GVC Modules and Applications

Seminar on Accounting for Global Value Chains

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Outline

I. What are value chains? How are they different?
II. Definitions and data sources
III. Example of GVC mapping/analysis in Costa Rica

Introduction to GVCs

- Proliferation of the term “GVC” over the last 5-10 years to describe anything pertaining to trade, firms, and countries.
- All related to production fragmentation and coordination, but different motives, approaches and definitions of GVCs
- Three groups
  - Social science & geography academics (1990s; GCC, GVC, GPN)
  - International NGOs and national governments (funders/implementers); 2000s
  - Economists & national statistics offices (~2007; multi-country I-O tables, TiVA; however also original firm-level VC approach 1980s).
- Benefits from combining (a) theoretical insights and industry experience from ‘traditional’ GVC research and (b) data and analysis from economists and statistics agencies.

What is a Value Chain?

- Input-output (supply chain of products or services*)
- Value-adding activities (services)

- Firms (establishments/enterprises), which are a composed of workers with different jobs (occupations), that perform activities that result in tangible goods (products) or provide services, that can generally be grouped together by similar activities (industries/sectors).
- These activities are rarely performed by one enterprise or country, giving rise to ‘global’ value chains.

Global Value Chain Framework: Theory

- Maximizing factors of production doesn't fully explain why some countries and firms are successful.
- Where does power and control come from in this interrelated set of activities? What determines who makes things, where they are made, and at what price?
- Governance (firms)
- Institutions (government/policy)
- As global trade increased, researchers looking for a way to explain why things happen. Found that industries operate in similar ways.

What is GVC Analysis?

- Define an *industry* using the four variables
  - Input-output of products and services
  - Geography
  - Important firms
  - Institutions (policies)
- Determine opportunities for upgrading (and identify bottlenecks and policy recommendations)
  - Process
  - Product
  - Backward linkages
  - End market
  - Chain
  - Functional

GVC Key Point #1:
A GVC is ***industry or sector-specific***

- The types of jobs, technologies, standards, regulations, products, and processes are all unique. So are the ways in which buyers and suppliers interact. The importance of each element varies by stage within the chain.
- Policymakers need to understand how specific industries operate. This is particularly important when selecting industries to target and developing policies that will enhance competitiveness, ideally in a way that provides economic, as well as social and environmental benefits.

GVC Key Point #2: Need to link to ***classification systems***

- A missing piece of presentations/chapters that would be helpful is to identify how the specific account/data source could be linked to a classification system.
- Is it linked already?
- Could it be linked by adding a question related to industries or products?
- Which countries collect data? How often? At what detail? (Even if not published).
- Data linking by an enterprise ID is needed, but this also needs to be linked back to an industry.

GVC Key Point #3: ***Reconfiguration*** of data

- A value chain spans ***the entire range*** of products, services and firms involved in this process, which crosses the traditional boundaries of how sectors or industries are defined in national accounts. A value chain includes ***service activities*** such as sourcing or back office accounting that are considered industries themselves.
- For example, the apparel manufacturing *industry* is just the cutting and sewing of fabric to make clothes. The apparel *value chain* begins with the production of fibers (part of the agriculture or chemical industry), which are transformed into yarn and then fabric by the textile industry, are assembled by apparel manufacturers, are distributed by intermediaries in the wholesale sector, and are sold to consumers by the retail industry.
- GVCs emphasizes the ***importance of the relationships*** among firms in the chain. This distinction is important because the firms responsible for the higher-value, service-related activities are often performed by different firms based in different countries than those engaged in producing the final product and its components.

Definitions and Data Sources

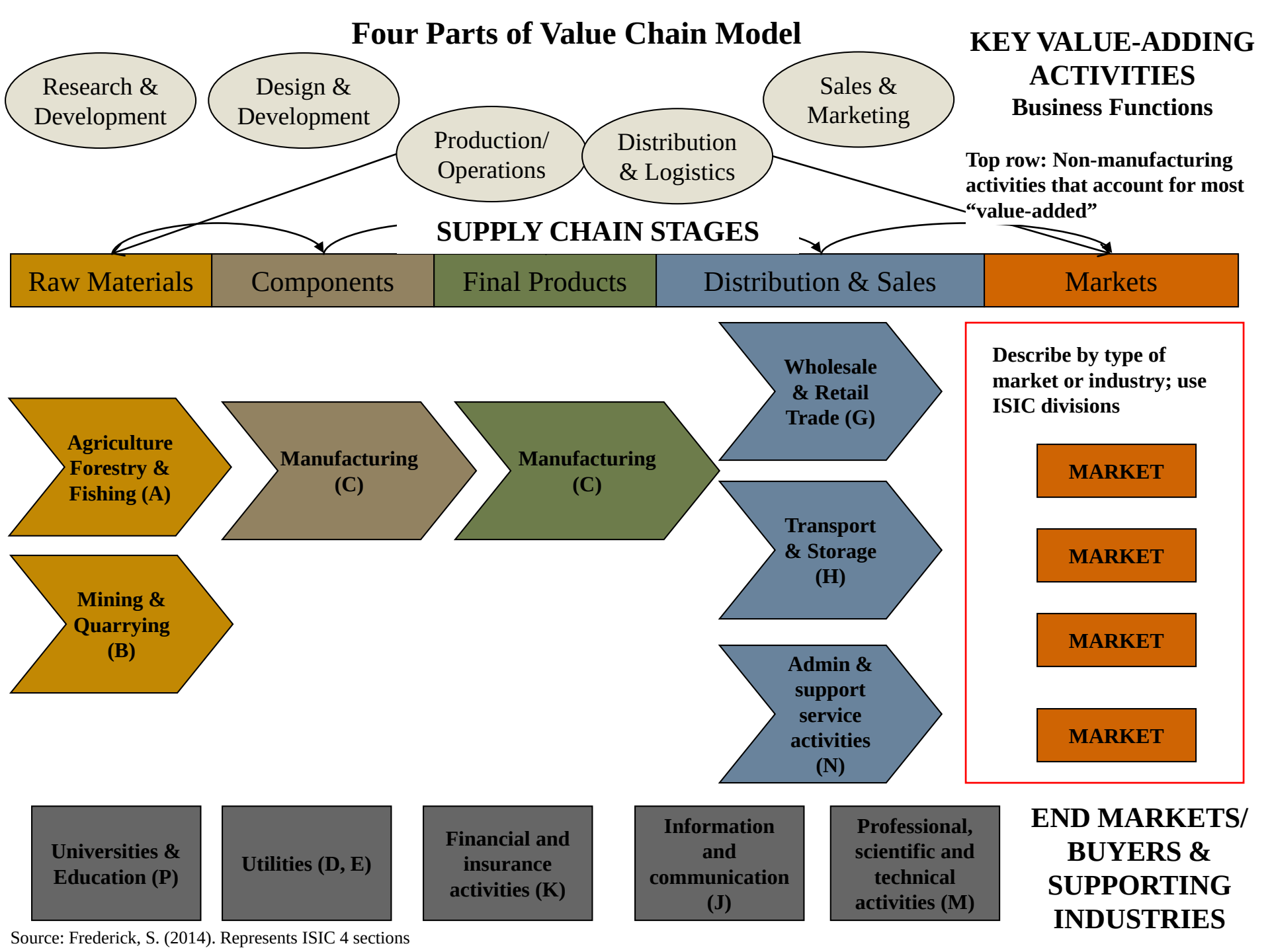
How to Construct a GVC

Levels of Data Collection & Primary Classification Systems

- Enterprises/establishments/business units
  - ISIC, basis of national accounts?
- Products/services
  - CPC, HS, EBOPS
- People/workers
  - ISCO
- Business functions
  - Usefulness will depend on ability to associate with other classification systems.
- All other accounts and surveys
  - How can we minimize burden by adding questions on industries or products?

