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**Functional Specialization in International Trade:
An Exploration Using Occupations Data**

Paper submitted by

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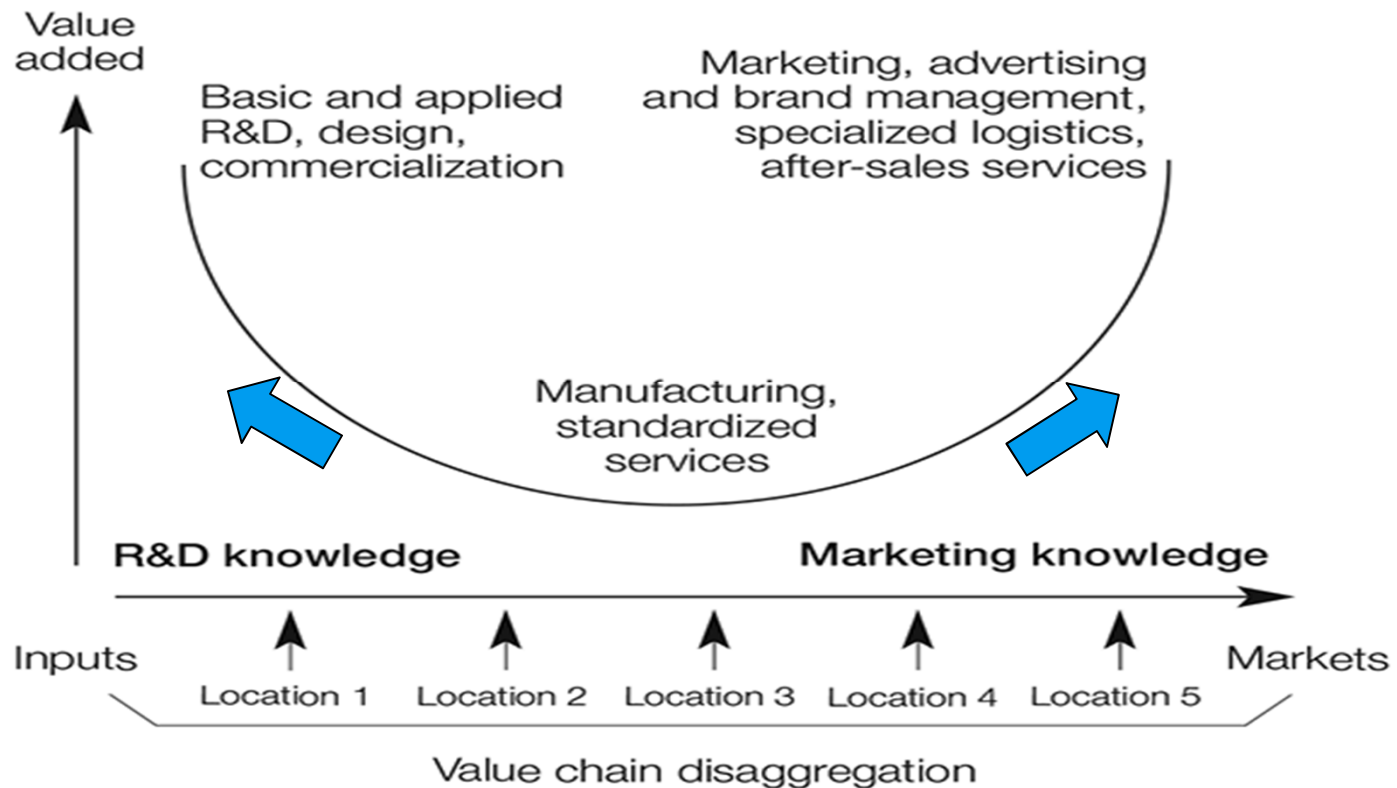


- A country's ability to compete internationally critically depends on its ability to generate jobs and income without running into long-run balance of payments difficulties
- Due to international fragmentation of production standard measures of competitiveness based on gross exports become less informative
- International competition increasingly plays out at the level of *activities or business functions* within industries, rather than at the level of whole industries or products



Acquisition of new and more sophisticated activities within an existing value chain (product line) that require higher skill content.

Figure 1: The “smile” shape of value creation



Source: Mudambi (2008).



1. Introduce new measure of functional specialization in international trade

- Requires national input-output tables and
- Information on occupations and wage of workers (e.g. from labor force survey)

2. Analyze trends

- Domestic value added exports by function
- In which functions are countries specializing in trade?



