.159)	1.091* (0.064)		
Employees with university/institution level of education (%)									-.009 (0.187)	-.005 (0.596)		
_Cons	-1.573*** (0.002)	-3.159*** (0.000)	-1.371*** (0.010)	-2.848*** (0.000)	-4.19*** (0.000)	-6.187*** (0.000)	-4.967*** (0.001)	-6.186*** (0.010)	-8.119*** (0.000)	-8.56** (0.013)	-3.239*** (0.000)	-5.280*** (0.000)
LR Chi^2	197.870	38.26	218.73	61.34	196.48	61.76	225.20	97.68	224.12	90.43	208.40	81.72
Prob > Chi^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.0000
Pseudo R2	0.3340	0.1467	0.3754	0.2395	0.3759	0.2651	0.4347	0.4141	0.4807	0.4228	0.3979	0.3385
Obs.	502	350	496	347	448	319	447	315	406	291	453	321
Balancing Property Satisfied	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: Author's calculation. Figures in the brackets are p-values. *** indicates that the coefficients are significant at 1% level, ** at 5% level and * at 10% level.

Table 11. PSM estimation results of memberships in business associations or chambers of commerce (pooled)

Outcome variables	(1)		(2)		(3)		(4)		(5)		(6)	
	NN	Kernel	NN	Kernel	NN	Kernel	NN	Kernel	NN	Kernel	NN	Kernel
Total sales (log)	0.25	0.33*	0.32	0.39	0.62	0.39***	0.44	-0.03	0.83	-0.02	0.13	-0.01
	(0.69)	(1.72)	(0.74)	(1.54)	(1.29)	(2.47)	(0.85)	(-0.08)	(1.42)	(-0.05)	(0.28)	(-0.02)
Total production (log)	0.34	0.43*	0.39	0.45***	0.70*	0.42***	0.59	0.03	0.79	0.11	0.20	0.07
	(1.01)	(1.86)	(0.99)	(2.23)	(1.67)	(2.09)	(1.26)	(0.10)	(1.47)	(0.34)	(0.49)	(0.23)
Labour productivity (log)	0.07	-0.02	0.14	0.08	0.08	0.07	0.11	-0.05	0.04	0.18	-0.13	-0.04
	(0.31)	(-0.09)	(0.58)	(0.37)	(0.31)	(0.43)	(0.42)	(-0.17)	(0.14)	(0.71)	(-0.51)	(-0.18)
Cost of labour (log)	0.43	0.48***	0.24	0.41***	0.60	0.39*	0.50	0.10	0.70	-0.02	0.33	0.09
	(1.45)	(2.88)	(0.67)	(2.22)	(1.56)	(1.67)	(1.15)	(0.50)	(1.44)	(-0.08)	(0.89)	(0.40)
Total number of workers (log)	0.32	0.52***	0.28	0.43***	0.63*	0.43*	0.50	0.10	0.76*	-0.06	0.37	0.14
	(1.25)	(3.37)	(0.82)	(2.12)	(1.76)	(1.90)	(1.30)	(0.39)	(1.81)	(-0.27)	(1.14)	(0.61)
Labour cost per worker (log)	0.11	-0.01	-0.03	-0.01	-0.03	-0.03	0.01	0.01	-0.06	0.05	-0.04	-0.04
	(0.79)	(-0.09)	(-0.17)	(-0.05)	(0.20)	(-0.23)	(0.04)	(0.03)	(-0.28)	(0.28)	(-0.27)	(-0.27)
Other cost of production (log)	1.44	2.66***	1.79	2.28*	3.48*	1.66*	0.50	-0.69	-0.14	-1.75	0.22	-0.32
	(0.92)	(2.43)	(1.01)	(1.79)	(1.78)	(1.71)	(0.23)	(-0.46)	(-0.05)	(-0.87)	(0.12)	(-0.25)

Source: Author's calculation. Figures in brackets are t-statistics. *** indicates that coefficients are significant at 1% level, ** at 5% level and * at 10% level.

