

Evolving Trends in Global Value Chain Analysis: Country Case Studies of Brunei Darussalam, Malaysia, and Singapore

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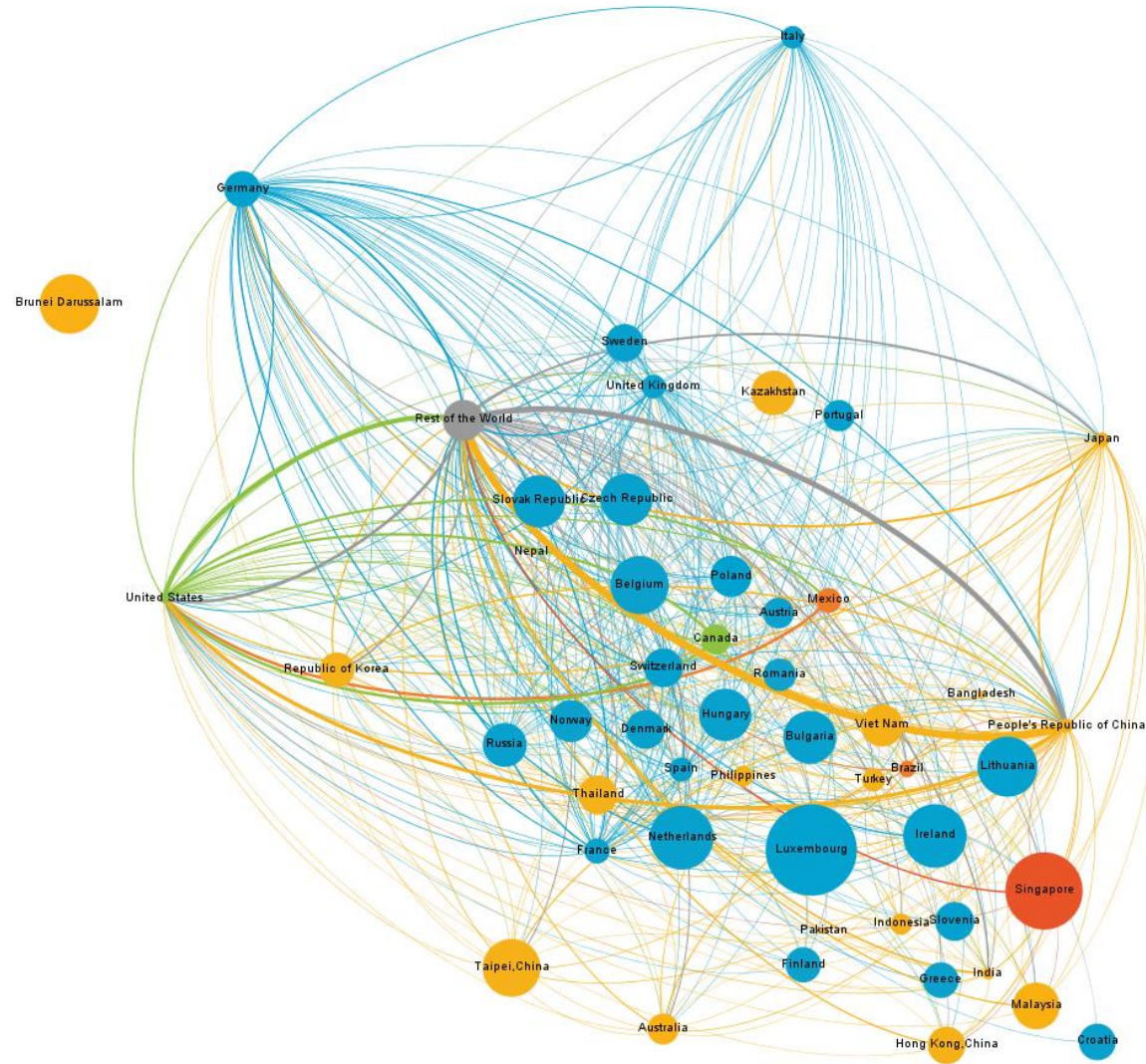
Outline

- I. Contextualization
- II. Framework and Methodology
 - a) ADB MRIOT and the Leontief Insight
 - b) GVC participation
 - c) Position in GVCs (upstreamness and APL)
 - d) New revealed comparative advantage
 - e) Gross exports decomposition
- III. Results
- IV. Conclusion

Contextualization

Why study GVCs?

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Framework and Methodology

The ADB MRIOT and the Leontief Insight

The Input-Output Framework

- Input-output tables allow us to pinpoint intersectoral and intercountry flows of intermediate and final products
- Multi-regional input-output tables provide a means to look at exports in value-added, not gross, terms
 - More appropriate measures of GVCs
 - Deeper forms of analyses and better foundations for policy recommendations

A Stylized Representation of a Multi-Regional Input-Output Table

		Intermediate Use (GN)								Final Demand (GF_n)													
		Country 1				...	ROW			Country 1				...	ROW			Total					
		c1	...		c35		c1	...		c35	f1	...		f5		f1	...		f5				
Intermediate Inputs (GN)	Country 1	c1	...		c35	Z								f								X	
		...																					
	Country 2	c1	...		c35																		
		...																					
	...																						
	ROW	c1	...		c35																		
Intermediate input total																							
Value Added (V_n)	VA 1	V'																					
						...																	
	VA 6																						
	Total					X'																	

DATA USED

ADB MRIO:

62 economies + RoW

35 industries

2000, 2007-2018

WIOD:

43 economies + RoW

mapped to 35 industries

2000-2006

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The Leontief Insight

- All decomposition methods in recent literature covering trade in value added and vertical specialization are fundamentally based on Leontief's (1936) input-output model
- Sectoral gross output in country s is used for intermediate and/or final consumption at home and/or abroad
- A system of equations for economy-sector gross output that can be expressed in matrix notation allowing for a total requirement matrix (i.e. Leontief inverse) to be derived
- The Leontief inverse allows us to answer this question: What amount of gross output of an economy-sector is required to produce a one-unit increase of final demand in another (or the same) economy-sector?

Framework and Methodology

Participation, Position, NRCA, and Gross Exports Decomposition

GVC Participation¹

- Forward Perspective: Decomposition of GDP by Country-Sector
 - Which types of production and trade are GVC activities?
 - A country-sector's total value-added in production of intermediate exports absorbed by direct importer (Simple GVCs)
 - A country-sector's total value-added in production of intermediate exports re-export/re-import (Complex GVCs)
- Backward Perspective: Decomposition of Final Goods Production by Country-Sector
 - Which part of final goods production and trade belong to GVCs?
 - Partner country's value-added in intermediate imports used in the production of domestic used products (Simple GVCs)
 - Domestic and foreign value-added in intermediate imports used in the production of exported products (Complex GVCs)

¹ Wang, Wei, Yu, and Zhu, 2017

Review: Participation

- Forward → Value-Added Decomposition
 - How much of total value-added is generated in the production of intermediates?
- Backward → Final Production Decomposition
 - How much GVC-related value-added is embodied in total production?

Upstreamness²

- An economy-sector's position in GVCs can be quantified through the upstreamness index, which is simply its average distance from final demand.
- Mathematically, the upstreamness of sector r in economy i is given by:

$$U_i^r = 1 \cdot \frac{Y_i^r}{X_i^r} + 2 \cdot \frac{\sum_{s=1}^S \sum_{j=1}^J a_{ij}^{rs} Y_j^s}{X_i^r} + 3 \cdot \frac{\sum_{s=1}^S \sum_{j=1}^J \sum_{t=1}^S \sum_{k=1}^J a_{ij}^{rs} a_{jk}^{st} Y_k^t}{X_i^r} + \dots$$

² Antràs and Chor, 2013 and 2018; Fally, 2012

Upstreamness

$$U_i^r = 1 \cdot \frac{Y_i^r}{X_i^r} + 2 \cdot \frac{\sum_{s=1}^S \sum_{j=1}^J a_{ij}^{rs} Y_j^s}{X_i^r} + 3 \cdot \frac{\sum_{s=1}^S \sum_{j=1}^J \sum_{t=1}^S \sum_{k=1}^J a_{ij}^{rs} a_{jk}^{st} Y_k^t}{X_i^r} + \dots$$

- Intuitively, higher values of U_i^r result from terms with larger weights not being equal to zero, thus providing us information that an economy-sector's output goes through several more stages of production before reaching final use (Miller and Temurshoev, 2017).