Need to be able to compare data across classification systems and countries

Four Parts of Value Chain Model



Source: Frederick, S. (2014). Represents ISIC 4 sections

ISIC and National Account Limitations

- Codes represent a mix of GVC concepts (business functions, supply chain position, markets)
- Codes do not provide adequate level of industry-specific detail beyond sections A, B & C
- Why? Because ISIC was developed before enterprises ‘unbundled’ manufacturing and services, and the span of ‘services’ that add value to a product was relatively nascent.

Electronics GVC based on ISIC4

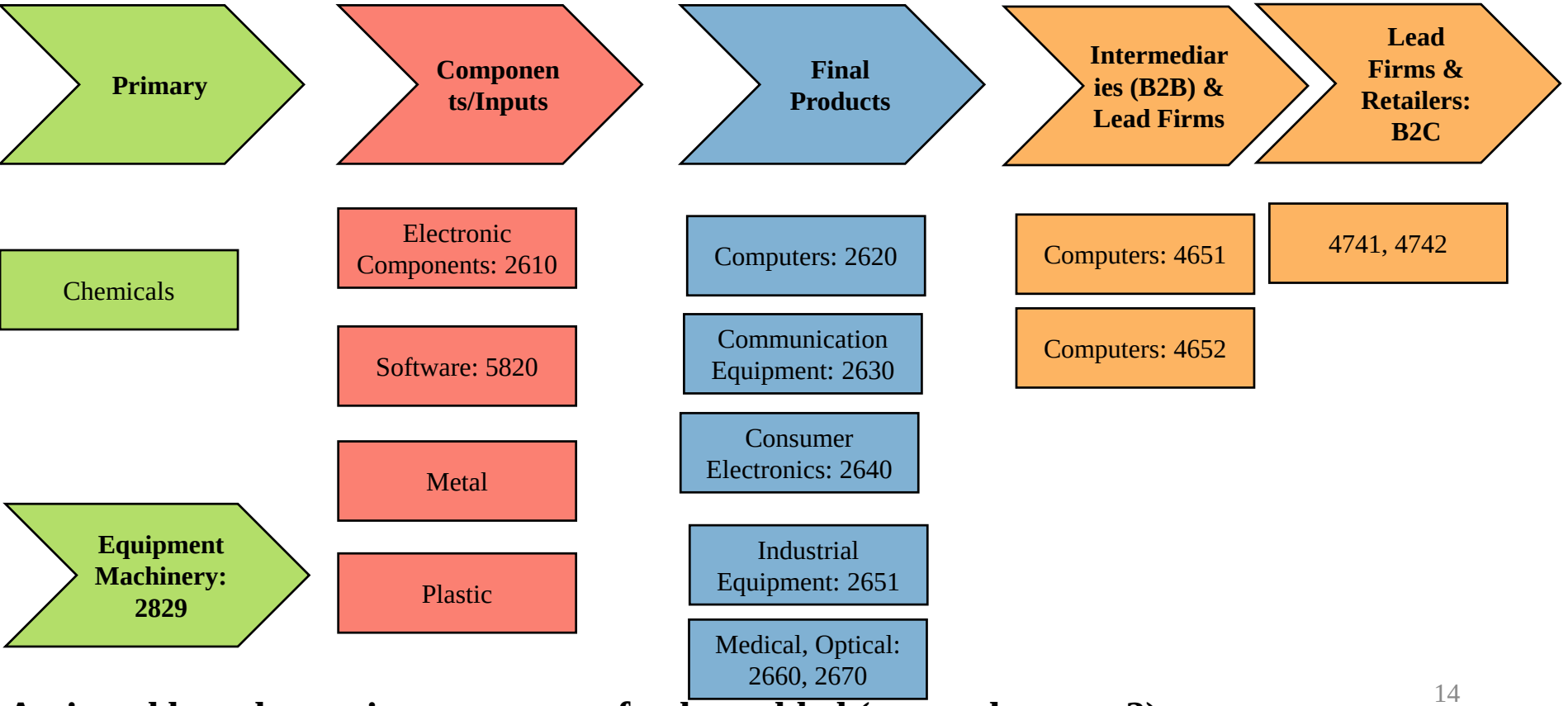
GVCs cover multiple sectors

Manufacturing Chemicals, Machinery

Manufacturing, Services (Software)

Wholesale

Retail



Assigned based on primary source of value-added (or employment?)