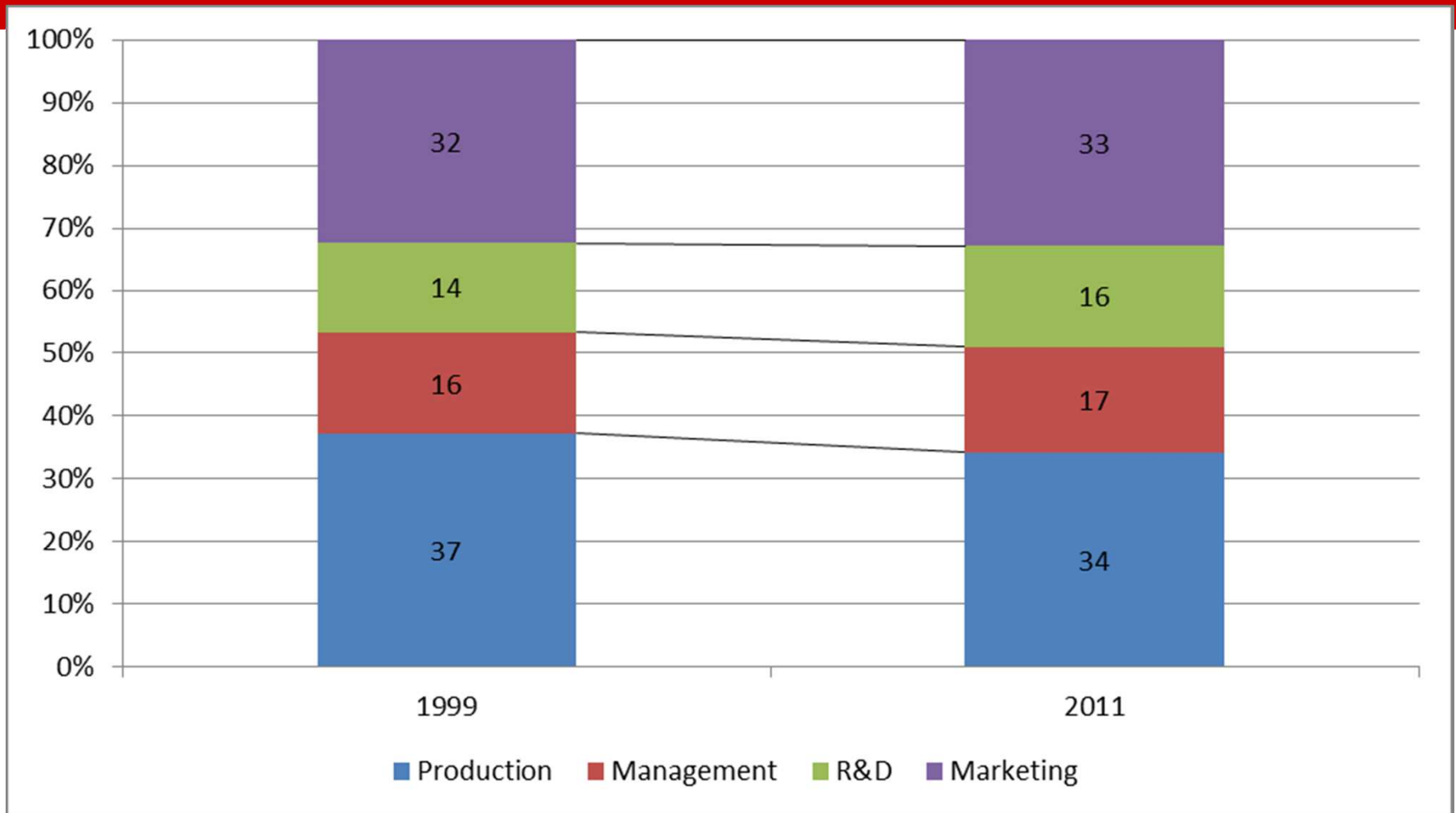
- Hummels, Ishii and Yi (2001 JIE) propose to measure vertical specialization by the import content of exports
- Los, Timmer, and de Vries (2016 AER) provide a simple and intuitive approach to measure domestic value added in exports
- Domestic value added in exports is the sum of income accruing to the production factors capital and labor.
- Here: identify domestic value added exports of a particular function by the labor income of workers that perform the function.