Table 12. PSM estimation results of memberships in business associations or chambers of commerce (SMEs)

Outcome variables	(1)		(2)		(3)		(4)		(5)		(6)	
	NN	Kernel	NN	Kernel	NN	Kernel	NN	Kernel	NN	Kernel	NN	Kernel
Total sales (log)	0.70***	1.00***	0.97***	1.00***	0.76	0.81***	0.78	1.12***	0.54	0.95***	0.20	0.92**
	(2.39)	(4.69)	(2.36)	(2.84)	(1.46)	(2.58)	(1.21)	(2.93)	(0.96)	(2.63)	(0.37)	(2.13)
Total production (log)	0.46*	0.82***	0.97***	0.87***	0.46	0.73***	0.58	0.89***	0.48	0.79*	0.17	0.78**
	(1.73)	(3.24)	(2.59)	(2.66)	(1.32)	(2.60)	(1.08)	(2.22)	(0.90)	(1.98)	(0.32)	(2.38)
Labour productivity (log)	0.22	0.20	0.65***	0.34	0.83***	0.61*	0.20	0.32	0.57*	0.37	0.01	0.20
	(1.19)	(0.77)	(2.75)	(1.25)	(2.98)	(1.91)	(0.58)	(0.79)	(1.85)	(0.96)	(0.02)	(0.55)
Cost of labour (log)	0.68***	0.82***	0.43	0.64***	0.09	0.35	0.53	0.47*	-0.32	0.36	0.29	0.63**
	(2.70)	(3.09)	(1.21)	(2.68)	(0.21)	(1.16)	(0.97)	(1.70)	(-0.65)	(1.06)	(0.64)	(2.36)
Total number of workers (log)	0.42***	0.66***	0.34	0.56***	-0.13	0.17	0.42	0.60***	0.001	0.46**	0.21	0.61**
	(2.07)	(3.89)	(1.08)	(2.82)	(-0.33)	(0.88)	(0.93)	(2.66)	(0.01)	(2.11)	(0.51)	(2.18)
Labour cost per worker (log)	0.21	0.17	0.04	0.11	0.16	0.19	0.06	-0.13	-0.26	-0.10	0.12	0.02
	(1.67)	(1.11)	(0.28)	(0.57)	(0.84)	(1.25)	(0.28)	(-0.71)	(-1.21)	(-0.49)	(0.62)	(0.10)
Other cost of production (log)	4.46***	5.27***	1.87	4.46***	-0.11	2.54**	2.52	2.35	0.98	2.99*	0.86	2.49
	(3.41)	(5.45)	(1.13)	(2.68)	(-0.05)	(2.14)	(0.96)	(1.23)	(0.38)	(1.91)	(0.35)	(1.07)

Source: Author's calculation. Figures in brackets are t-statistics. *** indicates that coefficients are significant at 1% level, ** at 5% level and * at 10% level.

Table 13. OLS estimation results of memberships in business associations or chambers of commerce

Outcome variables	(1)		(2)		(3)		(4)		(5)		(6)	
	Pooled	SME	Pooled	SME	Pooled	SME	Pooled	SME	Pooled	SME	Pooled	SME
Total sales (log)	0.53***	0.91***	0.49***	0.74***	0.46***	0.45*	0.36*	0.49*	0.23	0.29	0.42**	0.65**
	(2.83)	(3.43)	(2.59)	(2.70)	(2.40)	(1.67)	(1.83)	(1.78)	(1.15)	(1.04)	(2.06)	(2.26)
Total production (log)	0.54***	0.73***	0.51***	0.64***	0.49***	0.47*	0.31	0.31	0.22	0.19	0.43**	0.58**
	(2.82)	(2.70)	(2.62)	(2.31)	(2.53)	(1.72)	(1.55)	(1.08)	(1.05)	(0.68)	(2.11)	(1.98)
Labour productivity (log)	0.13	0.16	0.18	0.24	0.14	0.26	0.06	0.12	0.09	0.11	0.09	0.23
	(0.82)	(0.72)	(1.08)	(1.03)	(0.40)	(1.08)	(0.33)	(0.49)	(0.49)	(0.44)	(0.57)	(0.93)
Cost of labour (log)	0.53***	0.73***	0.40***	0.48**	0.34**	0.24	0.278*	0.09	0.19	-0.04	0.37**	0.39*
	(3.54)	(3.39)	(2.64)	(2.21)	(2.15)	(1.08)	(1.72)	(0.42)	(1.12)	(-0.18)	(2.30)	(1.65)
Total number of workers (log)	0.46***	0.63***	0.37***	0.45***	0.38***	0.25*	0.30***	0.25*	0.18	0.14	0.38***	0.42***
	(4.50)	(4.46)	(3.58)	(3.17)	(3.53)	(1.80)	(2.74)	(1.68)	(1.58)	(1.00)	(3.29)	(2.66)
Labour cost per worker (log)	0.07	0.12	0.05	0.05	-0.04	0.004	-0.02	-0.15	0.01	-0.18	0.005	-0.02
	(0.77)	(0.84)	(0.43)	(0.36)	(-0.32)	(0.03)	(-0.21)	(-0.98)	(0.12)	(-1.13)	(0.05)	(-0.14)
Other cost of production (log)	3.32***	4.86***	3.08***	4.28***	2.29***	2.95***	1.91*	1.66	1.00	1.68	2.31**	2.68*
	(3.53)	(3.61)	(3.58)	(3.46)	(2.70)	(2.47)	(1.84)	(1.11)	(1.14)	(1.36)	(2.23)	(1.81)