Apparel GVC based on ISIC4

Raw Materials	Components (Textiles)	Final Products	Distribution	Sales

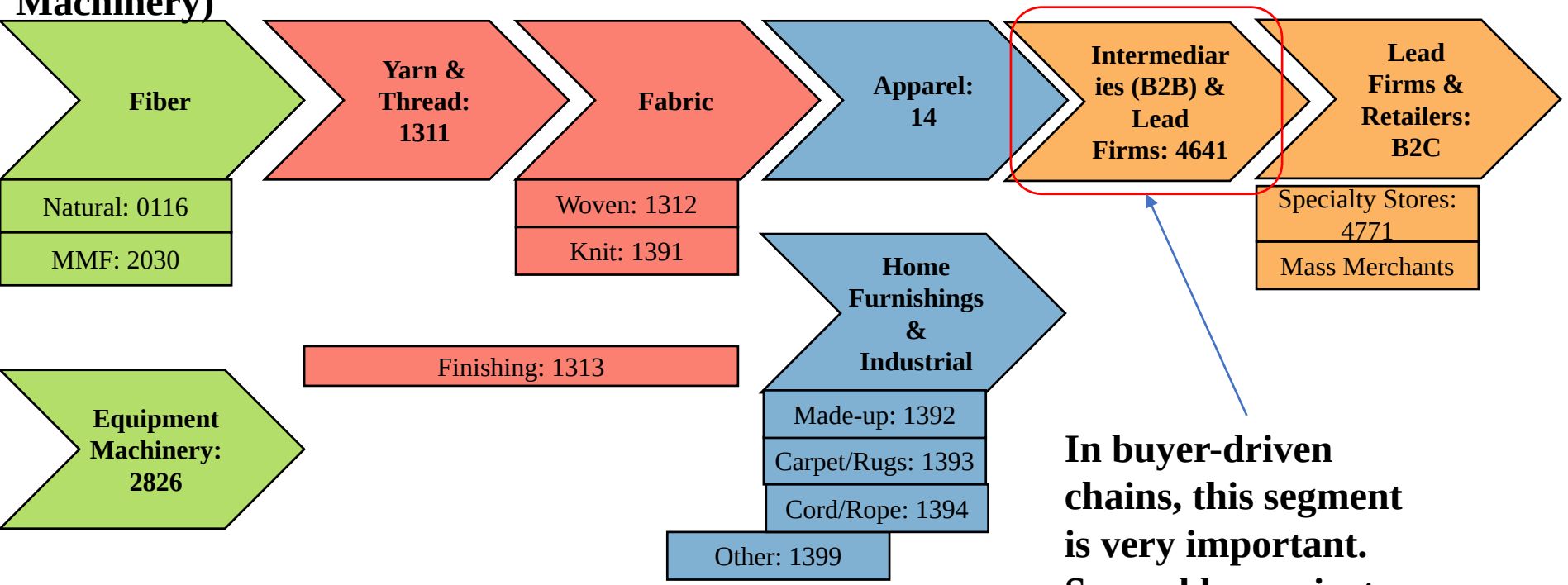
GVCs cover multiple sectors

Agriculture and Manufacturing (Chemicals, Machinery)

Manufacturing

Wholesale

Retail



In buyer-driven chains, this segment is very important. Several layers just here can be involved.

Data/Process to Construct GVC

- Define the industry/value chain by market research and firms
- Define template GVCs using classification systems of codes (ISIC, CPC, HS, ISCO);
  - Start with ISIC C (manufacturing); 24 total and narrow down; case studies so far: Apparel (or textiles/apparel): 14, automotive (29), electronics (26), medical (other mfg. 325)
- Use definitions to build a global and country-level picture
- National level industrial data
- Trade data
- Linking data by enterprise
- Interviews/review secondary data to validate

Key Points

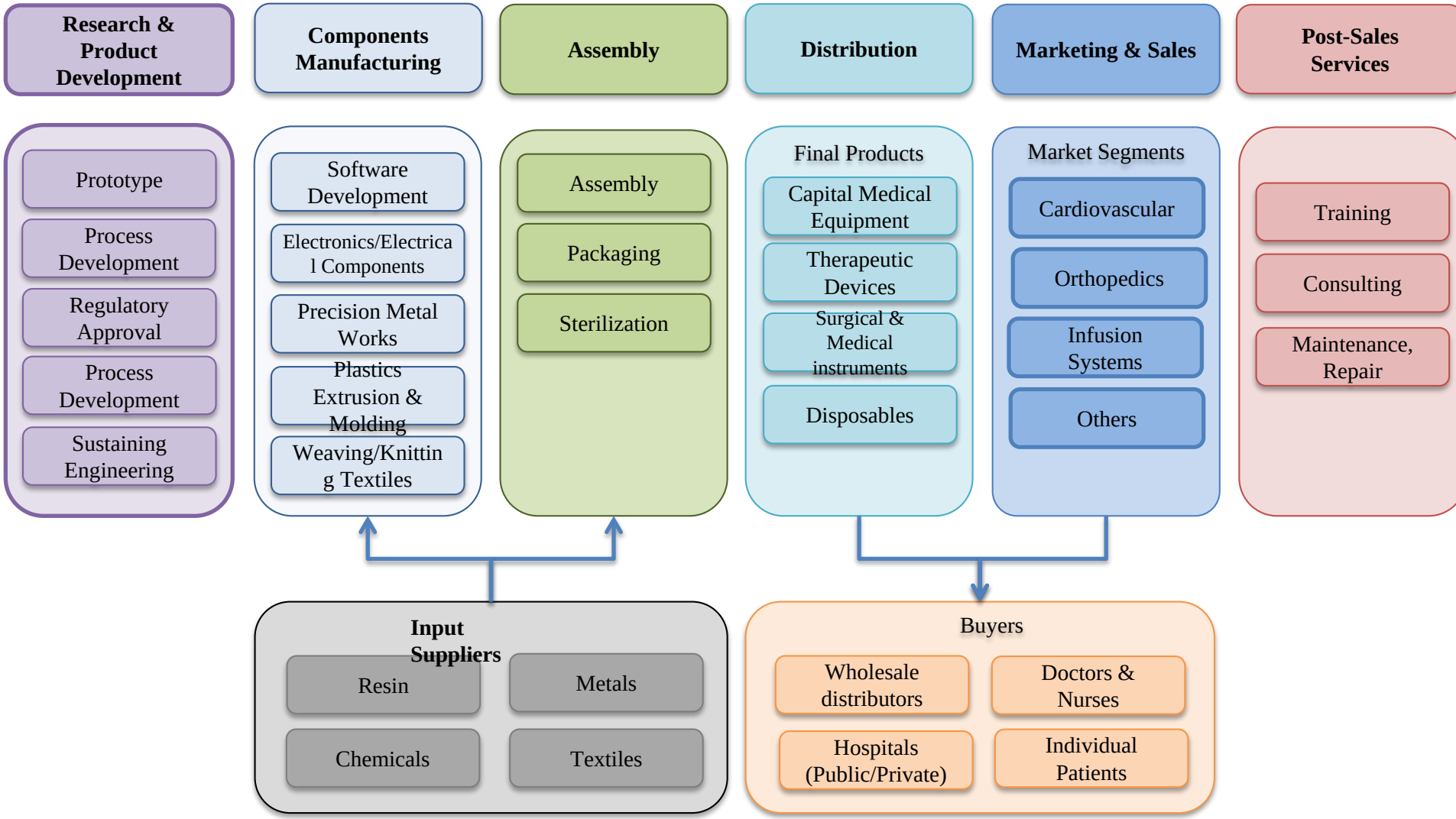
- Most of the accounts discussed are not useful for doing GVC studies because not industry-specific, or connected to a classification system, BUT
- The ‘raw data’ collected as part of the annual surveys, trade data; and linking these together at the firm-level are more useful for GVC studies than national accounts.
- SUTs and input-output tables, but primarily for mapping the industry-specific flow of goods and services.
- To make it a GVC based on data, must define codes in each classification system and use this to benchmark.
- More detailed data and codes are needed for wholesale, management, transportation, R&D OR, if determined that all firms labeled in manufacturing, the business function survey will help.
- Occupation data at the firm-level is the main piece of information not collected that would be helpful.

