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Global Production Sharing and Trade Patterns: Implications for Trade and Investment Policy

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Motivation

- Renewed emphasis in the Sri Lankan policy debate on export expansion
- Growing importance of global production sharing as an important phenomenon that shapes patterns of world trade.
- Absence of a systematic analyses of the implications of this phenomenon for global integration of Sri Lankan manufacturing and export performance

‘ The missing prince from [the Sri Lanka Economic Summit] Hamlet’

The ‘product space’ approach to policy advocacy is inconsistent with the goal of reaping gains from global production networks

Structure

1. Global production sharing and production networks
2. Opportunities for export-oriented industrialisation
3. Trends and patterns of global production sharing
4. Sri Lanka in global production networks: missed opportunities and some promising signs
5. Policy options
6. Concluding remarks

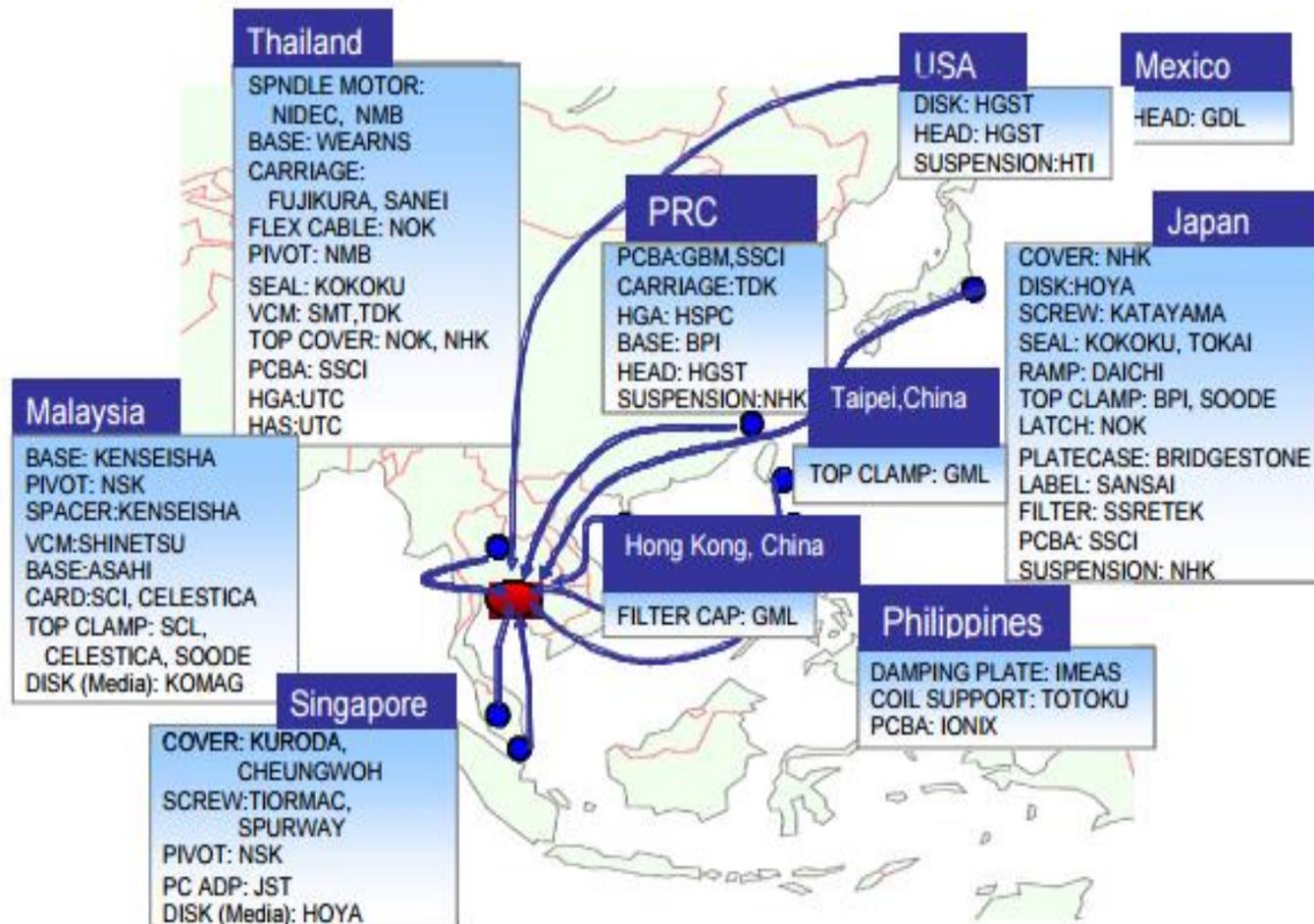
Focus solely on merchandise trade

1. Global production sharing and production networks

Let us begin with two examples:

- Thailand-centred hard disk drive network
- Boeing 787 Dreamliner

Thailand-centred hard disk drive network



HDD exports from Thailand (in 2013): US\$ 18.5bn

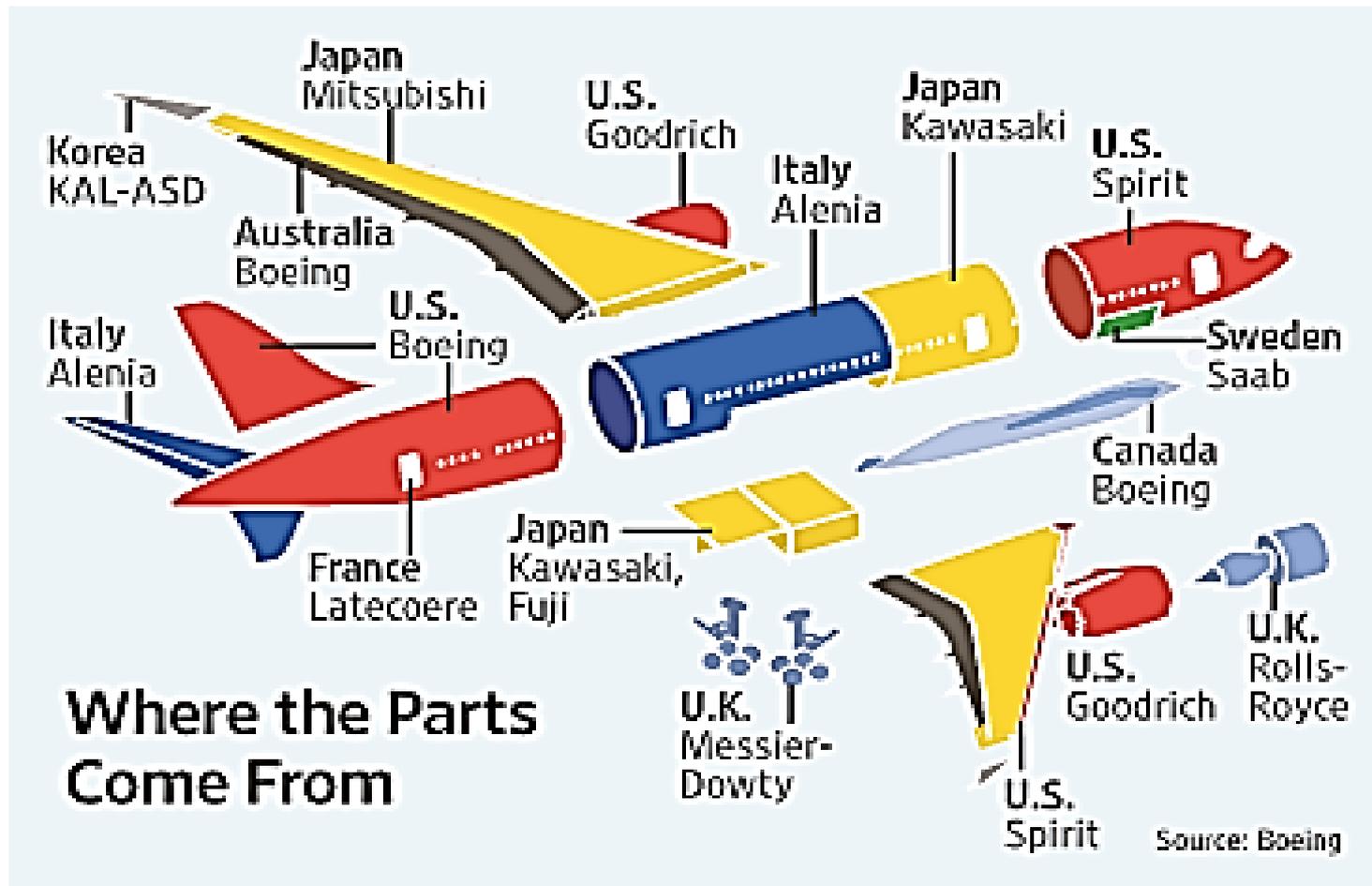
15% of total merchandise exports from Thailand

70% of total world HDD exports

But, HDD is not entirely made in Thailand:

At least ten other countries participate in its production

Boeing 787 Dreamliner



Boeing 787 Dreamliner

Involves 43 suppliers spread over 135 sites around the world

Boeing itself accounts for only 10% of the material inputs, but holds rights to the 787 technology

Close to 70% of parts come from countries other than the USA

Wings: Japan

Engine: UK and USA

Flaps and ailerons: Australia and Canada

Fuselage: Japan, Italy and USA

Horizontal stabilizers: Italy

Landing gear: France

Doors: Sweden and France

(Only about 1% of Boeing 707, produced in the 1950s, was build outside the USA)

Global production sharing

The internationalisation of a manufacturing process in which several countries participate in different stages of the production process of a given product'

Alternative terms

international production fragmentation

vertical specialization

slicing the value chain

offshoring

Global production networks (GPN)

Interrelations among a set of firms specialising in different segments of the production process of a given product as a single economic group

GPN trade: trade within global production networks

GPN trade = parts and components + final assembly

Parts and components and intermediate goods

Parts and components are a only a sub-set of ‘intermediate goods’

They are ‘relationship specific’ intermediate goods

- not sold on commodity exchanges
- more demanding on the contractual environment.