- Use information on the occupation and wage of workers.
- Collected and harmonized occupations data for a set of forty advanced and emerging countries from labor force surveys and population censuses.
27 members of the European Union (per January 2007), Australia, Brazil, Canada, China, India, Indonesia, Japan, Mexico, Russia, South Korea, Taiwan, Turkey and the United States.
- Map occupations to activities and combine with information on inter-industry and inter-country trade flows from the World Input-Output Database (WIOD, Timmer et al. 2015).



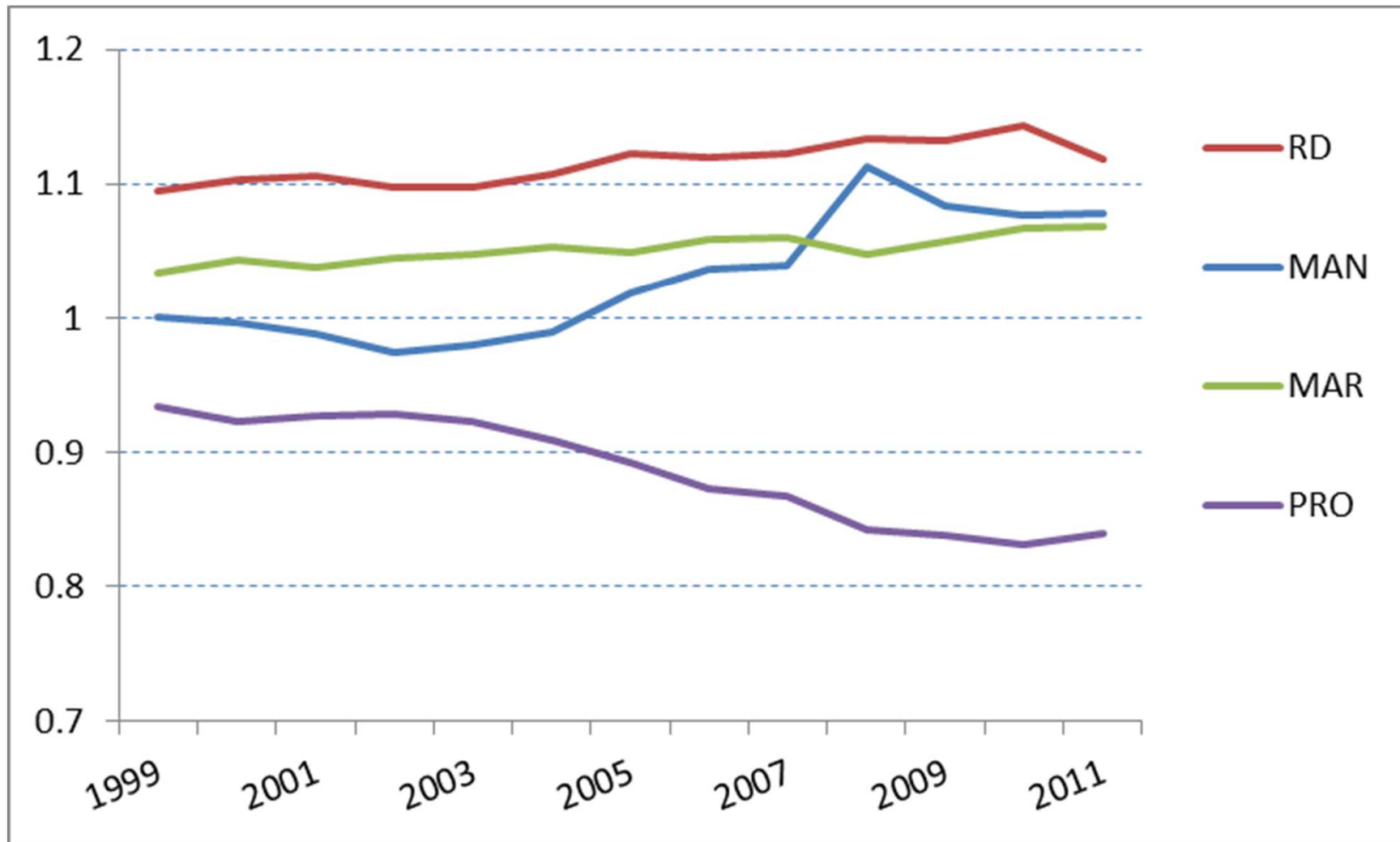
Business function	Example occupations
1. R&D and technology development	Engineers and related professionals; Computing professionals
2. Manufacturing and assembly	Assemblers; Machine operators
3. Sales and distribution	Sales persons; Client information clerks; Customer services representatives
4. Support activities	General managers; Financial managers; Human resources