Costa Rica Example

Medical Devices: Examples on how trade, industrial statistics and SUTs can be layered in

Electronics and Services: Classification Issues in Practice

Medical Devices Global Value Chain

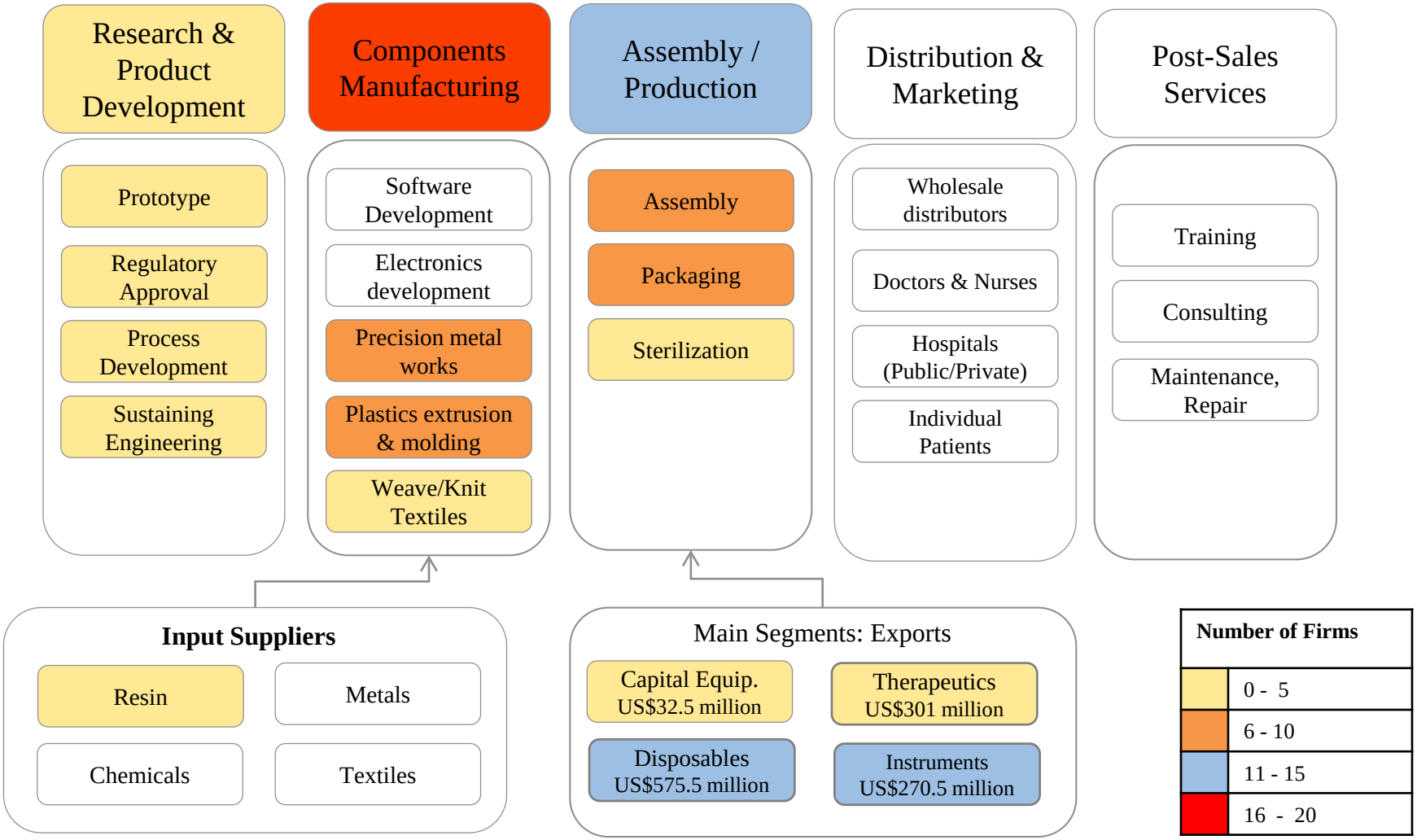


Source: Bamber & Gereffi (2013). Costa Rica in the Medical Devices GVC. Fig. 1, p. 9. Duke CGGC Report for COMEX.

Medical Device Dynamics

- Lead firms are in the U.S. and Europe
- Ultimate buyers are institutions/B2B (not consumer market)
- Outsourcing and offshoring relatively uncommon
- Why? High level of risk; standards/certifications required; limited capabilities in the supply base
- When the lead firm is the ‘brand’ or manufacturer in the home country, it makes mapping easier.

Costa Rica in the Medical Device Global Value Chain, 2012: Mapping based on Secondary Analysis and Firm Interviews



Sources: Duke CGGC 2012 Report: Costa Rica in the Medical Device GVC. Number of firms based on interviews with key stakeholders and a secondary review of the literature. Trade data from UNComtrade.

Costa Rica in the Medical Device Global Value Chain, 2014/15: Number of Firms

Define in terms of an ISIC code

# of firms: 28
Employment: 1,400
Turnover
Output
Taxes paid
Value-added

Data used in national accounts, but also other data points.

Assembly / Production

Medical Devices (AE080/ ISIC 3250): 28 establishments

Data Sources: BCCR, Costa Rica

Define by ISIC and Link to HS/CPC

Product Sector	HS Codes	CPCv2	Incl. based on ISIC4 (325)	Comments
Other	9019, 9020	48160	Yes	
Disposables	9018.3, 50, 90	48150	Yes	Would consider 901850, 90 to be with instruments.
Instruments	9018.41, 49	48130	Yes	
Therapeutics	9021.10 - 39	48171	Yes	
Therapeutics	90214, 5, 9		No	Electronic medical devices
Capital Equip.	90181 90182 9022		No	Electronic medical devices
Sterilizers	841920	48140	Yes	
Glasses	9004	48312	Yes	Only 900490 900410 (sunglasses, not typically a medical device)
	9003.11, 19	48313	Yes	Not entirely for medical devices (sunglasses)
	9003.90	48352	Yes	Not entirely for medical devices (sunglasses)
Lenses	900130, 40, 50		No	
Furniture	9402	48180	Yes	Do not agree, but needs further evaluation