But, the two terms ‘intermediate goods’ and ‘parts and components’ are often used erroneously as synonyms

GPN versus GVC

Global production networks (GPN)

Interrelations among firms specialising in different segments of the production process of a given product as a single economic group

Focuses on vertically integrated global industries such as electronics, electrical goods, automobiles, and surgical equipment and other medical devices.

GPNs are ‘producer driven’: the ‘lead-firm’ is a producer

Global value chain (GVC)

The full range of activities undertaken to bring a product from its conception to its end users.

The focus is on the ‘structure of governance’ (the interaction among different actors) involved in the value chain of primary products and the standard labour intensive manufacturing (eg. apparel, footwear furniture).

GVCs are ‘buyer driven’: the ‘lead firm’ is a buyer

The Process of global production sharing

Global production sharing is not a new phenomenon,

but

it has become a defining feature of world manufacturing trade during the past four decades.

- Global spread from mature industrial economies to developing countries from about the late 1960s (starting with semiconductor assembly)
- The product coverage has expanded to encompass a wide range of products: electronics and electrical goods, machine tools, automobile ,cameras and watches, pharmaceuticals, bio-medical equipment
solar panels, light emitting diodes (LED)

Three phases in the spread of production networks to developing countries

- (1) two-way exchange between home and host country: parts and component assembly/testing in the host country to be incorporated in final assembly in the home country (started in semiconductor assembly in the later 1960s)
- (2) Component production networks encompassing many countries.
- (3) Full-fledged production networks involving component production/assembly/testing and final assembly

Final assembly plants are generally located in countries with large labour reserves (eg. China, Thailand and Vietnam)

Three mutually reinforcing factors have contributed to the rapid expansion production fragmentation

1. Advances in production technology, enabling the industry to slice up the value chain into finer segments (tasks).
2. Technological innovations in communication and transportation that have contributed to significant reduction in the cost of ‘service links’ involved in coordinating international operations
3. Liberalisation policy reforms across the world

2. Global production sharing and export-oriented development strategy

Global production sharing opens up opportunities for countries to participate in a finer international division of labour, to specialize in different slices (tasks) of the production process in line with their relative cost advantage.

In a labour abundant economy, assembly activities within global production networks tend to be relatively more labour intensive (and hence ‘pro poor’) compared to ‘conventional manufacturing’ (production from start to finish in just one country) of the given final product

Successful integration of the manufacturing sector into production networks has played a key role in employment generation and poverty reduction in China and other high-performing East Asian countries

Specific advantages

(1) Runs counter to *the fallacy of composition argument** against export-led industrialisation

(* Export-oriented growth strategy that worked well for some (few) countries would not work for many countries: all countries would loose because of the demand constraint)

(2) Participation in GPNs is likely to have a favourable ‘atmosphere-creation’ effect on domestic manufacturing

The very nature of the process of global production sharing is the continuous shaking-up of industry through the emergence of new products and production processes in place of old ones.

(Creation of a ‘Schumpeterian’ environment conducive to manufacturing growth)

(3) Opens up greater opportunities for achieving economies of scale and scope:

when production is fully integrated (produced in a single location) achieving scale economies is limited by the volume at the end product level

(4) Helps overcome ‘tyranny of distance’: opportunities to specialise high-value-to-weight components in the value chain and the growing importance of air cargo as the major mode of transport.

Global production sharing and the ‘product space’ analysis

“The introduction of the possibility of component manufacture and middle-stage processing within international industries rather knocks the bottom out of *any stage theory* of the development, which focuses upon final products”

Helleiner, Gerald K. (1973), ‘Manufactured Exports from Less-Developed Countries and Multinational Firms’, *Economic Journal*, 83 (329), p. 43.

‘Product space’ analysis (popularised by Ricardo Hausmann and his team in CID at Harvard team) is essentially a ‘stage theory’.

It is based on the conventional trade theorist’ assumption that foreign trade is solely an exchange of goods produced from beginning to end in individual countries.

‘Empirically, countries move through the product space by developing new goods close to those they currently produce’

Hidalgo, C. A., B. Klinger, A.-L Barabasi and R. Hausmann (2007), ‘The Product Space Conditions the Development of Nations’, *Science*, 317, p. 482.

Product space analysis completely ignores opportunities for countries to specialise in tasks/slices within global production networks.

Value-creation potential within production networks

Who gain most by engaging in a production network at a given time?

How can value creation be improved over time within the value chain?