Average Production Length³

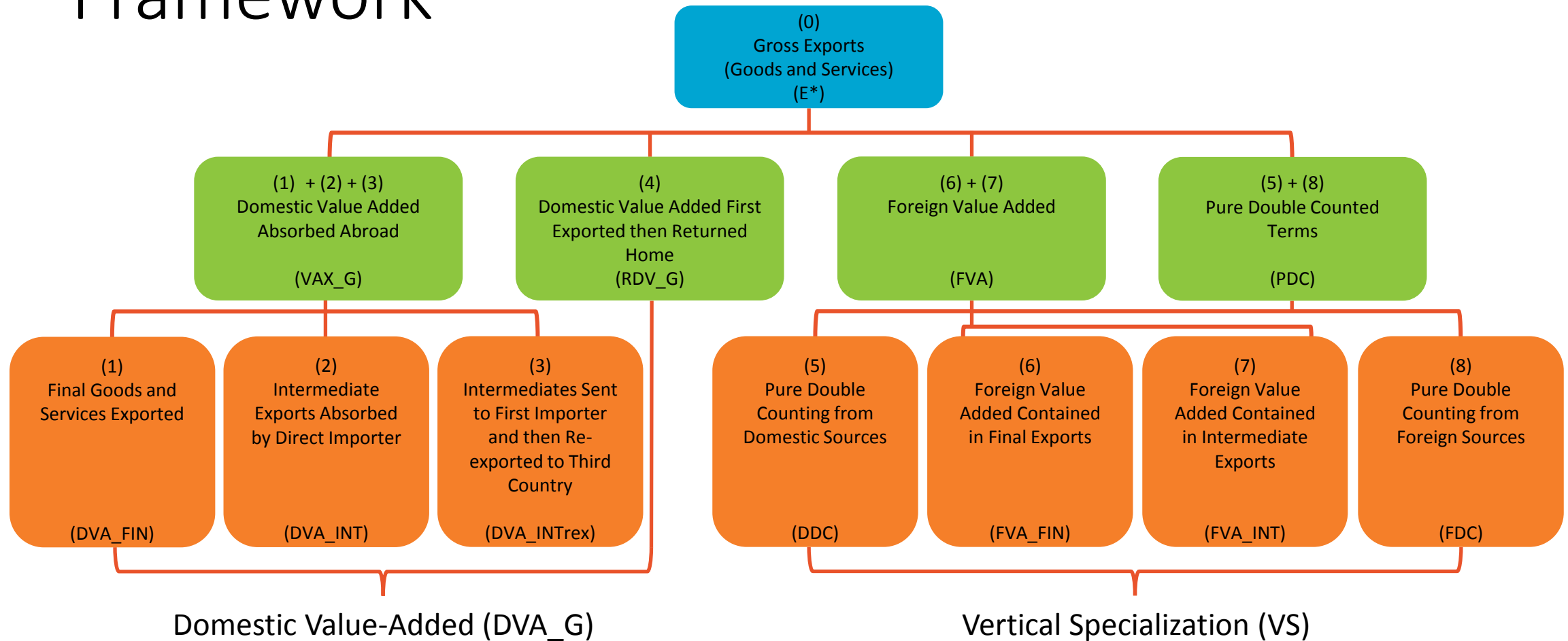
- Also computed based on forward and backward industrial linkages, which further provides three sub-measures based on pure domestic, traditional trade, and GVC production activities
- Forward: How many stages of production does an economy-sector's value added go through before reaching final consumption?
- Backward: How many stages of production do an economy-sector's final goods and services require before reaching final consumption?

³ Wang, Wei, Yu, and Zhu, 2017

Average Production Length

- The GVC position is then derived as the ratio of the GVC production length based on forward industrial linkages to the GVC production length based on backward industrial linkage.
- By comparing all economy-sectors in terms of their GVC position index, sectors with relatively high index values are considered to be more upstream in the economy.

Gross Trade Accounting: Conceptual Framework⁴



⁴ Wang, Wei, and Zhu, 2018

Revealed Comparative Advantage⁵ Using Value-Added

- Revealed comparative advantage using domestic value-added through the forward linkage:

$$NRCA_i^r = \left(\frac{DVA_{F_i^r}}{\sum_{i=1}^N DVA_{F_i^r}} \right) / \left(\frac{\sum_{k=1}^G DVA_{F_i^k}}{\sum_i^N \sum_{k=1}^G DVA_{F_i^k}} \right)$$

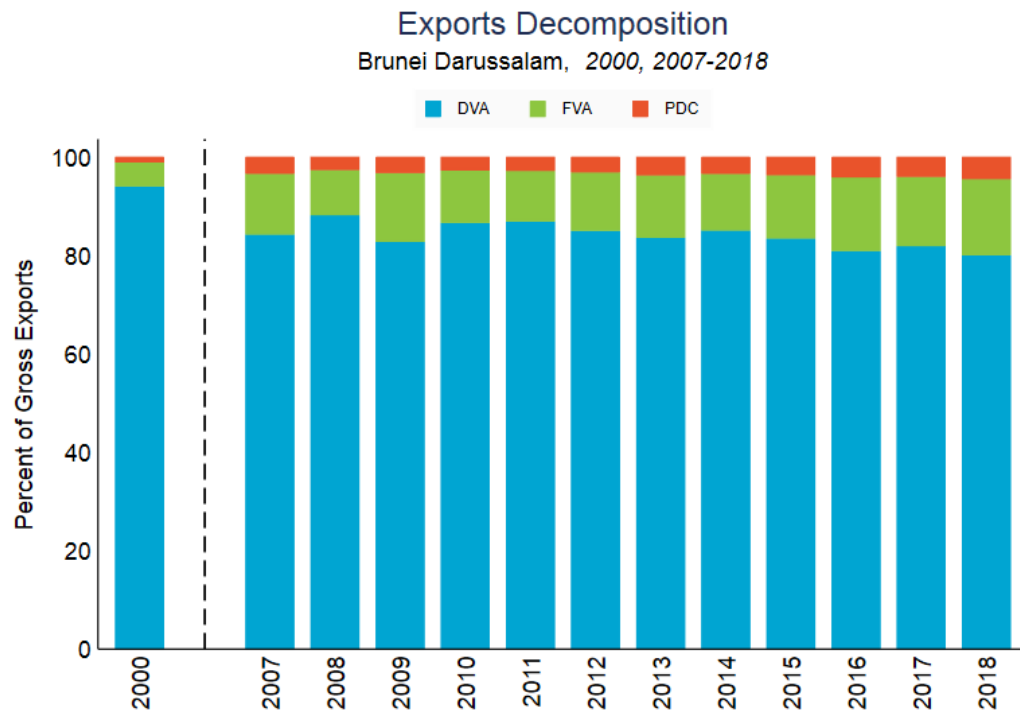
- NRCA accounts for indirect exports of an economy-sector's value-added through the exports of other sectors
- It also accounts for the fact that foreign value-added may be present in an economy-sector's exports if it uses imported intermediates as inputs to production

⁵ Balassa, 1965; Wang, Wei, and Zhu, 2018

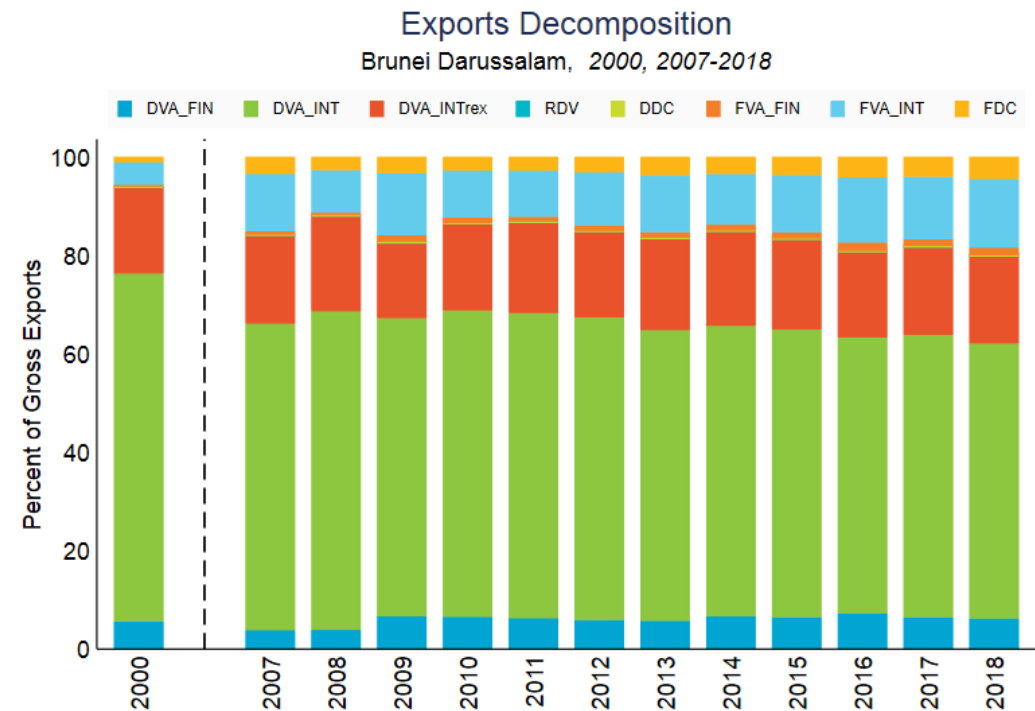
Results: Brunei

Decreasing Contribution by the Oil and Gas Industry and the Pursuit for Diversification

For Brunei's gross exports, most of the value-added contributions came from i) domestic sources and ii) intermediates but DVA's dominance gradually declined over time.

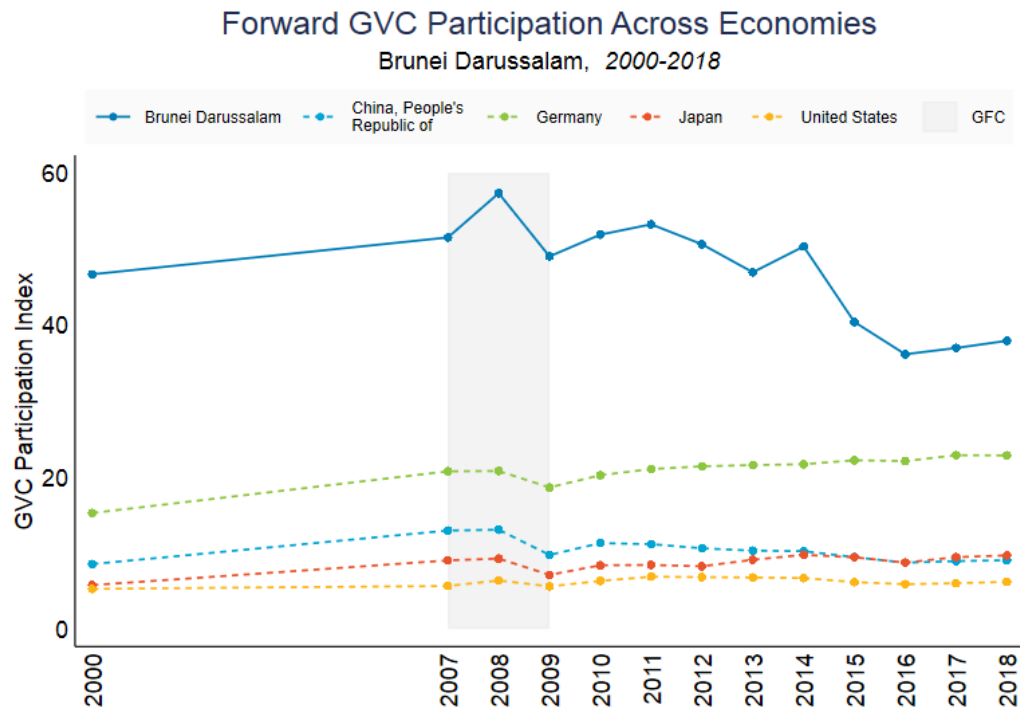


Source: ADB estimates based on WWYZ (2018) using ADB-MRIO (2000, 2007-2018).