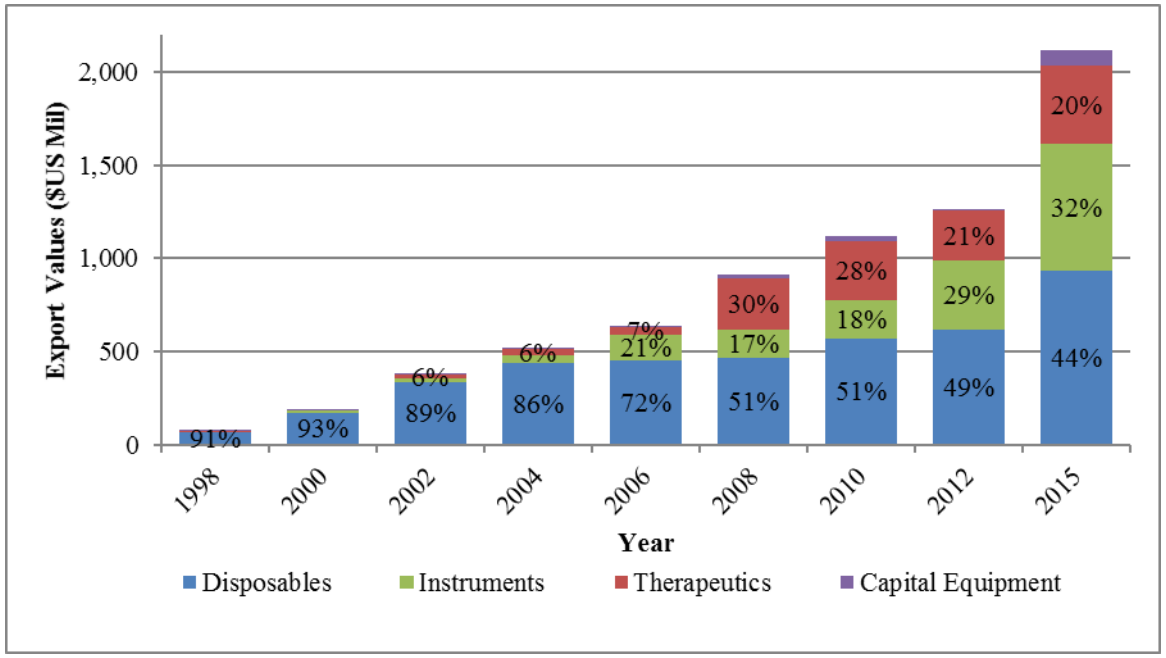
- ISIC category 3250 which covers "manufacturing of medical and dental instruments and supplies".
- ISIC and HS code definitions of industries will not always line up. In Costa Rica they did, but is a small country without intermediaries. In China, only half of apparel trade was by apparel manufacturers. Alignment in ‘producer-driven’ chains better than ‘buyer-driven.’

Costa Rica in the Medical Device Global Value Chain, 2015: Share of Medical Exports: UNComtrade

Assembly / Production

Exports, $US Mil. (2015)

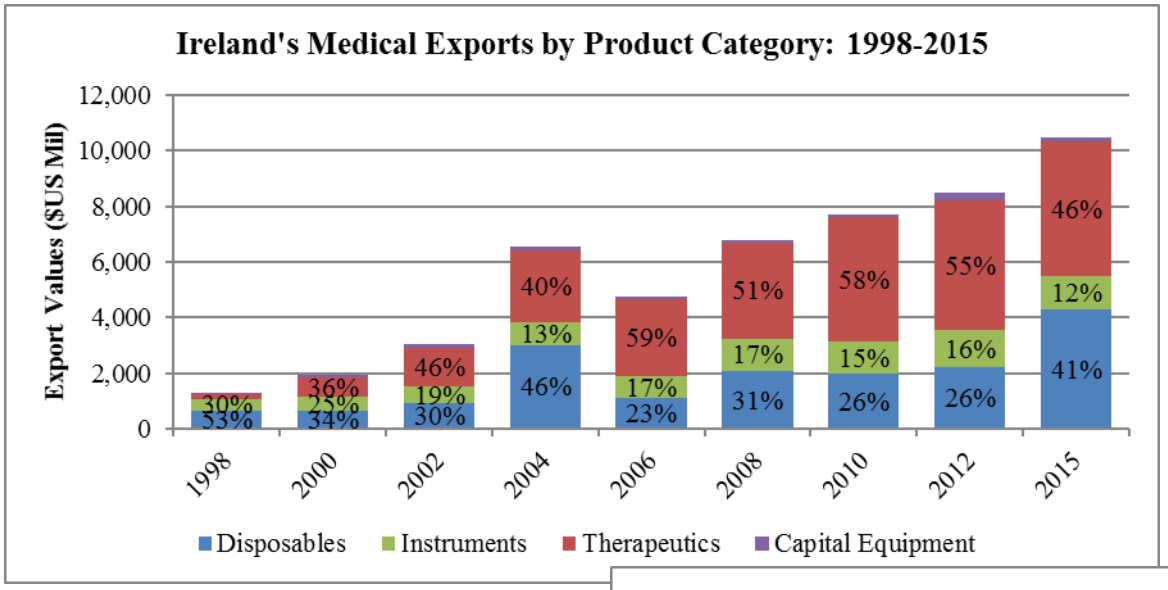
- Disposables-44% US$934 million
- Instruments-32% US$680 million
- Therapeutics-20% US$423 million
- Capital Equip.4% US$81 million
- Other. < 1% US$1 million

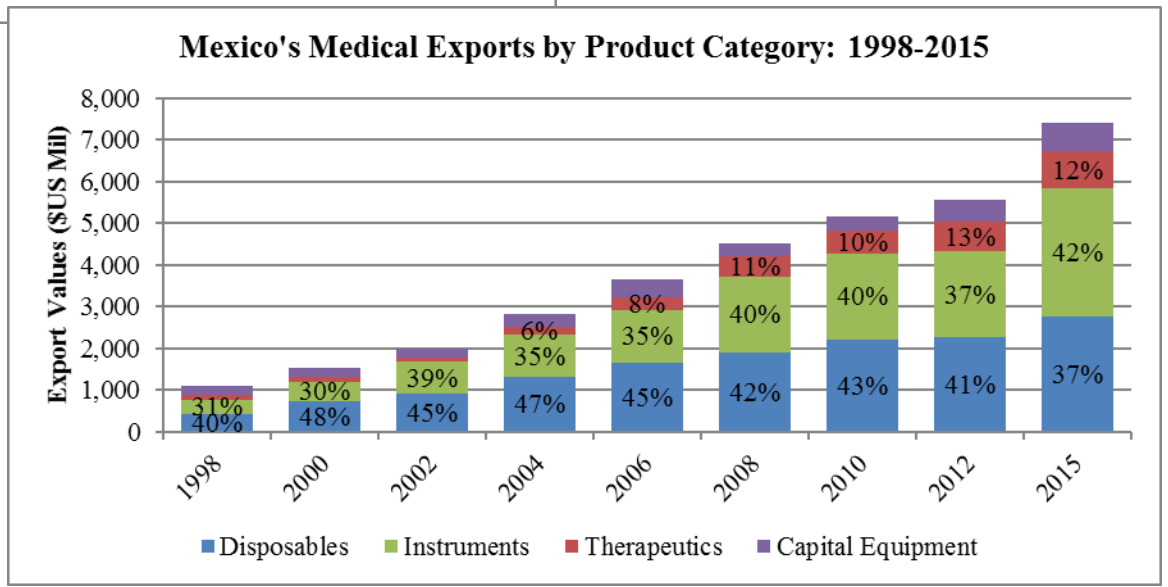


In GVC terms, can be used to show product upgrading or diversification

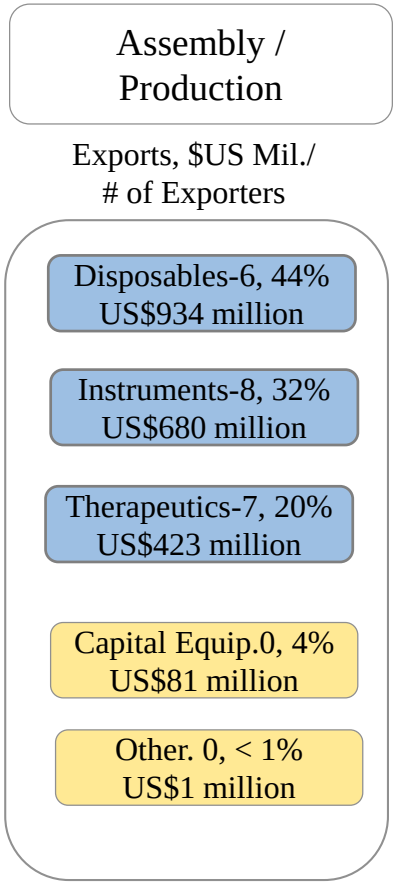
Data Sources: Trade data: UNComtrade.