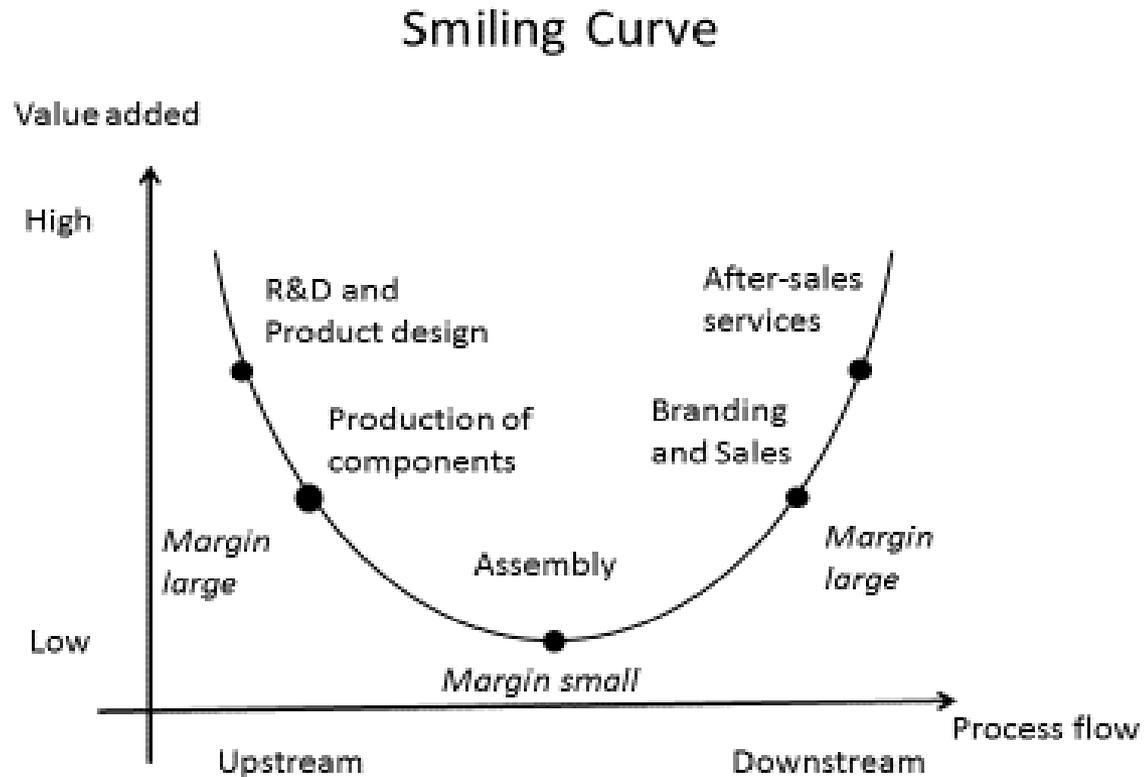
The ‘smiling curve’* provides a framework for thinking about these issues (Shih 1996).

* Proposed by Stan Shih, the founder of Acer Corporation:

Shih, Stan (1996), *Me-too is not my Style: Challenge Difficulties*, Taipei: Acer Foundation.

(<https://www.google.com.au/#q=Me-too+is+not+my+Style:+Challenge+Difficulties>)

Figure 1: Smile curve



3. Trends and patterns of global production sharing

Compilation of trade data

The analysis is based on gross (Customs-record based) trade data.

Data source: UN Comtrade database (SITC Rev. 3)

Focus on manufacturing trade: SITC 5 to SITC 8 less SITC 8

(consistent with the Australian definition of elaborately transformed manufacturing)

- (1) **Parts and components**: directly identified at the five-digit level of the Standard International Trade Classification System (SITC)
- (2) **Final assembly**: recorded trade in product categories* in which global production sharing is heavily concentrated excluding parts and components

* Office machines and automatic data processing machines (SITC 75), telecommunication and sound recording equipment (SITC 76), electrical machinery (SITC 77), road vehicles (SITC 78), other transport equipment (SITC 79) professional and scientific equipment (SITC 87), and photographic apparatus (SITC 88)

(Athukorala, P. (2014) 'Global production sharing and trade patterns in East Asia', in N. and B. Singh (eds.) *Oxford Handbook of Pacific Rim Economies*, New York: Oxford University Press, 334-360)