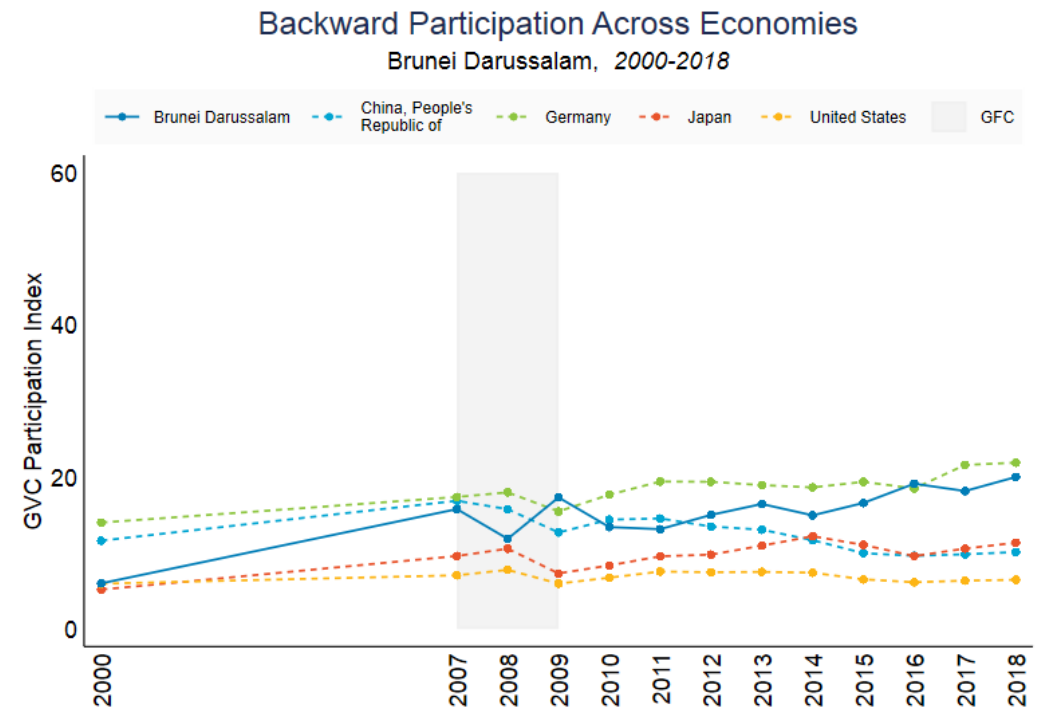


Source: ADB estimates based on WWYZ (2018) using ADB-MRIO (2000, 2007-2018).

Brunei's participation indices moved in opposite directions, but it is apparent that the economy participated more in terms of providing value-added.

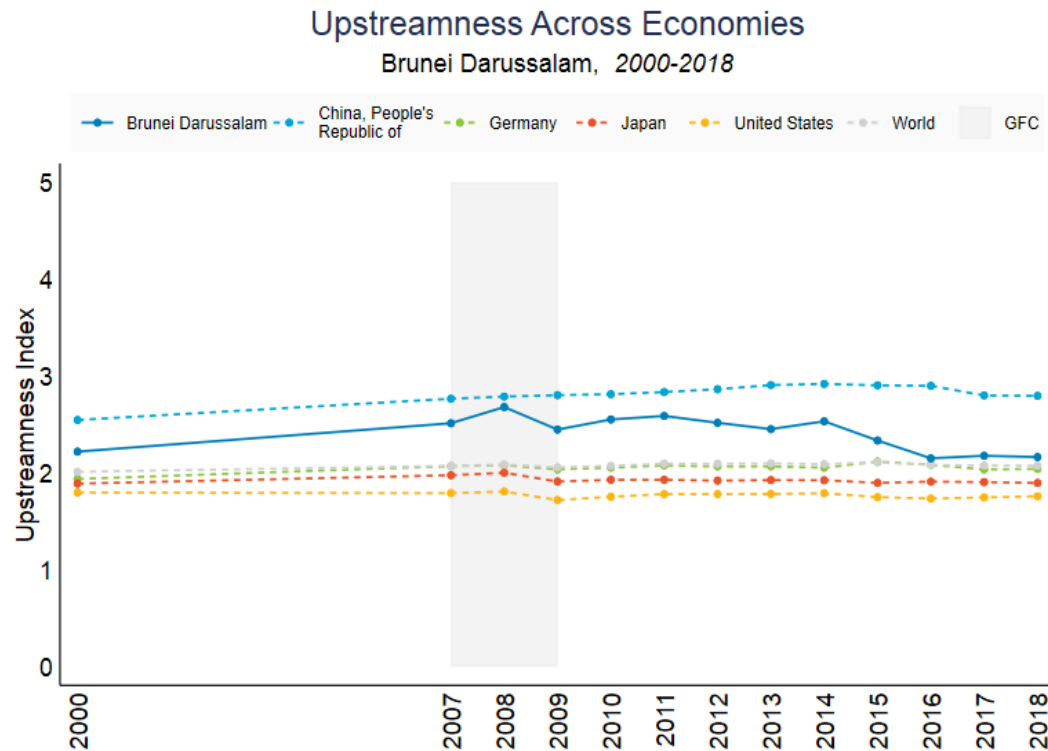


Source: ADB estimates based on WWYZ (2018) using ADB-MRIO (2000, 2007-2018).

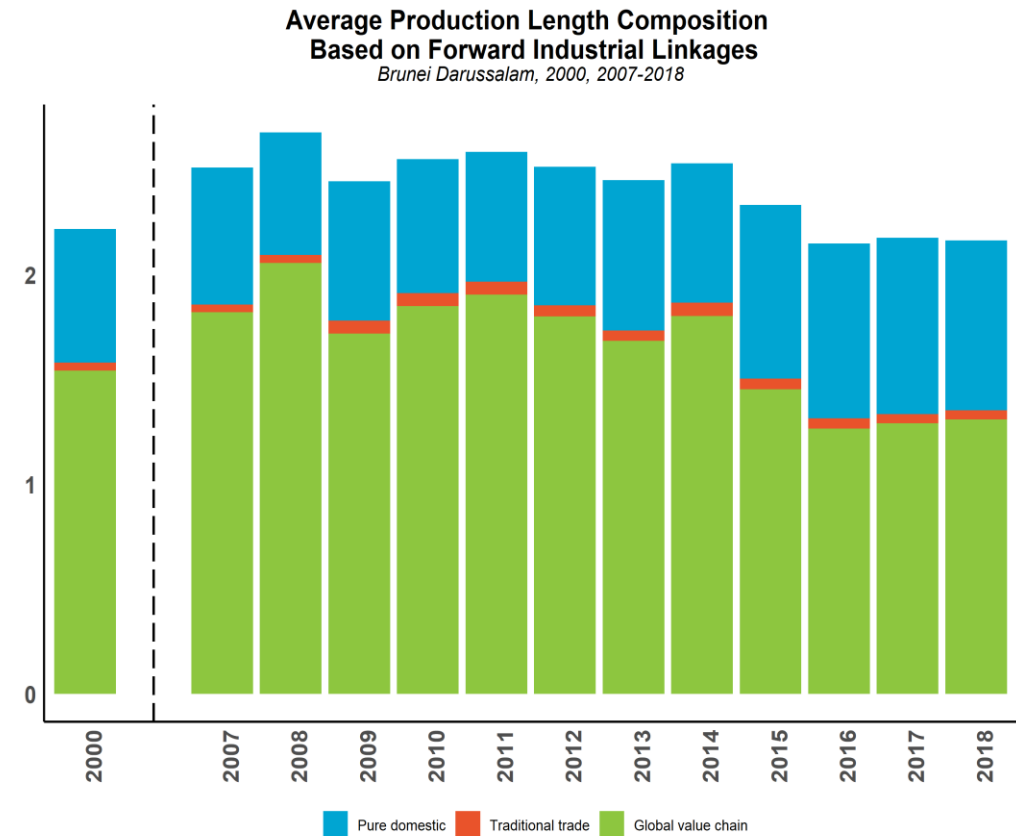


Source: ADB estimates based on WWYZ (2018) using ADB-MRIO (2000, 2007-2018).