Ability to Compare/Benchmark to Other Countries





Costa Rica in the Medical Device Global Value Chain, 2015: Share of Medical Exports and Number of Exporters: UNComtrade and Establishment-Level Export Data of ISIC-based Firms



Of the 28 firms, able to put 22 into a more specific sector using export data. Two were not primarily exporters of correlated HS codes, and four exported similar shares in multiple sectors.

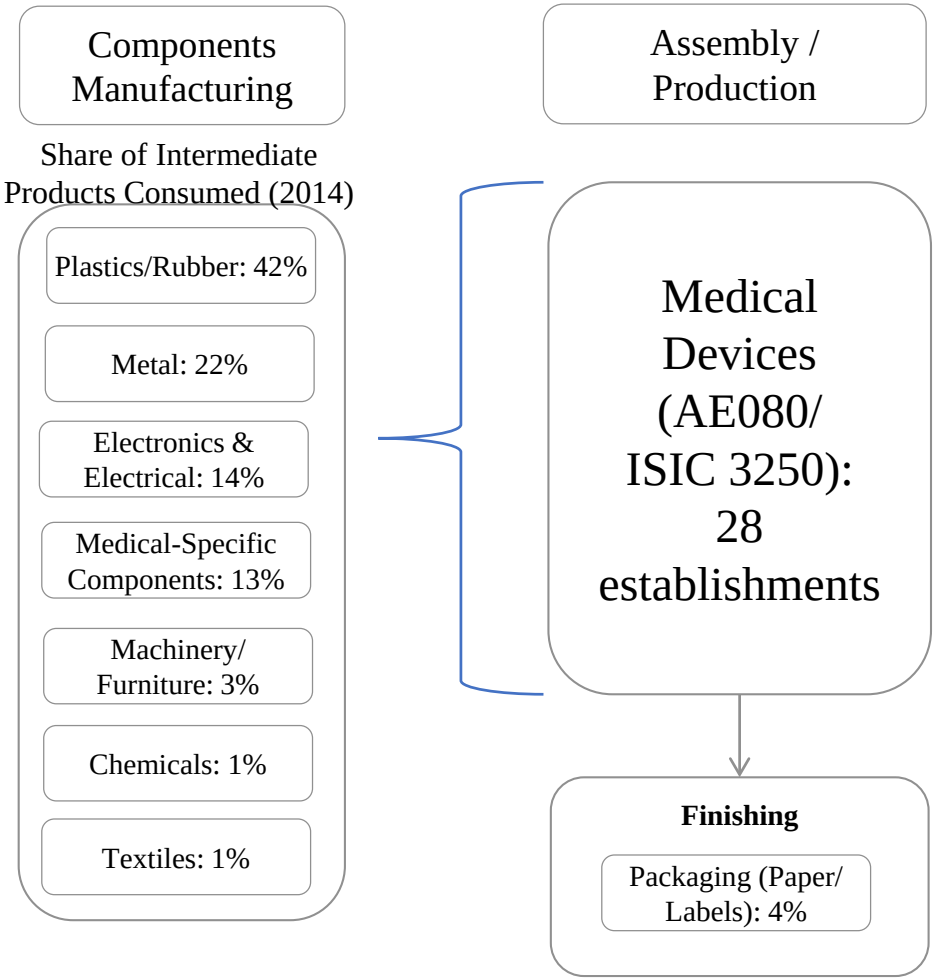
Number of Firms w/ ≥ 50% of exports in product category	
	0 - 2
	3 - 5
	6 – 8

Data Sources: Trade data: UNComtrade
Number of assembly companies: based on my analysis of companies in AE080 and product sectors based on HS codes.

Costa Rica in the Medical Device Global Value Chain, 2014/15: SUT for Medical Devices to Identify Intermediates Consumed

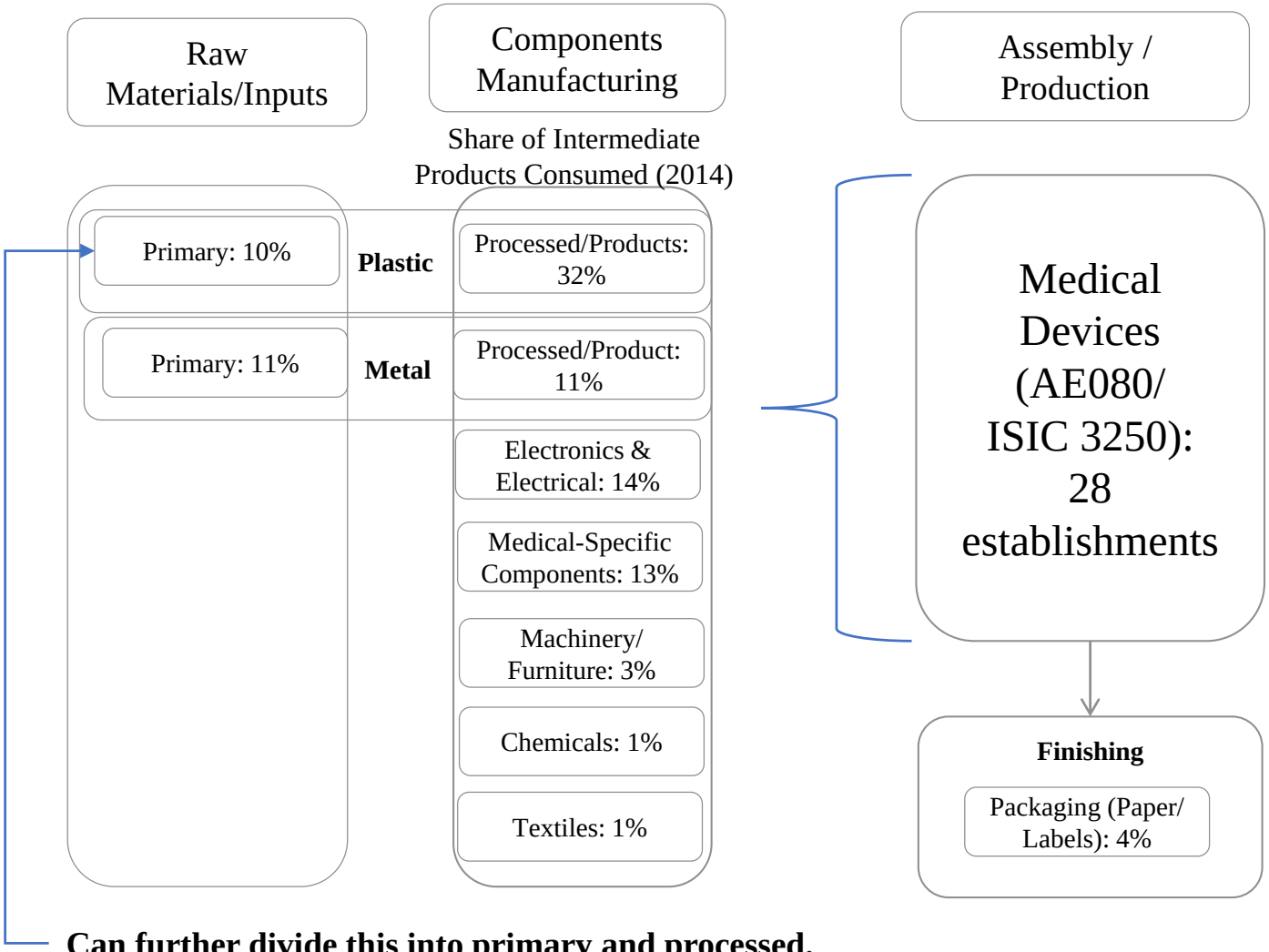
Manufactured inputs account for 64% of intermediate purchases.