Source: Author's calculation. Figures in brackets are t-statistics. *** indicates that coefficients are significant at 1% level, ** at 5% level and * at 10% level.

Table 14. PSM & OLS estimation results of memberships in business associations or chambers of commerce

Outcome variables	(1)		(2)		(3)		(4)		(5)		(6)	
	Pooled	SME	Pooled	SME	Pooled	SME	Pooled	SME	Pooled	SME	Pooled	SME
Total sales (log)	0.52***	0.86***	0.48**	0.72***	0.51***	0.43*	0.39**	0.63**	0.30	0.41	0.44**	0.71**
	(2.72)	(3.18)	(2.48)	(2.68)	(2.67)	(1.59)	(1.95)	(2.11)	(1.39)	(1.36)	(2.12)	(2.34)
Total production (log)	0.51***	0.67**	0.46**	0.60**	0.52	0.45*	0.36*	0.42	0.31	0.39	0.44**	0.65**
	(2.64)	(2.45)	(2.42)	(2.26)	(2.62)	(1.63)	(1.83)	(1.42)	(1.40)	(1.29)	(2.16)	(2.15)
Labour productivity (log)	0.12	0.10	0.17	0.20	0.16	0.23	0.07	0.23	0.12	0.25	0.09	0.21
	(0.73)	(0.44)	(0.99)	(0.88)	(0.95)	(0.99)	(0.43)	(0.94)	(0.61)	(0.93)	(0.49)	(0.83)
Cost of labour (log)	0.56***	0.71***	0.39**	0.46**	0.35**	0.19	0.34**	0.15	0.24	0.09	0.43***	0.52**
	(3.70)	(3.30)	(2.54)	(2.10)	(2.16)	(0.85)	(2.18)	(0.57)	(1.33)	(0.03)	(2.71)	(2.17)
Total number of workers (log)	0.45***	0.63***	0.34***	0.45	0.39***	0.24*	0.32***	0.21	0.21*	0.16	0.40***	0.48***
	(4.30)	(4.48)	(3.29)	(3.06)	(3.43)	(1.69)	(2.74)	(1.30)	(1.78)	(1.02)	(3.42)	(3.04)
Labour cost per worker (log)	0.13	0.10	0.06	0.03	-0.02	-0.33	0.02	-0.07	0.02	-0.16	0.05	0.04
	(1.20)	(0.71)	(0.56)	(0.25)	(-0.23)	(-0.22)	(0.23)	(-0.43)	(0.16)	(-0.82)	(0.39)	(0.21)
Other cost of production (log)	3.25***	4.94***	2.87***	4.24***	2.19**	2.84**	2.04*	2.03	0.87	1.53	2.19**	2.64*
	(3.49)	(3.59)	(3.32)	(3.50)	(2.48)	(2.27)	(1.89)	(1.24)	(0.91)	(1.15)	(2.10)	(1.68)
Region of common support	[0.0329-0.9333]	[0.0230-0.5096]	[0.0222-0.9878]	[0.0131-0.9885]	[0.0244-0.9774]	[0.0116-0.9326]	[0.0609-1.0000]	[0.0251-1.000]	[0.0273-1.000]	[0.0206-1.000]	[0.0425-[1.000]	[0.0193-1.000]

Source: Author's calculation. Figures in brackets are t-statistics. *** indicates that coefficients are significant at 1% level, ** at 5% level and * at 10% level.