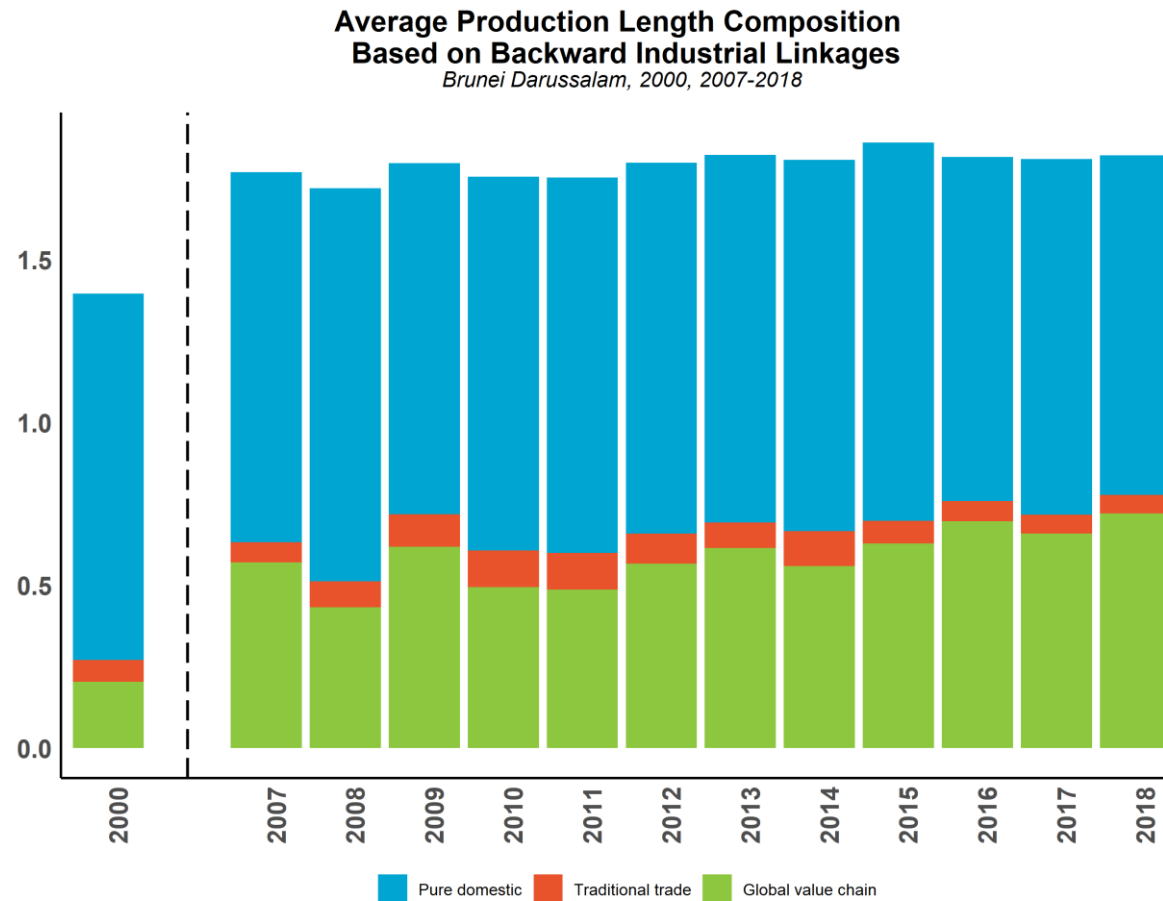
Brunei had decreasing trends in upstreamness and forward-linkage-based production lengths.



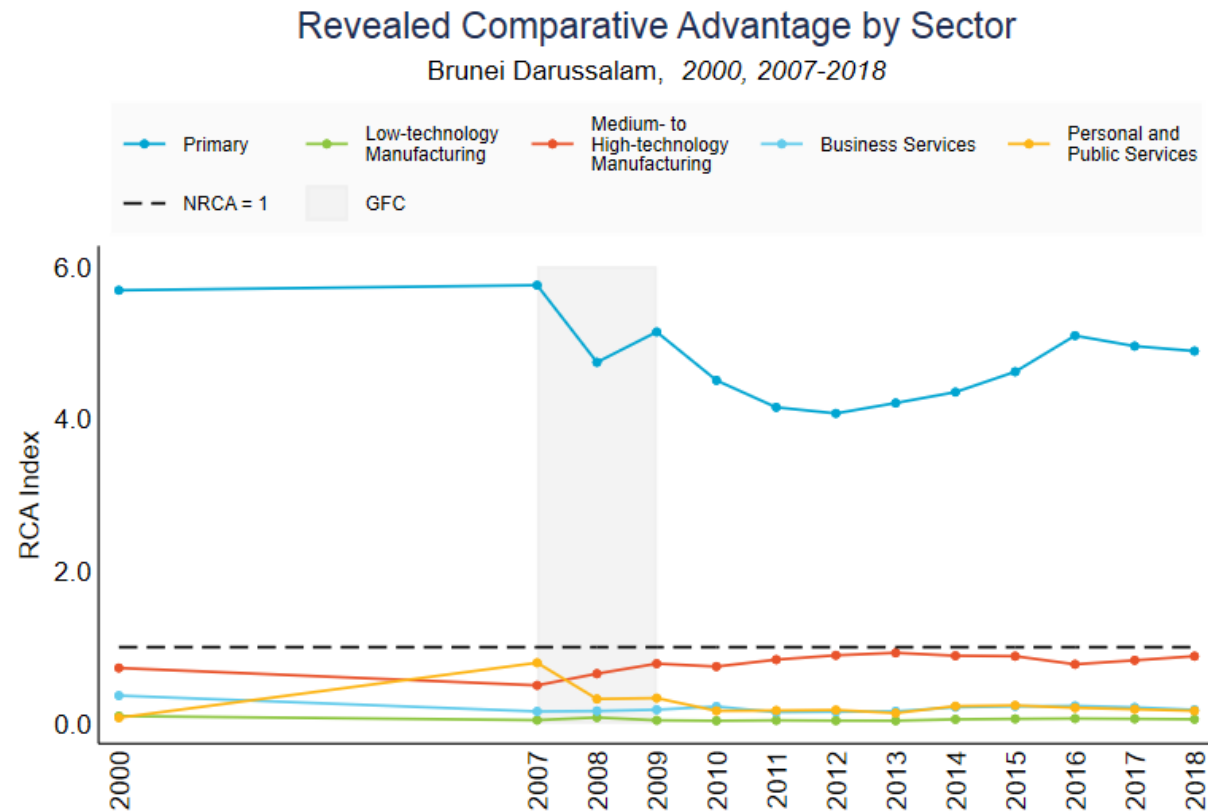
Source: ADB estimates based on WWYZ (2018) using ADB-MRIO (2000, 2007-2018).



Brunei's backward-linkage-based production length index increased and this was mirrored by the trend in the GVC-related component.



From 2000-2018, only one broad sector in Brunei had a comparative advantage based on NRCA.

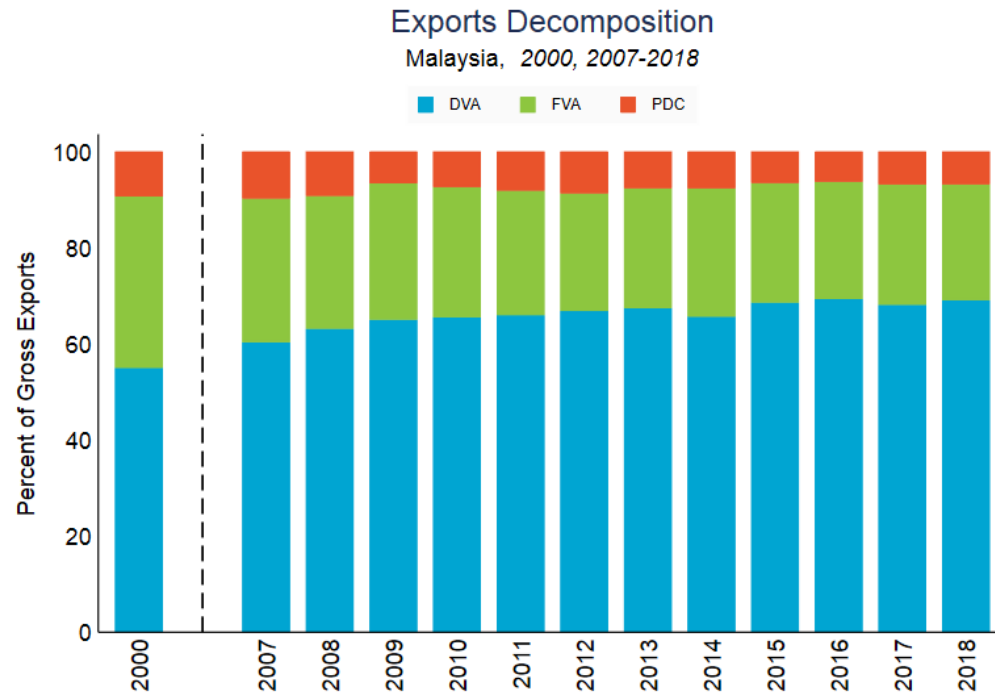


Source: ADB estimates based on WWZ (2018) using ADB-MRIO (2000, 2007-2018).

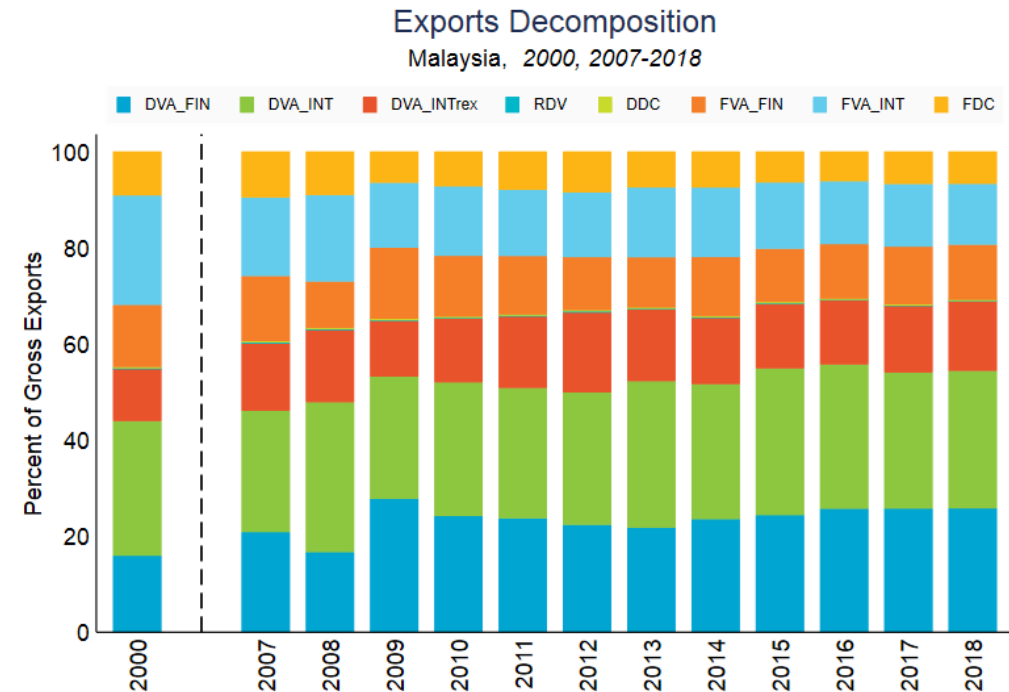
Results: Malaysia

Transition to more inward-looking economic strategies and de-industrialization

Domestic sources of value-added became more central to Malaysia's gross exports. Trade also came mostly in the form of intermediates.