We can also do this for services (which account for the remainder of purchases), but these are the segments where we can compare with the trade data by HS codes.



Data Sources: 2014 SUT for AE080
Table 1: Cuadro de Oferta y Utilizaction Detallado, Oferta de Productos a Precios Basicos y su Utilizacion a Precios de Comprador
Number of assembly companies: based on my analysis of companies in AE080 and product categories based on HS codes.
Number of establishments in medical devices: BCCR, Costa Rica

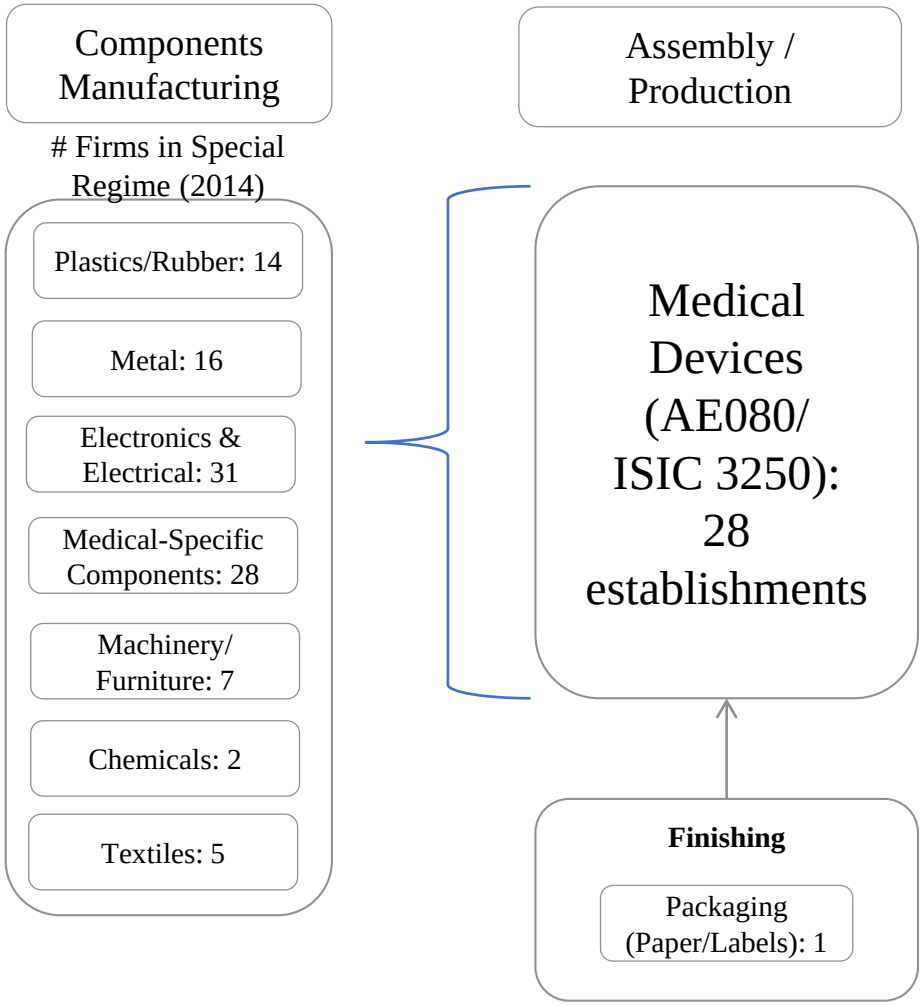
Costa Rica in the Medical Device Global Value Chain, 2014/15: SUT for Medical Devices to Identify Intermediates Consumed



Data Sources: 2014 SUT for AE080
Table 1: Cuadro de Oferta y Utilizaction Detallado, Oferta de Productos a Precios Basicos y su Utilizacion a Precios de Comprador

Costa Rica in the Medical Device Global Value Chain, 2014/15: Identify Number of Potential Suppliers/Linking (Backward Linkages)

Number of companies in the free zones in 2014 within each category (an 'upper bound'). This can be redone with # of companies outside the special regime, however MOST export-oriented firms make very few purchases outside the zones. Knowing the number would provide economic developers with a target of companies that could upgrade capabilities to become suppliers.



Data Sources: Number of component companies in the Special Regime, 2014, from BCCR.
Trade data: UNComtrade
Number of assembly companies: based on Stacey's analysis of companies in AE080 and product categories based on HS codes.