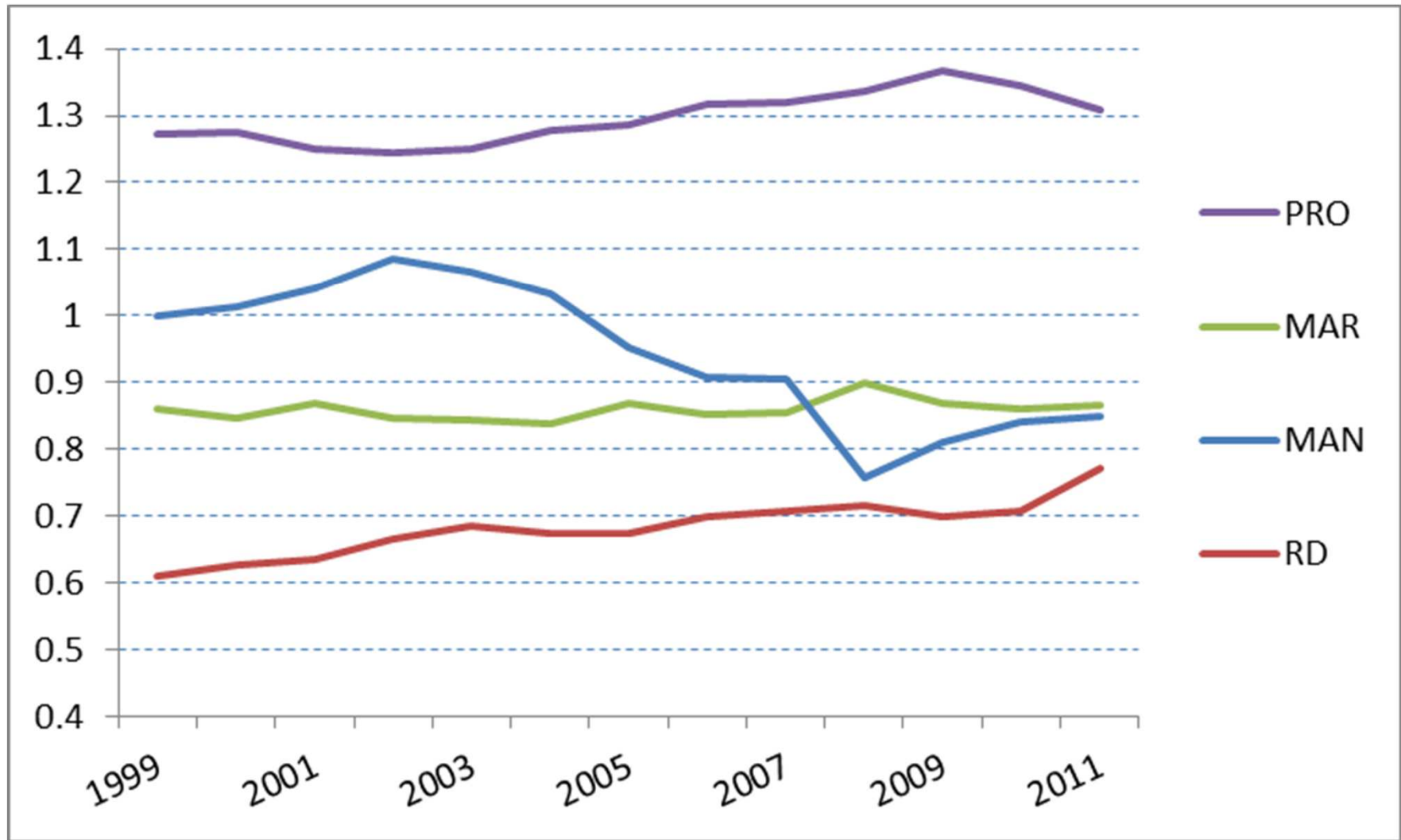


Distribution of labor income by business function in domestic value added exports