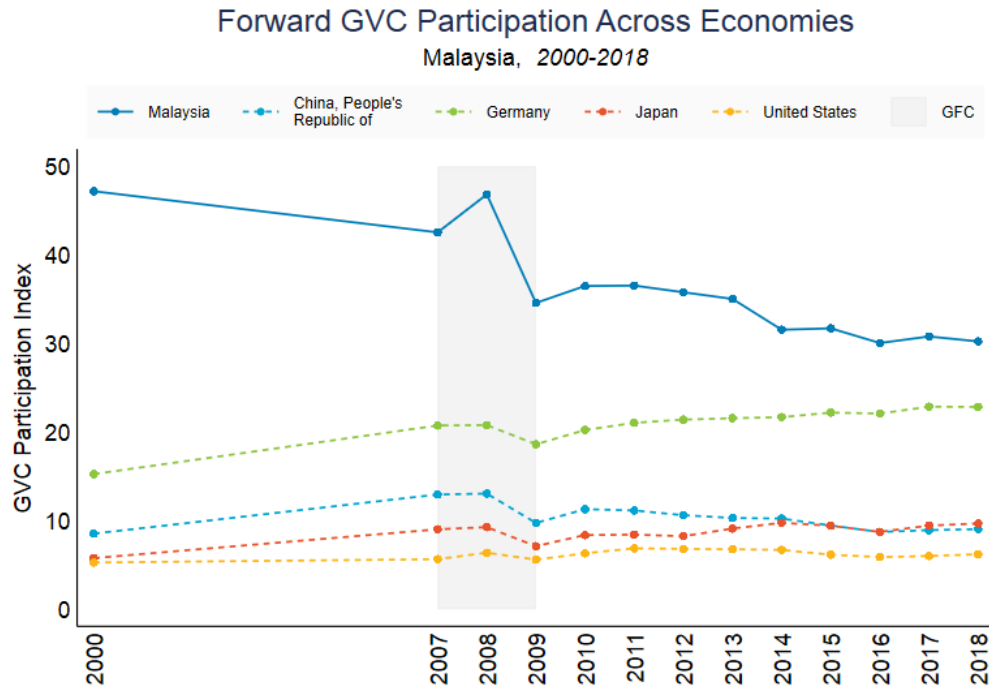


Source: ADB estimates based on WWYZ (2018) using ADB-MRIO (2000, 2007-2018).

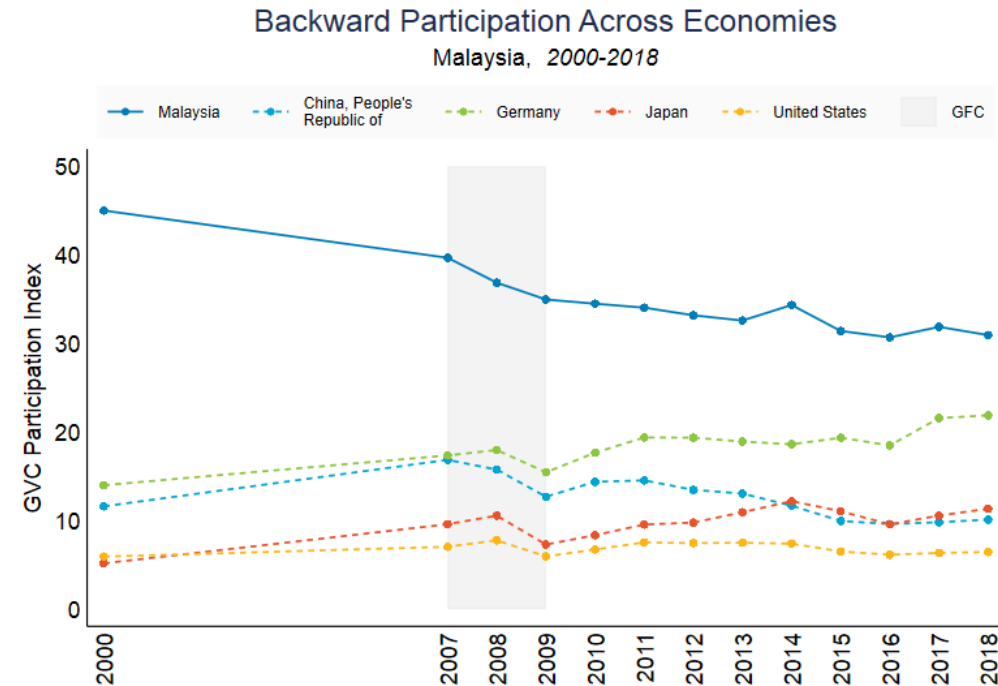


Source: ADB estimates based on WWYZ (2018) using ADB-MRIO (2000, 2007-2018).

Malaysia's forward and backward participation declined over time.

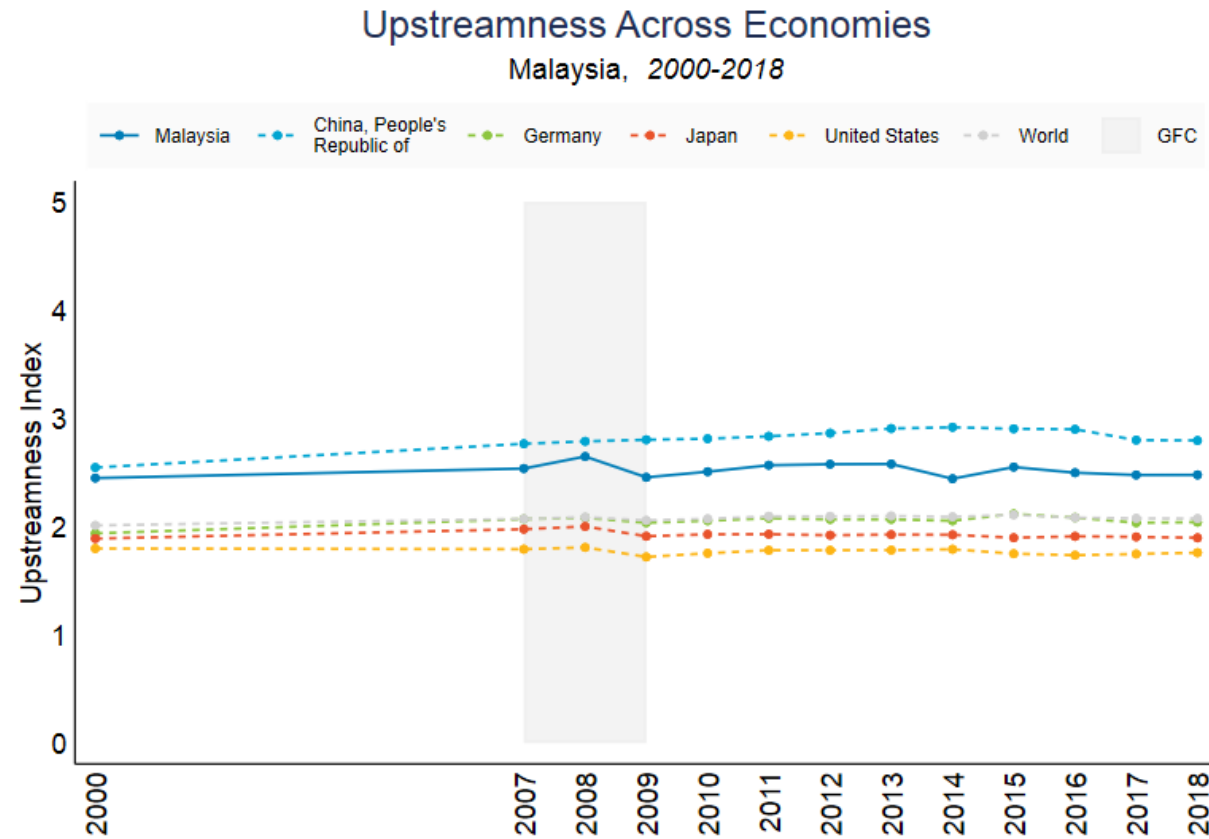


Source: ADB estimates based on WWYZ (2018) using ADB-MRIO (2000, 2007-2018).