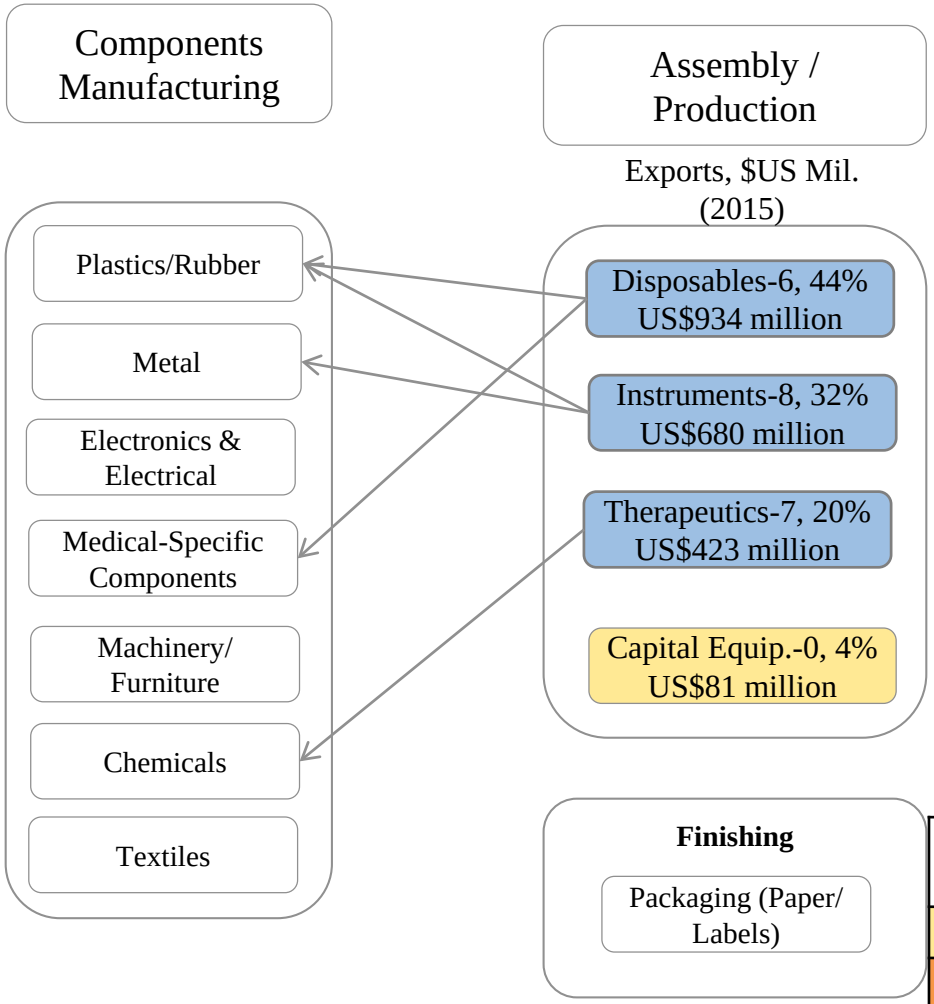
Costa Rica in the Medical Device Global Value Chain, 2014/15: Establishment-Level Import Data of Exporters

Upgrading potential backward linkages

Different products require different intermediate products

Could also be done with underlying data to create SUT

Can be further used to make proxy for technology-intensity



Can also be used to track domestic vs. imported inputs over time.

Based on aggregate data, 9% in 2014 vs. 6% in 2012.

An import matrix and TiVA indicators make similar higher-level estimations

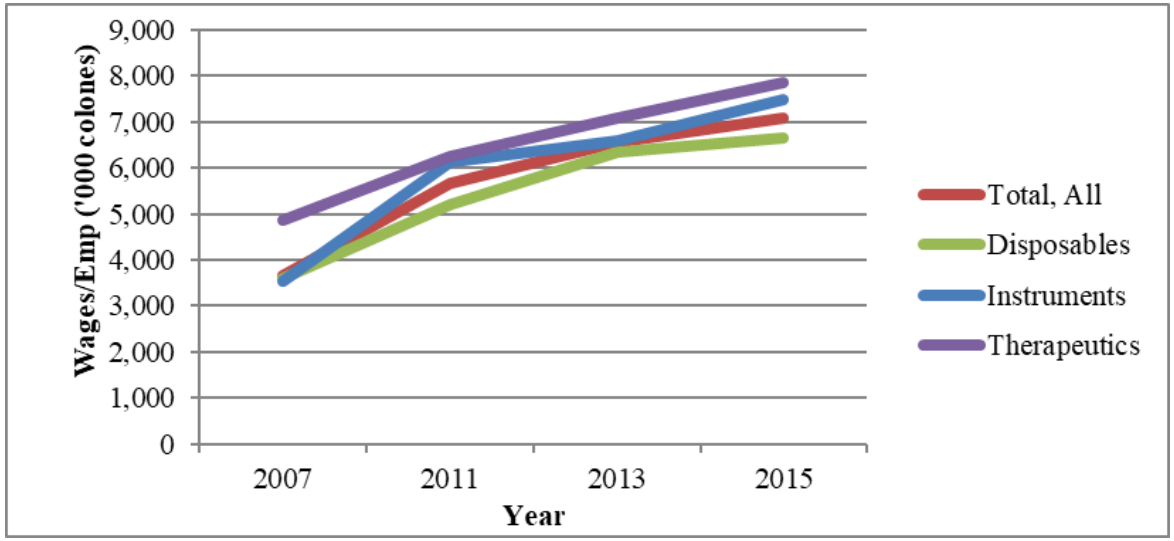
Data Sources: Import data (2014) of medical device (AE080) companies primarily exporting medical devices (26/28)

Costa Rica in the Medical Device Global Value Chain, 2014/15

- Use the SUT data to also map purchases of services (about 36% in 2014), of which:
  - Royalties (AE118): 20%
  - Admin/office support activities (AE123): 4.5%
  - Public services: 3%
  - Other: 8%

Data Sources: 2014 SUT for AE080
Table 1: Cuadro de Oferta y Utilizaction Detallado, Oferta de Productos a Precios Basicos y su Utilizacion a Precios de Comprador

Costa Rica in the Medical Device Global Value Chain, 2014/15:
Layering in Employment and Wages



- Disposables account for largest share of employment (and exports), but avg. wages/worker are lower.
- Within a GVC, ideally want to be able to move into sectors that offer higher-paying jobs or more skill-intensity (but difficult to do with available data)
- Occupation data would be better

What Else?

Other Points

- Trade and investment is with the United States (branch plants of MNEs).
- Costa Rica has continued to increase exports, employment, backward linkages and value-added in medical devices, and acquire FDI in presumably more skill-intensive sectors.

What GVC Theory Tells Us

- However facilities are still branch plants of MNEs.
- The ability to take on the tasks the MNEs do in the U.S. is limited.
- The first activities outsourced tend to be sourcing and logistics-related.

What's Not Available

- What the workers do; the ability for a company or a country to improve largely relates to skills and occupations.
  - This type of data is not collected at the enterprise level (if collected, often in household surveys)
  - Recommendations and benefits to policymakers were mostly in this area
- ISIC code of establishments that import products from Costa Rica (where linking country data would be useful).

Example: Costa Rica and Electronics

- Provides an example of how reporting under one code and accounting practices miss the ability to separate service and manufacturing activities.
- Manufacturing company initially set up an assembly plant in the country. However, over time shifted back office services (captive) and R&D/testing to the country as well. Workers in these positions accounted for one-third of the overall workforce, but no indicator of this in statistics. Observable in wages/worker only.
- Wages increased as a larger share of workers were in services instead of manufacturing.
- When manufacturing ceased, reclassified into a service code with no connection to electronics. However half of the firm's operations were doing the same thing as in the past.
- **Question:** based on existing systems, how would this be recorded? If the service activities were treated a secondary activity and entity from an accounting standpoint, they would have no connection to the electronics industry (which is the case now).