Figure 2: Global production sharing in world trade

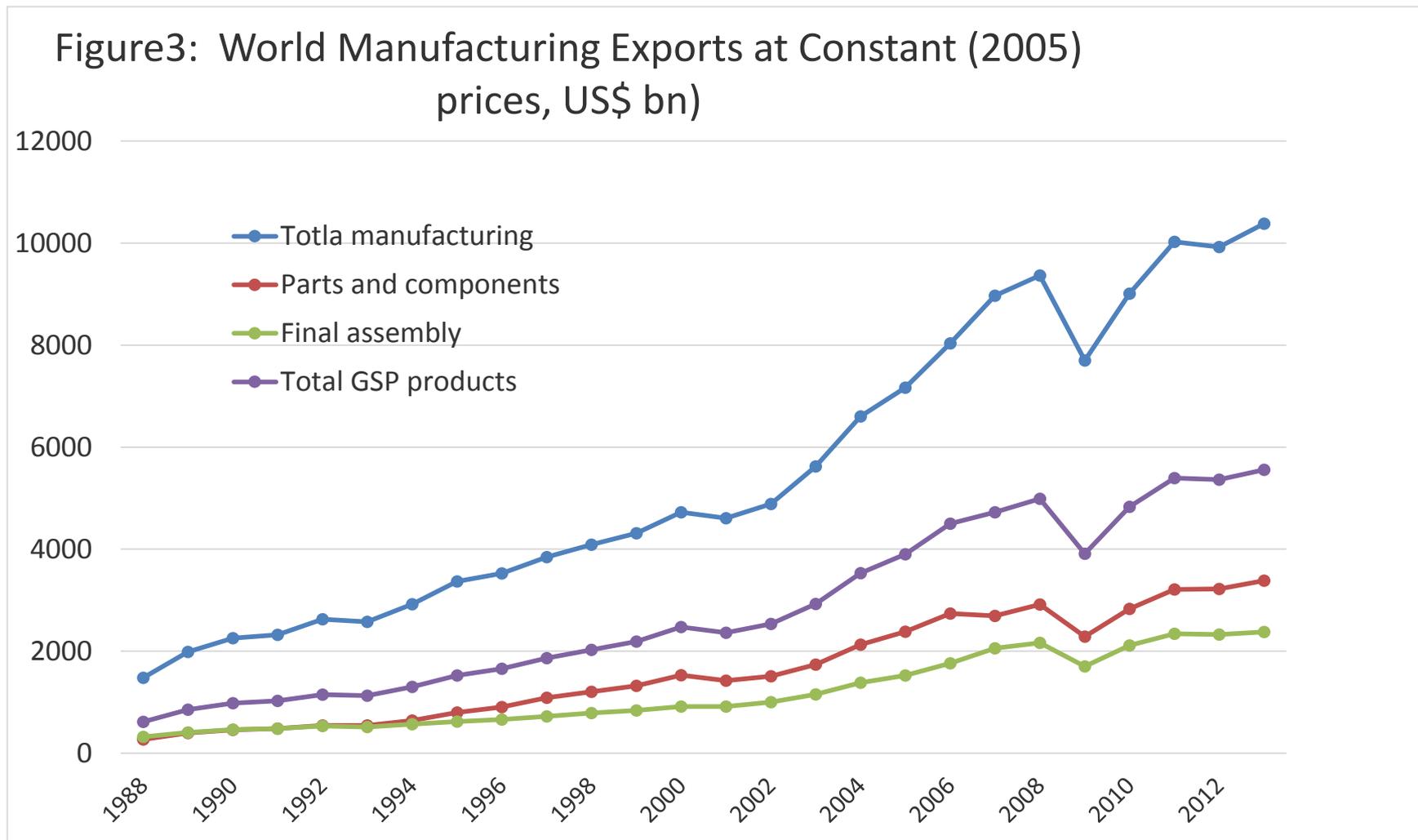


Table 1: GPN products in world manufacturing exports

| | 1989-1990 | 1999-2000 | 2012-2013 |
|---|-----------|-----------|-----------|
| World manufacturing exports, US\$bn (at 2005 price) | 2121 | 4516 | 10152 |
| Share of GPN products | | | |
| Parts and components | 20.1 | 31.6 | 32.5 |
| Final assembly | 20.5 | 19.4 | 23.2 |
| Total GPN products | 40.7 | 51.0 | 55.7 |

Figure 3: Developing countries' share in world manufacturing exports, 1988-2013 (%)