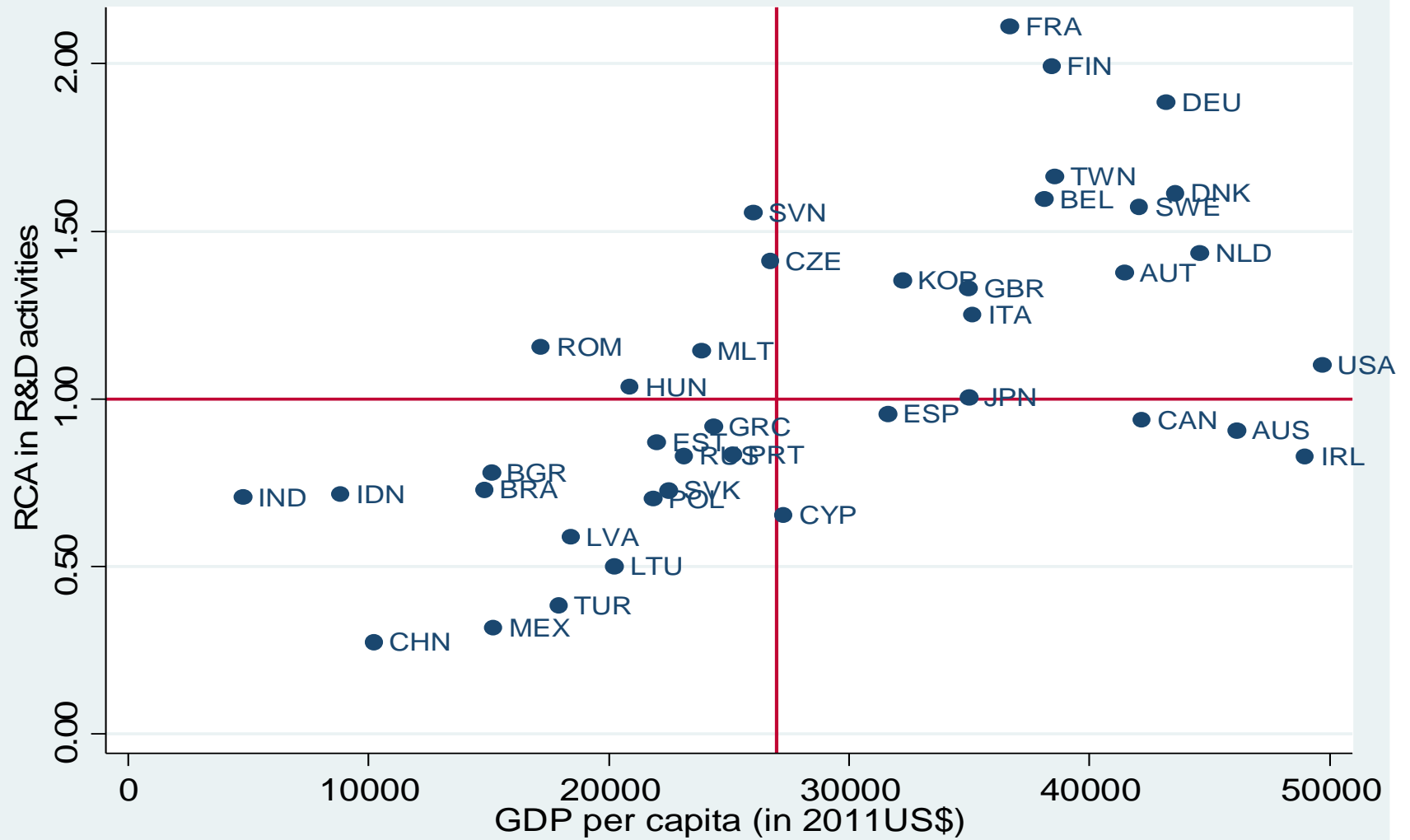
- The standard tool to analyze specialization patterns is by means of revealed comparative advantage (RCA)
- Adapt RCA to perform on the basis of the domestic value added in exports (Koopman, Wang and Wei, 2014 AER).
- Based on value added exports in functions, an RCA for a particular function, say R&D, larger than one indicates that the country derives a higher share of its overall domestic value added exports from adding R&D value to its exports relative to other countries.