Appendix A

Variable definitions

Variable	Definition
Sales	Firms' annual sales in USD for fiscal years 2006 and 2005.
Production	Firms' annual production in USD for fiscal years 2006 and 2005
Cost of labour	Firms' annual cost of labour in USD for fiscal years 2006 and 2005. The costs include wages, salaries, bonuses, social payments, and others.
Labour cost per worker	Firm's cost per workers in USD for fiscal years 2006 and 2005. This variable is the division between total labour cost in each fiscal year and the total permanent workers firms had in respective fiscal year. Permanent workers include management, professionals, skilled production workers, unskilled production workers, and non-production/service workers.
Cost of intermediate goods	Firms' annual cost of raw materials and intermediate goods used in production and goods and materials purchased for re-sale in USD for fiscal years 2006 and 2005.
Other costs	Firms' other costs of production in USD for fiscal years 2006 and 2005 include costs of electricity, fuel, water, communication services, transportation, rents, and repairs and maintenance.
Labour productivity	Production per worker in USD for fiscal years 2006 and 2005.
# of regular employees	Total number of permanent workers in fiscal years 2006 and 2005.
# of customers	This is defined as total number of customers within the main product line in domestic market. Customers include domestic private firms, Cambodian state-owned firms, foreign owned firms, NGOs, and others.

Business Association membership	A 0/1 dummy variable with “1” representing firms’ membership in business association or chamber of commerce and “0” otherwise.
Firm characteristics Firm age	The number of years that firms had been in operation from establishment to April 2006. Firms which started operation after April 2006 were terminated.
Investment prospect of firms	This was taken from a question “what is your [firms] prospect for investment in the next 3 years?” The variable takes the value of “1” if firms are optimistic and “0” otherwise”.
Perceptions on legal system or conflict resolution	A categorical variable having three groups: 1 “no obstacle” 2 “minor obstacle” and 3 “more obstacle”.
Efficiency of government service delivery	A categorical variable having three groups: 1 “Inefficient” 2 “Somewhat efficient” and 3 “Efficient”.
Senior management time in dealing with government requirements	This is defined, in a typical week, as % of senior management’s time spent in dealing with government requirements (e.g. taxes, customs, labour regulations, licensing and registration) which includes dealing with officials and completing forms.
Government lobby	A 0/1 dummy variable that takes value “1” if firms seek to lobby government or influence content of laws or regulations affecting firms and “0” otherwise.
Term loans with financial institution	A 0/1 dummy variable taking value “1” if firms has term loan (more than 6 months) from a bank or financial institution and “0” otherwise.
Term loans with collateral	A 0/1 dummy variable with “1” representing that the financing requires collateral or a deposit and 0 otherwise.
Formal training to permanent employees	A 0/1 dummy variable having value “1” if firms offer formal beyond the job training to permanent employees and “0” otherwise.

Permanent skilled employees received training	This is defined as the percentage of permanent skilled staff who received formal training in 2006.
Permanent unskilled employees received training	This is defined as the percentage of permanent unskilled staff who received formal training in 2006.
Number of foreign nationals to total employees	Number of skilled workers who were foreign nationals in 2006.
Information on Special Economic Zones	A 0/1 dummy variable taking value "1" if firms have heard of and "0" otherwise.
Educational levels of employees	The overall percentage of the workforce in the firms who have the following educational levels: Primary school (below grade 6), Up to Lower Secondary (grade 7-9), Up to Upper Secondary (grade 10-12), Up to University and Institutions.
Sector	This variable contains four sectors: Manufacturing (food, textiles, garments, chemicals, plastics & rubber, basic metals and fabricated metal products, machinery and equipment, electronics, and others), Trade (wholesale including export services, retail), Tourism (hotels and restaurants, travel agencies, tour operators, etc.), and Other (construction, transport, IT, etc.).
Firm size	This variable defines two groups of firms: Small and Medium Enterprises and Large Enterprises. The number of regular employees firms have in April 2006 and the definition of firms given by the government are used to derive these categories. This variable assumes binary value with "1" representing MSMEs and "0" LEs.
Location	Battambang, Siem Reap, Phnom Penh, and Kampong Cham
Exporting indicators	Exporters and non-exporters
Equity stakes of firms	Domestically-owned (100%), foreign-owned (100%), and joint-venture

Source: Author's preparation

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