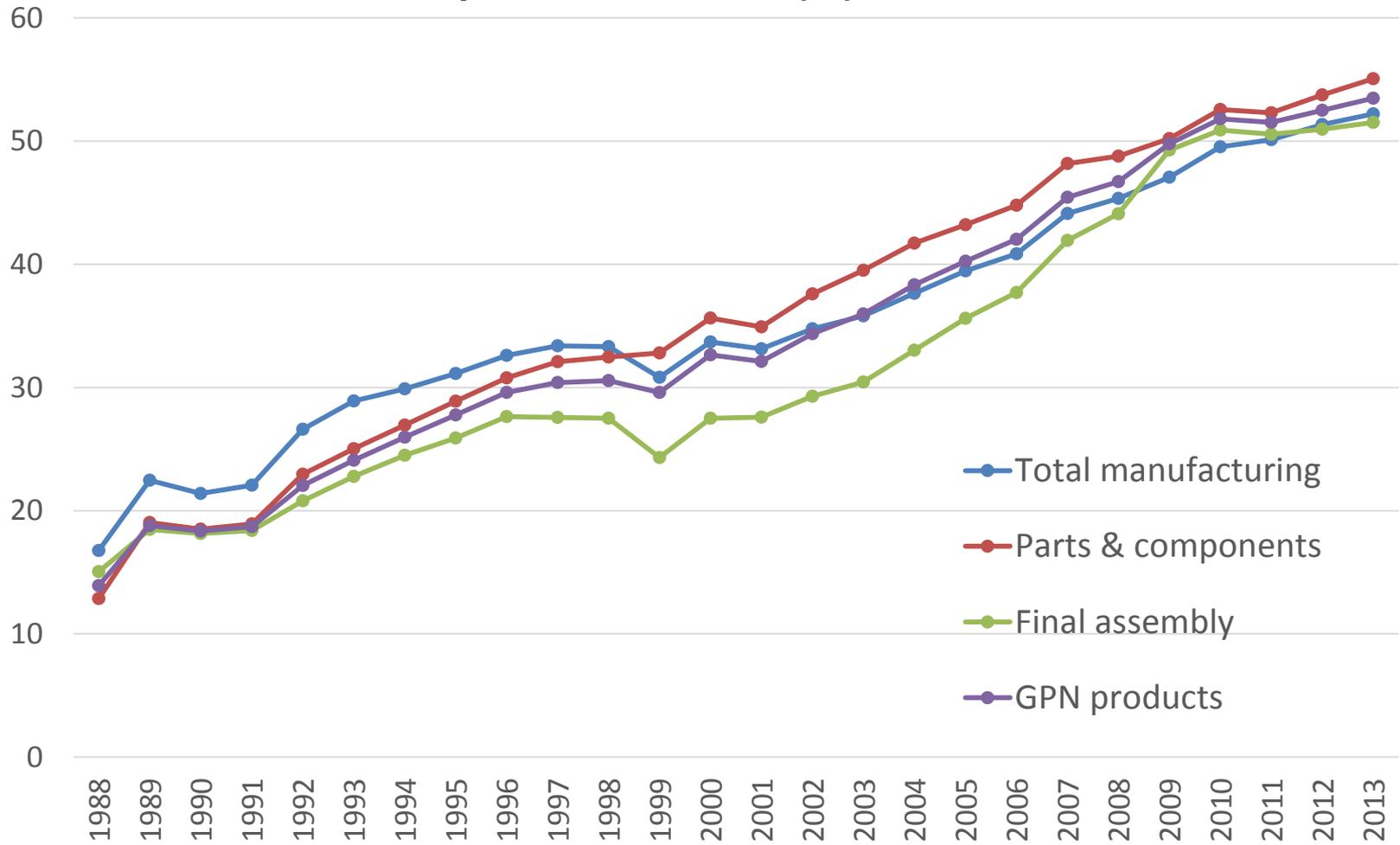


Table 2: Manufacturing exports from Developing countries

| | 1989-1990 | 1999-2000 | 2012-2013 |
|--|-----------|-----------|-----------|
| Manufacturing exports from developing countries, (US\$bn (at 2005 price)) | 465 | 1457 | 5256 |
| Share of GPN products | | | |
| Total GPN products | 34.4 | 49.0 | 57.1 |
| Parts and components | 17.2 | 33.4 | 34.2 |
| Final assembly | 17.2 | 15.6 | 22.9 |
| Developing country share in world exports of, | | | |
| Total manufacturing | 21.9 | 32.3 | 51.8 |
| Total GPN products | 18.6 | 31.1 | 53.0 |
| Parts and components | 18.8 | 34.2 | 54.4 |
| Final assembly | 18.3 | 25.9 | 51.2 |

- GPN products account for over a half of world manufacturing trade.
- There has been a notable shift GPN trade away from developed countries and towards developing countries.

Table 3: Share of GPN products in manufacturing exports, 2012-13 (%)

| | Parts & components | Final assembly | Total |
|----------------------|-------------------------------|-----------------------|--------------|
| Developing East Asia | 31.0 | 24.7 | 63.2 |
| China | 20.5 | 36.8 | 57.3 |
| Taiwan | 36.7 | 43.1 | 79.8 |
| South Korea | 37.0 | 41.2 | 78.2 |
| ASEAN | 52.5 | 19.6 | 71.5 |
| Indonesia | 20.1 | 13.2 | 33.3 |
| Malaysia | 63.5 | 9.8 | 73.2 |
| The Philippines | 62.0 | 14.3 | 76.3 |
| Singapore | 81.9 | 12.7 | 94.6 |
| Thailand | 46.9 | 22.8 | 69.7 |
| Viet Nam | 20.1 | 10.3 | 30.5 |
| South Asia | 11.2 | 11.2 | 22.5 |
| Sri Lanka | 6.2 | --- | 6.2 |
| India | 11.6 | 11.3 | 22.9 |
| Developed countries | 25.2 | 23.6 | 48.8 |
| Developing countries | 34.1 | 28.0 | 62.0 |
| World | 29.2 | 17.9 | 47.1 |

4. Sri Lanka in global production networks: missed opportunities and some promising signs

Responses of two large electronics MNEs to the 1977 liberalisation reforms:

Motorola*

In 1980 incorporated a fully-owned subsidiary company: initial employment of the assembly plant: 2624.

Harris Corporation

In the same year incorporated a fully-owned subsidiary company and even started building an assembly plant: initial employment 1850

Both MNEs left Sri Lanka within a few years as political instability and ethnic conflict set in, shattering Sri Lanka's hopes of becoming an electronics export hub.

* On Motorola in Sri Lanka:

Weigand, R. (1983), International Investment: Weighing the Incentives', *Harvard Business Review*, 61, 146-152)

But, a number of medium-size joint-venture firms set up (mostly in the 1990s) for assembling parts and component (mostly in automobile, electronics and electrical goods industries) are still operating successfully.

Tables 4, 5 and 6, shows Sri Lanka's unexploited potential.