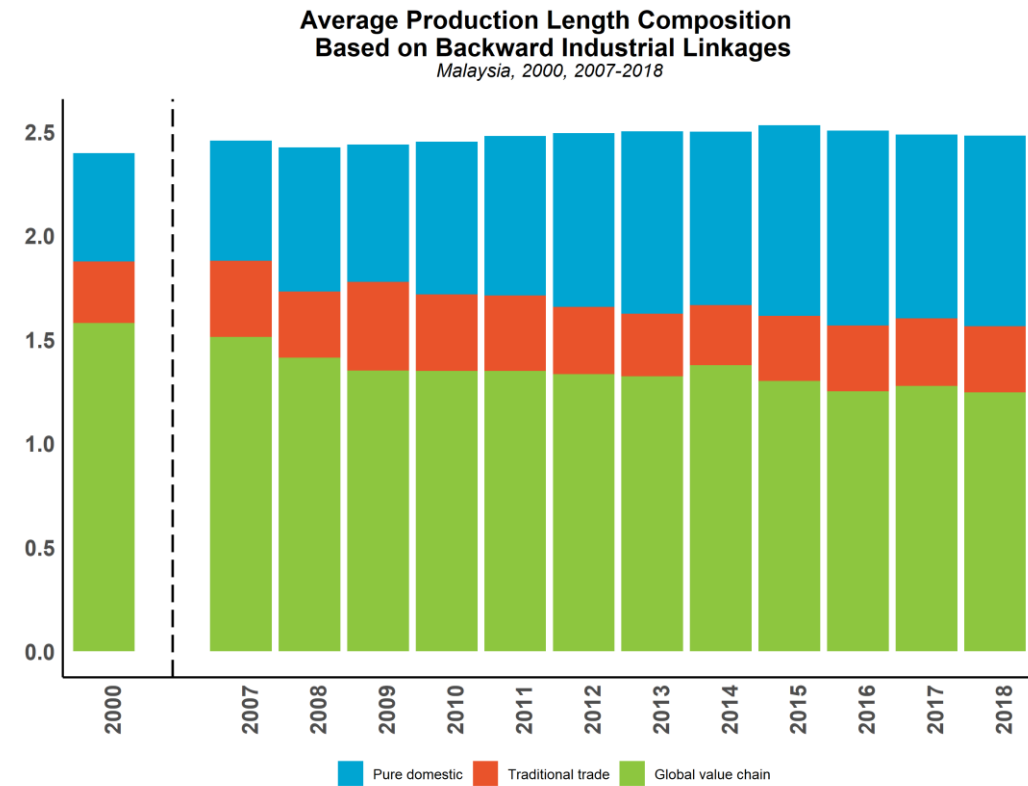
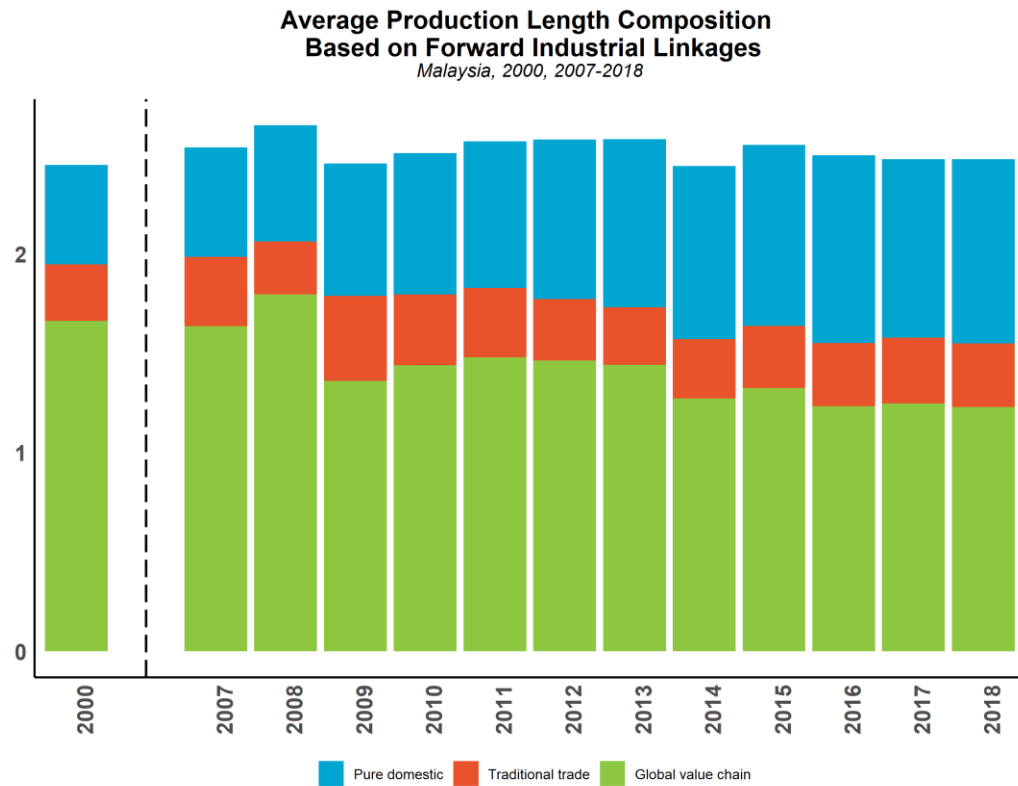
Source: ADB estimates based on WWYZ (2018) using ADB-MRIO (2000, 2007-2018).

Malaysia had relatively stable average upstreamness indices.

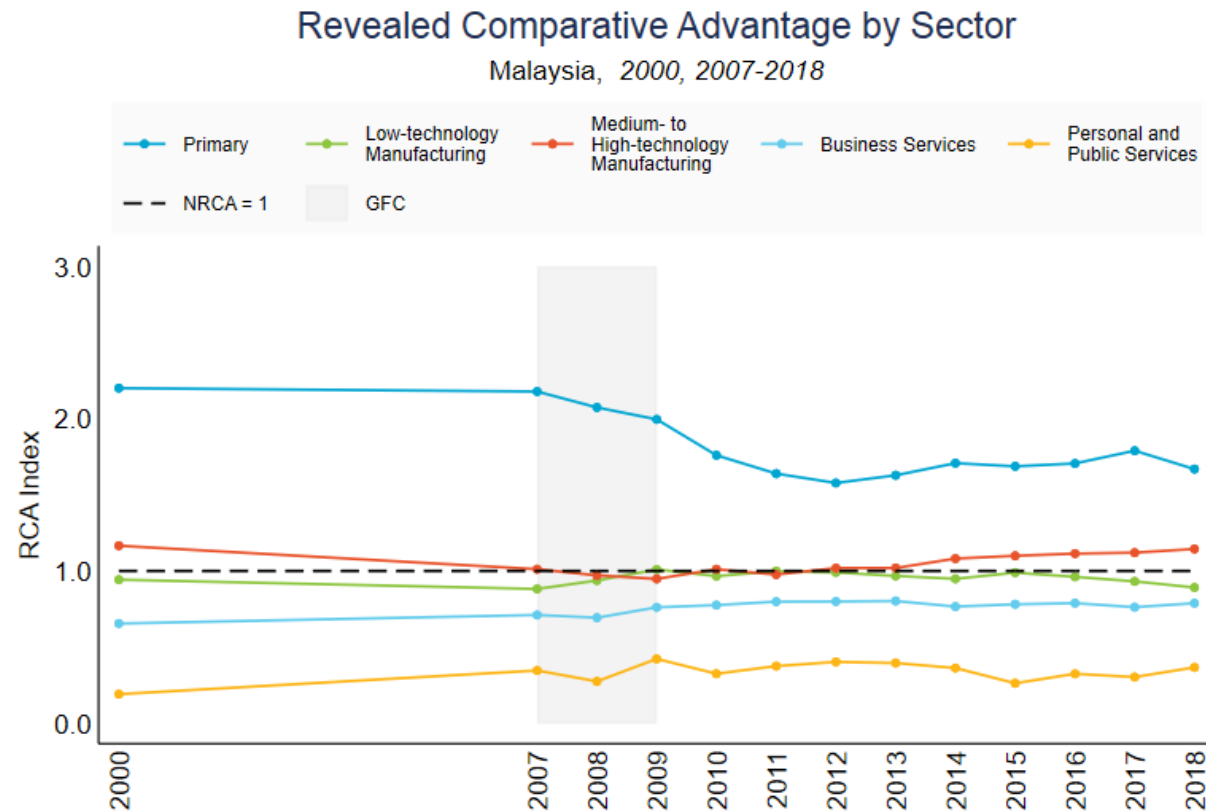


Source: ADB estimates based on WWYZ (2018) using ADB-MRIO (2000, 2007-2018).

Decomposing Malaysia's production activities offer some insight on pattern shifts that occurred over time.



From 2000-2018, Malaysia had a comparative advantage in the primary and medium- to high-technology aggregate sectors.

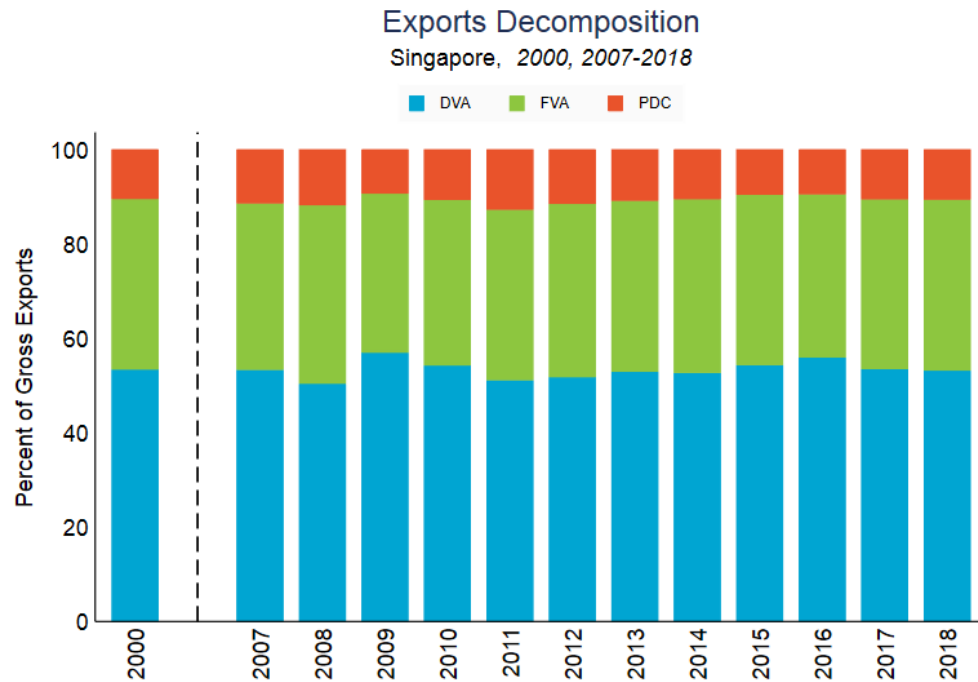


Source: ADB estimates based on WWZ (2018) using ADB-MRIO (2000, 2007-2018).