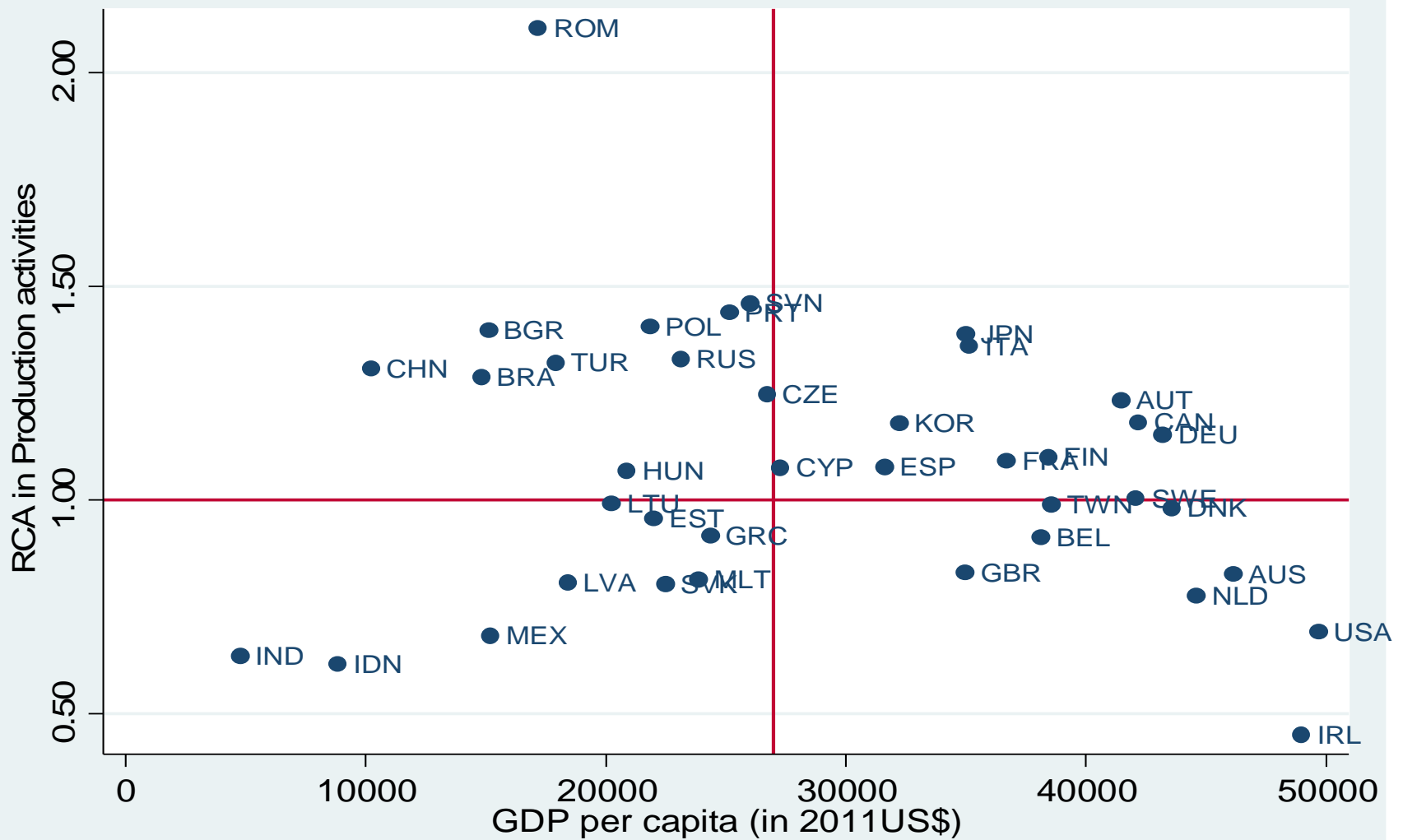


RCA in R&D activities



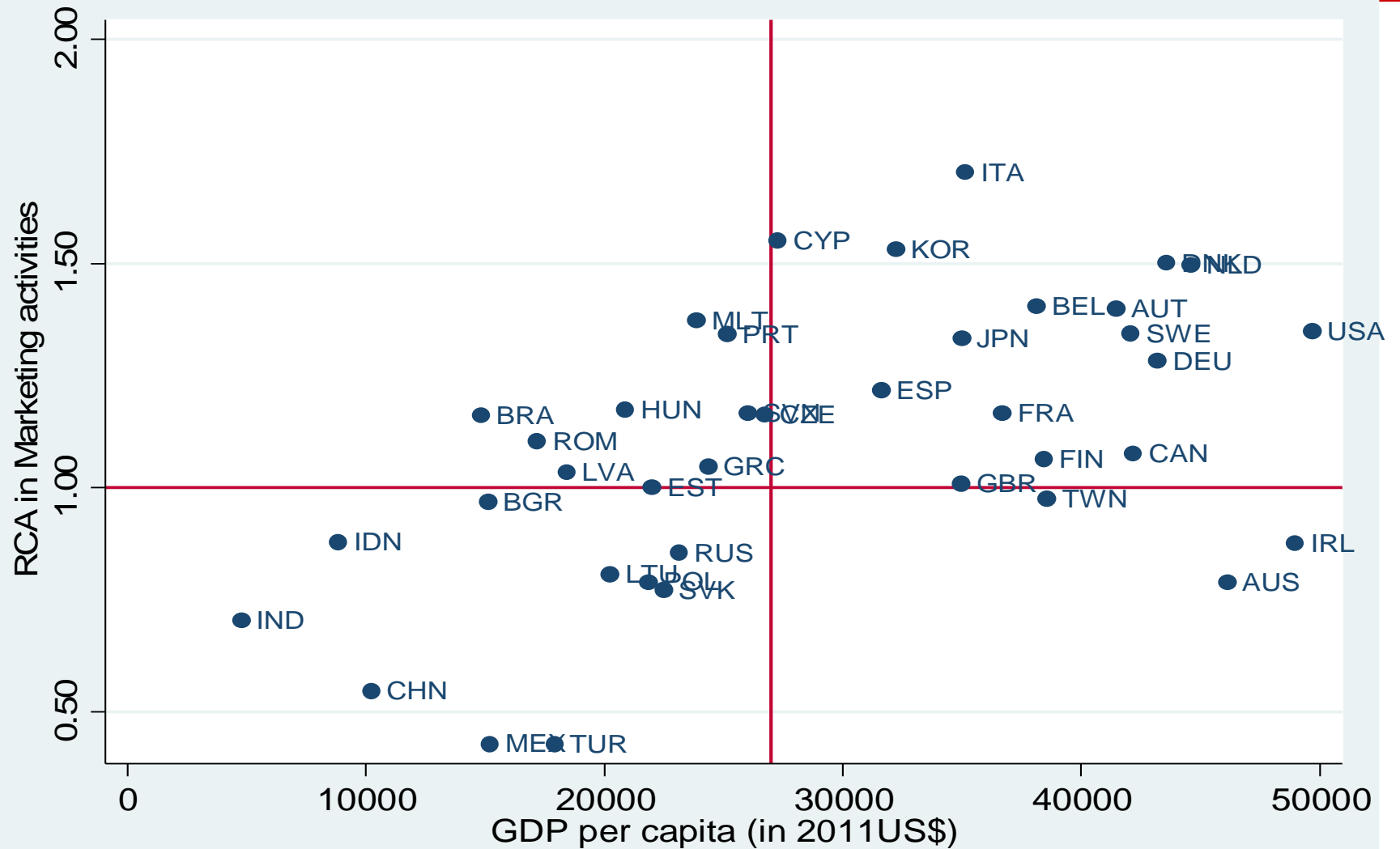


RCA in production activities



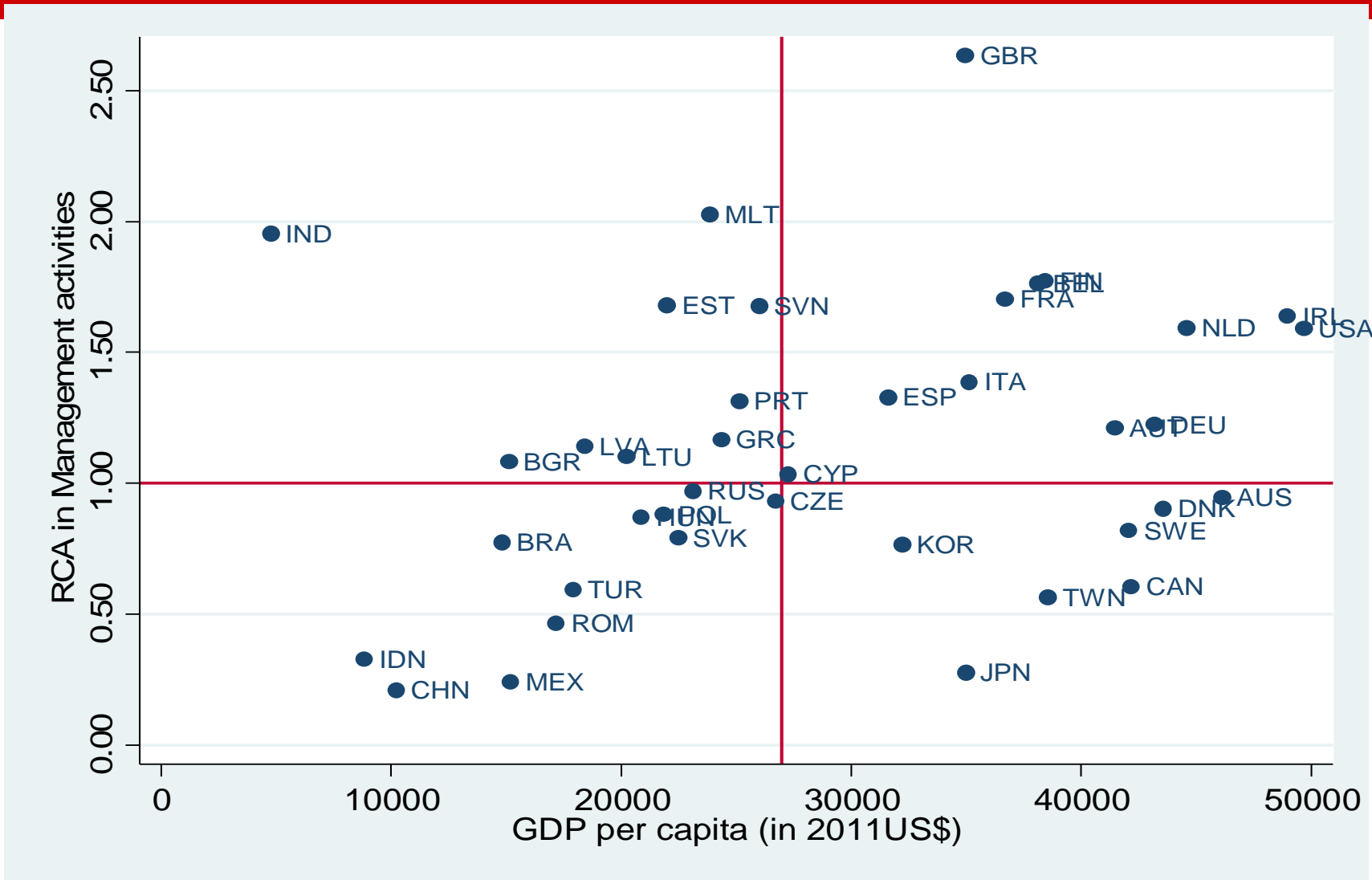


RCA in marketing activities





RCA in management activities





- Production fragmentation has led to economic interactions between nations rising strongly over the past decades
- Comparative advantage is no longer defined in terms of products or sectors, but in tasks or functions
- Extend recent empirical model of trade to analyse patterns of functional specialisation in international trade

Thank you for your attention

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Table 2. Decomposition of functional specialization in exports, 1999 to 2011.

	Change in functional specialization share in domestic value added exports (2011 minus 1999)	contribution from:	
		Change in functions' share of products' domestic value added exports	Change in products' share of domestic value added exports
Unweighted average EU 15:			
R&D and technology development	7.0	5.6	1.4
Manufacturing and assembly	-7.2	-5.0	-2.3
Sales and distribution	-2.5	-2.8	0.3
Support activities	2.7	2.2	0.6
United States:			
R&D and technology development	3.3	2.1	1.2
Manufacturing and assembly	-4.6	-3.7	-0.9
Sales and distribution	-1.5	-0.8	-0.7
Support activities	2.8	2.4	0.5
China:			
R&D and technology development	2.1	1.2	0.9
Manufacturing and assembly	1.5	1.8	-0.3
Sales and distribution	-3.3	-2.8	-0.4
Support activities	-0.3	-0.1	-0.2

Notes: numbers may not sum due to rounding. Decomposition using equation (8). *Sources:* Authors' calculations based on World Input-Output Database (November 2013 release) and Occupations database.