Table 4: Parts and component assembly firms in Sri Lanka

| | Age (years) | Ownership | Product | Employment |
|--------------------------|-------------|---------------|--|-------------------|
| Esjay Electro Mag | 34 | Japan/SL | Electronics component, auto wire harnesses and LED/CFL lighting | 250 |
| FDK Lanka | 25 | Japan/SL | Magnetic head, printed circuits, optical isolators | 686 |
| Tos Lanka | 20 | Japan/SL | Printed circuits/auto harnesses | 250 |
| Lanka Harness | 12 | Japan/SL | Censor switches for seat belts and airbags | 330 |
| Okaya Electrics | 8 | Japan/SL | Electric components, crystal display modules, LED lighting devices | 644 |
| Aerosense | 6 | USA/Sweden/UK | Sensors for Airbus | 2000* *planned |
| Cable Solutions | 6 | EU/India | Specialised, customised cables | --- |
| Harness Solutions | 6 | EU | Customised cable harnesses | --- |
| Metal Component services | 6 | EU | Metal components | --- |

Table 5: GPN products in manufacturing exports from Sri Lanka

| | Total manufacturing US\$ million | Prats and components | |
|------|-------------------------------------|----------------------|-----------|
| | | US\$ million | Share (%) |
| 1990 | 896.8 | 35.3 | 3.9 |
| 1995 | 2121.2 | 89.0 | 4.2 |
| 2000 | 35958.9 | 246.8 | 6.9 |
| 2005 | 41968.2 | 307.5 | 7.3 |
| 2006 | 45482.8 | 389.3 | 8.6 |
| 2007 | 49386.8 | 530.3 | 10.7 |
| 2008 | 51218.7 | 411.1 | 8.0 |
| 2009 | 44423.9 | 238.4 | 5.4 |
| 2010 | 51367.9 | 346.4 | 6.7 |
| 2011 | 64572.1 | 429.2 | 6.6 |
| 2012 | 58795.5 | 377.1 | 6.4 |
| 2013 | 65253.8 | 399.4 | 6.1 |
| 2014 | 69708.2 | 472.1 | 6.8 |

Table 6: Main GPN exports from Sri Lanka:
Disaggregated (SITC-5 digit) data

| SITC Code | product | 2000 | 2005 | 2010 | 2011 | 2012 | 2013 | 2014 |
|-----------|---|-------|-------|-------|-------|-------|-------|-------|
| | Products with exports>US\$10mn in 2013/14 | | | | | | | |
| 74492 | Lift truck parts | --- | --- | 15.0 | 34.1 | 31.2 | 43.6 | 57.1 |
| 77313 | Vehicle ignition wire | --- | --- | 37.0 | 40.6 | 37.2 | 36.1 | 36.1 |
| 77119 | Other elec. transformers | 13.1 | 16.4 | 50.0 | 36.7 | 28.4 | 28.4 | 24.5 |
| 77282 | Switchgear parts | 0.3 | 12.1 | 26.7 | 38.3 | 33.8 | 21.7 | 28.6 |
| 77261 | Switchboards etc <1000v | 0.7 | 6.1 | 11.1 | 13.2 | 6.9 | 20.0 | 27.3 |
| 77281 | Switchboards etc unequip | 8.1 | 14.2 | 12.4 | 17.3 | 11.8 | 12.6 | 17.2 |
| 77220 | Printed circuits | 14.8 | 5.9 | 22.7 | 28.6 | 26.6 | 16.7 | 10.9 |
| 77812 | Electric accumulators | 0.3 | 0.4 | 0.2 | 0.3 | 0.8 | 6.0 | 18.4 |
| 77866 | Paper/plastic capacitor | --- | --- | --- | 4.5 | 9.9 | 10.0 | 14.4 |
| 89281 | Labels paper,paperboard | 1.7 | 4.6 | 10.2 | 10.7 | 8.5 | 11.3 | 10.3 |
| | Other | 207.9 | 247.8 | 161.2 | 204.8 | 182.1 | 193.1 | 227.3 |
| | Total parts & components | 246.8 | 307.5 | 346.4 | 429.2 | 377.1 | 399.4 | 472.1 |
| | Note: --- Zero or negligible | | | | | | | |

5. Policy Options

Prediction of the standard international trade theory:

Factor intensity of the given product and the relative prices of factor inputs (adjusted for productivity) jointly determine which country produces and trade in what product.

This prediction is based on the assumption that that goods are produced entirely in one location; inputs are trapped by national boundaries

The emerging patterns of GPN is not consistent with this assumption (factors of production are mobile with GPNs)

Inter-country differences in labour cost has been a significant contributor to the growing importance of developing countries (as a group) in network trade,

But difference in labour cost does not seem to explain differences among developing countries in their success in joining global production networks (Table 3 again)

Table 3: Share of GPN products in manufacturing exports, 2012-13 (%)

| | Parts & components | Final assembly | Total |
|----------------------|-------------------------------|-----------------------|--------------|
| Developing East Asia | 31.0 | 24.7 | 63.2 |
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What are the other determinants?

- Human capital
- Service link cost
- Proactive investment promotion ('marketing the country')

Human capital

- At the initial stage, availability of trainable unskilled labour, and middle-level (supervisory) technical manpower are key determinant.
- In the long-run, availability of high-level technical and managerial manpower is vital for moving into high-value creating segments in the smile curve
- Human capital development is partly endogenous to a country's engagement in GPNs, but the government has to play a major role.