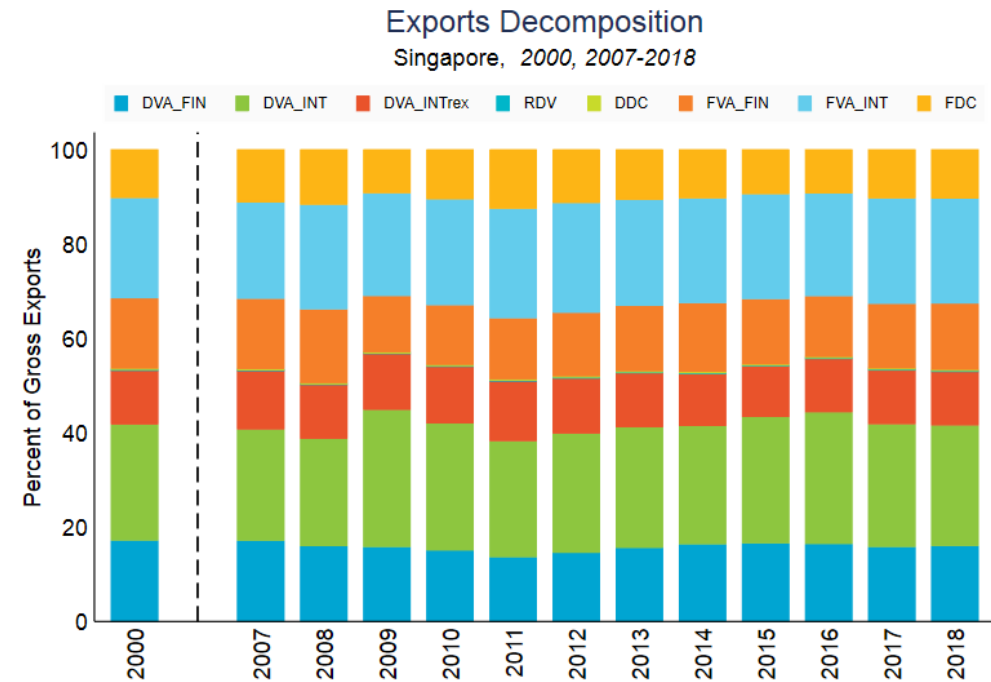
Results: Singapore

Consistency Across the Board and the Challenge of Innovation

Singapore's gross exports displayed a steady structure both at the 3- and 8-term level.

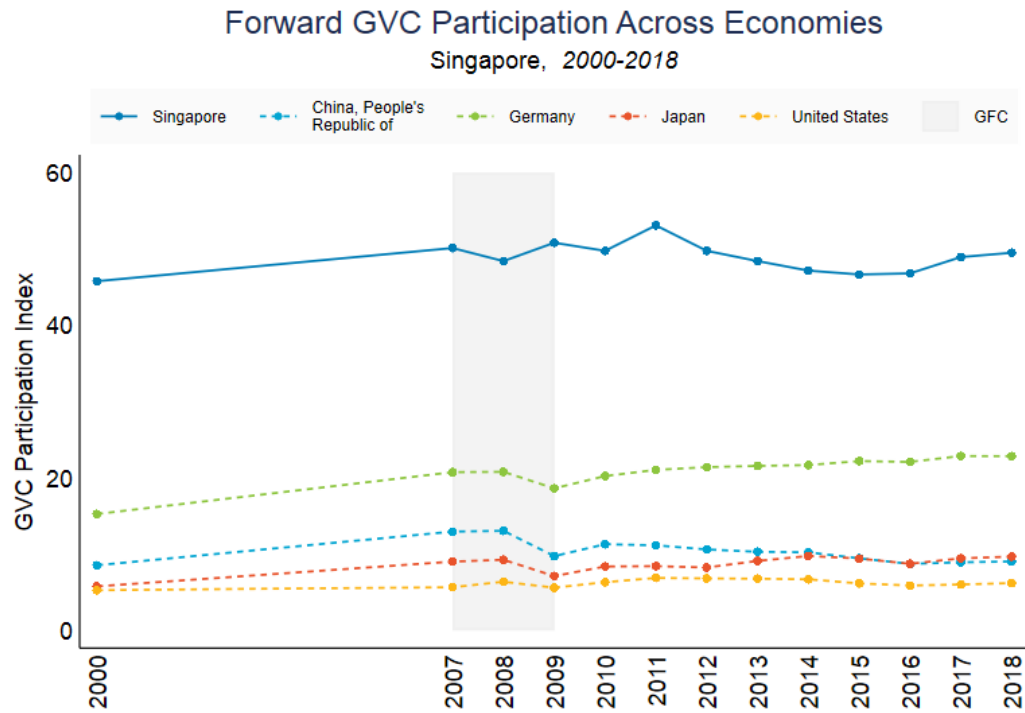


Source: ADB estimates based on WWYZ (2018) using ADB-MRIO (2000, 2007-2018).

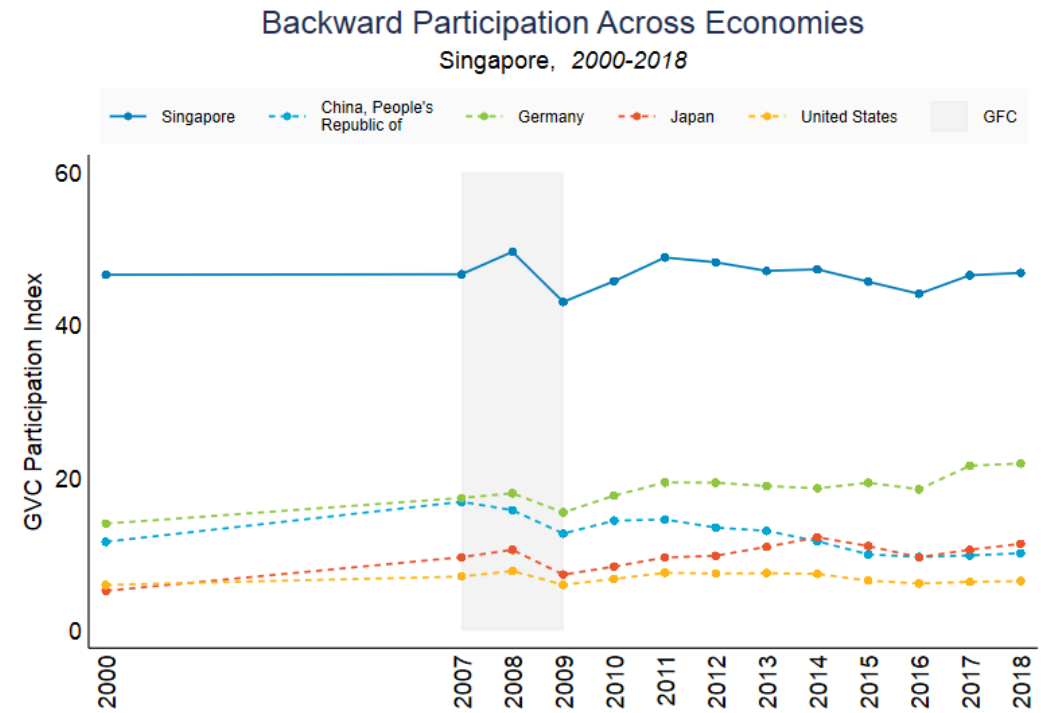


Source: ADB estimates based on WWYZ (2018) using ADB-MRIO (2000, 2007-2018).

Singapore's forward and backward participation remained relatively high and steady over time.

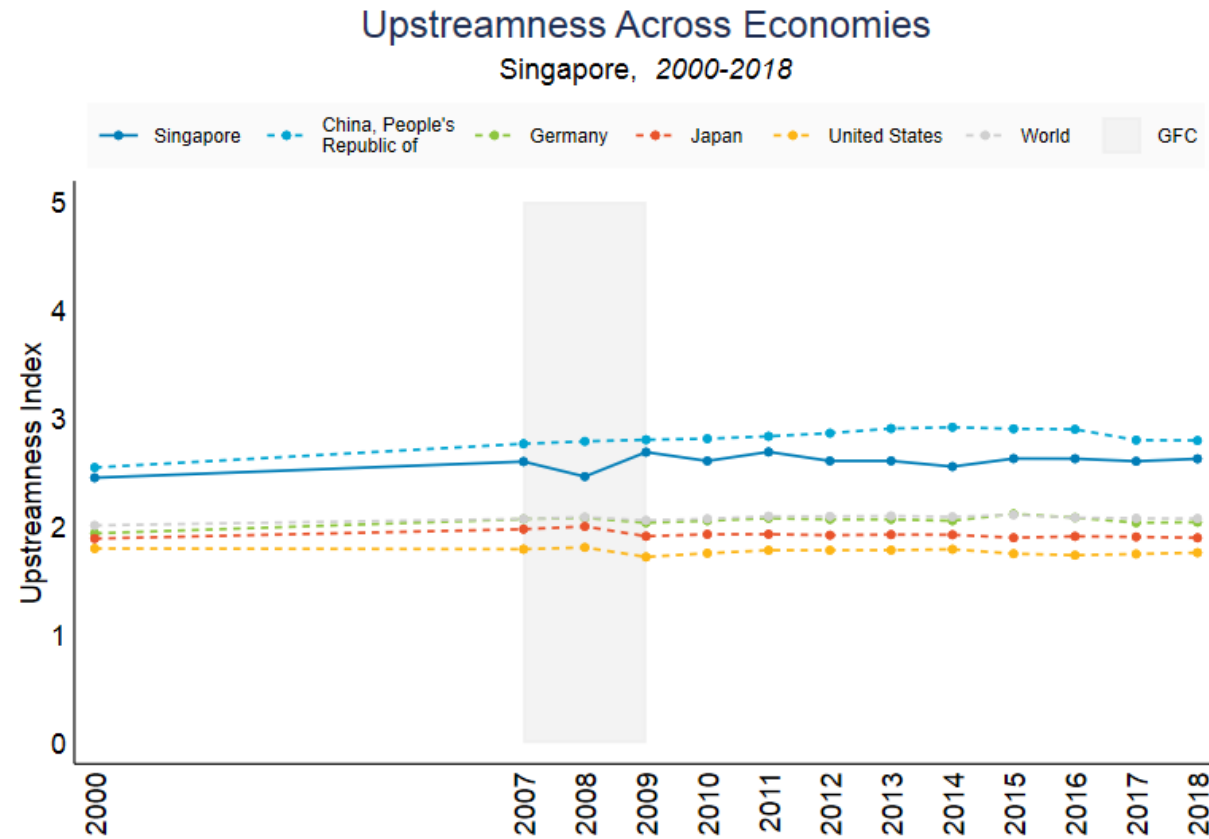


Source: ADB estimates based on WWYZ (2018) using ADB-MRIO (2000, 2007-2018).