Service link cost

Service link cost: the costs involved in coordinating production blocks/tasks located across borders.

Service link cost in a given country depends on a whole range of factors impacting on the overall business environment:

- (i) Infrastructure and trade-related logistics (**air transport has become increasingly important for network trade**)
- (ii) political stability and policy certainty
- (iii) Property right protection, including enforcement of contracts
- (iv) Liberalisation of trade and investment policy regimes (elaborate in the next two slide)

Foreign trade and investment liberalisation

MNEs are the key players in global production sharing.

A close relationship between foreign direct investment (FDI) and trade in parts and components and final assembly.

In recent years, production sharing practices have begun to spread beyond the domain of MNEs:

- As production operations in host countries become firmly established, MNE subsidiaries begins to subcontract some activities to local (host-country) firms.

But, the bulk of global production sharing take place through intra-firm linkages within MNEs rather than in an arms-length manner.

(Over the past three decades, MNEs from newly industrialised countries in East Asia have become increasingly important players within GPNs (mostly as OEMs for large MNES))

Therefore, global production sharing makes a strong case for concurrent liberalisation of trade and FDI policy regimes

FDI and trade policies are co-determinants of the location choice of MNEs within production networks

With the rapid expansion of global production sharing, the boundary between international trade and foreign direct investment have become blurred

China vs. India

Indonesia vs. Singapore, Malaysia, Thailand and Vietnam

Marketing the country

Need for proactive, targeted policies to attract foreign investors

- 'locked-in-effect': tendency of MNEs to become embedded in a give host country (because of agglomeration benefits , fixed costs involved in setting up service links, 'country risk' considerations etc.)
- 'Market failure in information' about potential investment sites
- Evidence from Singapore, Ireland, Costa Rica, Penang (Malaysia), Vietnam

‘Barely a month goes by without some country’s leader contact me and offer the likes of \$1billion in tax credits and other incentives if we will open an Intel plant and create jobs in that country’

Paul Otellini, the CEO of Intel

(Freedman and Mandelbaum 2012, p. 320)

- Winning an ‘investment tournament’ by a new host country requires involvement/commitment at the highest political level.

Related policy issues

- FTAs and GPN trade
- GPN trade and tariff revenue
- The use (and abuse!) of domestic value added/linkages as industry-policy criteria

Can FTAs promote GPN trade?

The rise of global production sharing strengthen the case for multilateral (WTO-based) or unilateral, rather than regional (FTA), approach to trade liberalisation:

- Production-sharing based international specialisation can't be sustained as a regional phenomenon because of the importance of extra-regional (global) markets for final products.
- Formulation of rules of origin (RoOs) for GPN trade is rather complicated task (next slide).

‘Bilateralism distorts flows of goods In structuring the supply chain, every country of origin rule and every bilateral deal has to be tackled on as additional consideration, thus constraining companies in optimising production globally’

Victor Fung, *Financial Times*, November 3, 2005.

- Most major trading nations are signatories to the WTO's Information Technology Agreement; FTAs are irrelevant for products covered by the agreement.

RoOs and Global Production Sharing

- The trade effects of any FTA depends very much on the nature of the rules of origin (RoOs) built into it
- The conventional value added criterion is virtually inapplicable to this form of trade because tasks undertaken by each country in the value chain normally generate rather small domestic value addition
- The only viable option is to go for ‘change in tariff line’-based RoOs, but in most cases trade in final goods and parts and components belong to the same tariff codes even at the HS-6 digit level
- These administrative problems could result in unnecessary delays in customs clearance and also open up opportunities for rent seeking through tweaking of RoOs

Revenue implications of import tariffs

Global production sharing strengthen the standard case for greater uniformity in tariff rates

A cascading tariff structure opens up room for tariff evasion by importers (with or without the involvement of customs officials)

The use (and abuse!) of domestic value added/linkages as industry-policy criteria

Per unit value added/linkage is a misleading indicator of gains from GPN exports

Input structure within global production networks is ‘relationship specific’

Policy interventions aimed at promoting domestic value added can be counter productive (Can run counter to the objective of employment generation/poverty reduction through export-oriented growth)

The pertinent criterion should be ‘the volume factor’: ability to produce for a vast global market and employment generation.

Contribution to the national output (GNP) depends on the volume factor, not on per unit value added.

6. Concluding Remarks

- International trade is no longer an exchange of ‘wine for cloth’!

With the rapid expansion of global production sharing, the conventional approach to trade flow analysis, which attributes the commercial value of a product to the last country of origin, is becoming increasingly misleading.

‘This phenomenon calls for a change in analytical and statistical tools we use to measure and understand the real world’

Pascal Lamy, *Financial Times*, 24, January 2011

- Global production sharing has been the prime mover of the dramatic shift in manufacturing exports from developed to developing countries.
- The expansion of global production sharing has made inputs and capital increasingly mobile across national boundaries and hence the patterns of production and trade has become more sensitive to the overall investment climate of the country
- The role of government is to create an enabling environment: the government has the potential to focus on specific industries (as in Singapore, Penang (Malaysia), Costa Rica), but promoting individual firms to specialise in specific tasks within GPNs is beyond its capability