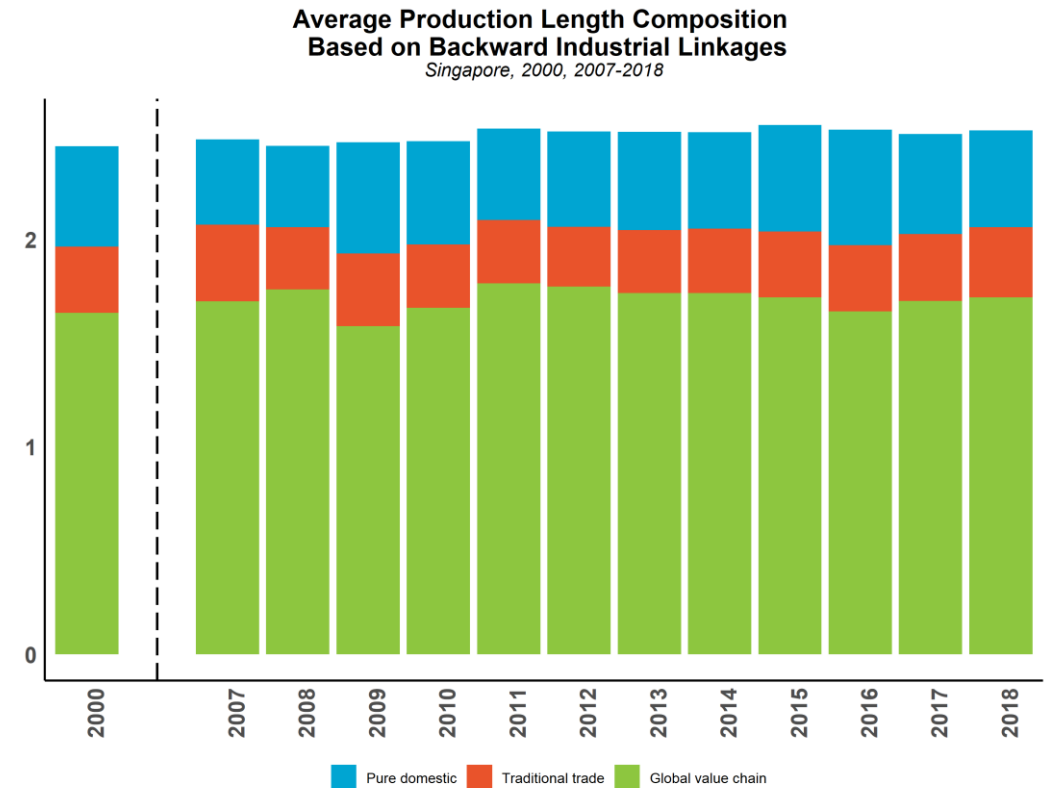
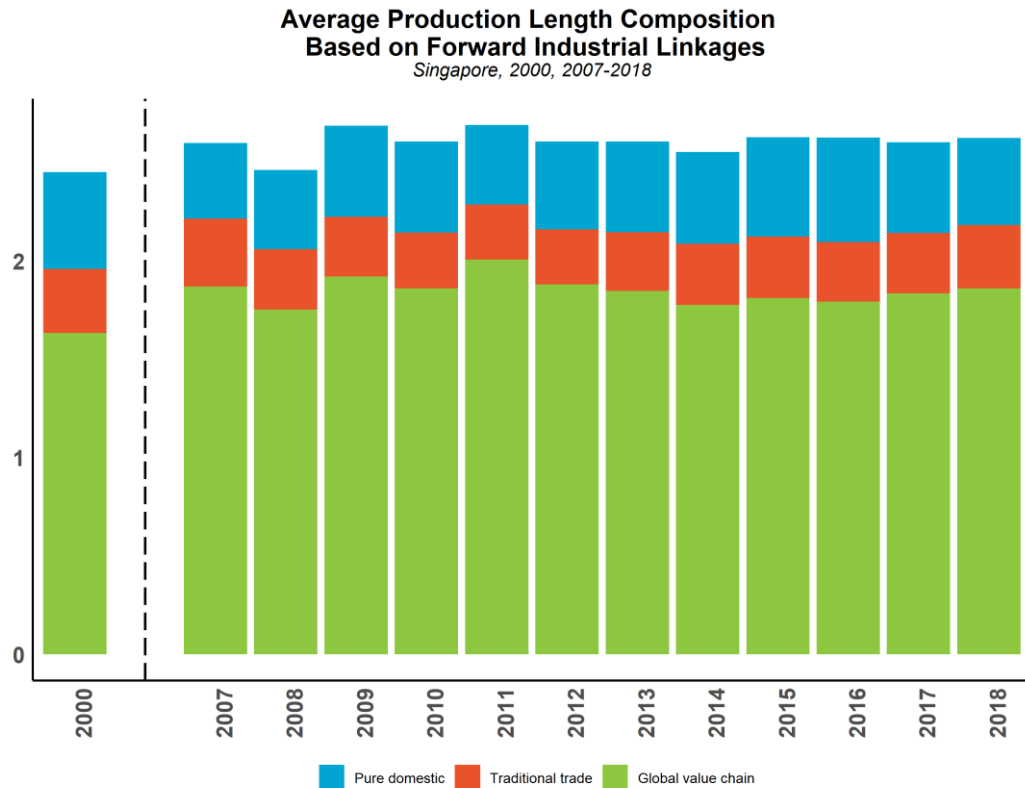
Source: ADB estimates based on WWYZ (2018) using ADB-MRIO (2000, 2007-2018).

Singapore had relatively stable average upstreamness indices.

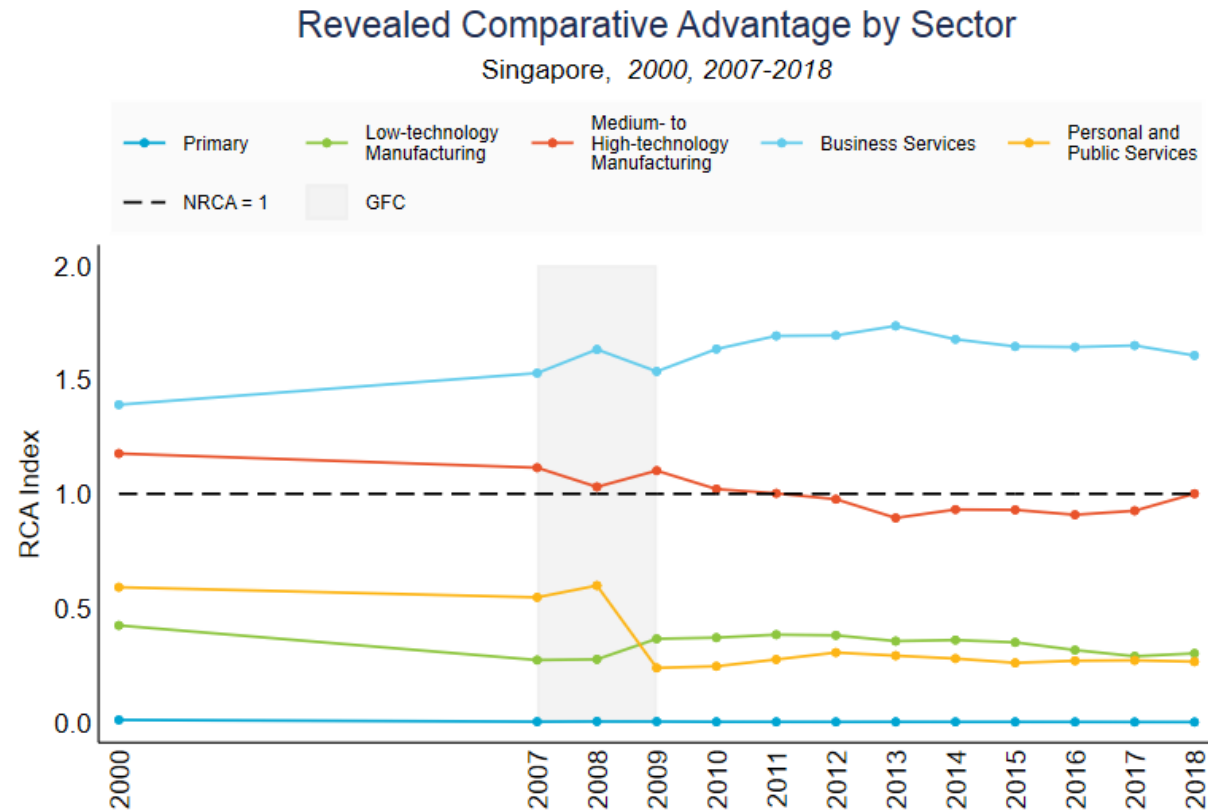


Source: ADB estimates based on WWYZ (2018) using ADB-MRIO (2000, 2007-2018).

Decomposing Singapore's production activities also show very little changes occurred.



Singapore had a comparative advantage in business services and medium- to high-technology manufacturing sectors for most periods.



Source: ADB estimates based on WWZ (2018) using ADB-MRIO (2000, 2007-2018).

Conclusion

1. Considerable variations in participation and roles in global production networks across the economies of Brunei, Malaysia, and Singapore were noted from 2000 and 2018.
2. Overall, though Brunei's reliance on domestic sources of value-added remained persistent, the results suggest that the economy gradually welcomed more foreign sources over time as a response to lower oil prices and its diversification objectives.
3. Malaysia appears to have had less involvement in trade over time and has become more reliant on domestic sources of value-added in exports.
4. Singapore displayed consistency in its GVC indicators. Among the three economies, the results suggest that Singapore was the most involved in terms of trade, which can be attributed to its dearth of natural resources and its policies supporting both free trade and openness.