Measuring Innovation in Multinational Enterprises

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Role of innovation in MNEs

Successful multinational enterprises (MNEs) innovate [E.g., Corrado et al. 2017]

- Develop new goods and services
- Improve production processes
- Tailor products for local markets

MNEs balance competing considerations in managing their intellectual property (IP)
[E.g., Jenniges et al. 2018; Lerner 2009; Branstetter, Glennon, and Jensen 2019; Guvenen et al. 2022]

- Tax liabilities
- Skilled labor requirements
- Intellectual property protection

Yet innovation is still difficult to observe and measure for statistical purposes [E.g., Rassier 2017; UNECE 2015]

Challenges of valuing innovation in MNEs

Main challenge: IP is intangible

- Quantifying and valuing it is more complicated than for physical assets like machinery or real estate

Each stage of innovation takes place in different locations by different units of the MNE	Value of innovation is difficult to estimate	Not all R&D is successful
• Creation • Ownership • Use in production	• Can be used by multiple units simultaneously • Which unit owns the IP product is opaque	• A cost-based approach to measuring IP could over- or understate its value

Assembling information on innovation

Potential sources

- BEA surveys
- Tax data
- Patent data

This presentation

- Summarizes the information in these data sources
- Illustrates the in-progress resulting data set
- Describes potential uses of combined data

Feedback

- Suggestions about the approach?
- Additional data sources?

BEA survey data and innovation (1)

1. BE-10 Benchmark Survey of U.S. Direct Investment Abroad (2019)

Innovation information collected from **majority-owned foreign affiliates (MOFAs)**:

R&D expenditure	Expenditure on R&D performed by others under contract	IP fee payments/receipts
Performed... On own account For affiliated persons For unaffiliated persons	Also estimate of share performed by U.S. reporter	To/from... U.S. parent Other foreign affiliates Other U.S. persons Other foreign persons

BEA survey data and innovation (2)

2. BE-125 Quarterly Survey of Transactions in Selected Services and Intellectual Property with Foreign Persons (2019)

Survey goes to any firm with international services transactions

Payments/receipts for IP services

- Includes license fees, royalties, and other fees received or paid for the right to certain IP products
- Breakdown by type of IP (e.g., patents, trademarks, books, franchises)

Payments/receipts of R&D services

- Provision of customized and non-customized R&D services
  - Work to discover new knowledge or develop new or significantly improved goods and services
  - Includes basic and applied scientific research
- Other R&D services
  - Testing or product/process development activities that will likely result in patents

Fictional data example

Outward Direct Investment Survey

BE-10 ID	Affiliate ID	Year	U.S. Parent	Affiliate	Country	IP fee receipts from U.S. Parent
1	1	2019	Seed Corp, LLC	T&C R&D holding ltd	Ireland	50
1	2	2019	Seed Corp, LLC	Wales Biocorp CCC	United Kingdom	75
1	3	2019	Seed Corp, LLC	Foodcolour Lab ltd.	United Kingdom	100
1	4	2019	Seed Corp, LLC	London Hedge ltd.	United Kingdom	125
1	5	2019	Seed Corp, LLC	Köln GmbH	Germany	150
1	6	2019	Seed Corp, LLC	EU Bioholdings GmbH	Germany	175
3	1	2019	DE 1st State, Inc.	New South Wales, Inc.	Australia	200
3	2	2019	DE 1st State, Inc.	Wales CCC	United Kingdom	225
3	3	2019	DE 1st State, Inc.	New Brunswick Corp.	Canada	250

<- Bruner & Grimm (2019) ->

Trade in Services Survey

BE-120 ID	Year	Quarter	U.S. Parent	Country	IP fee payments to foreign affiliates
5	2019	Q3	Seed Corporation	Ireland	50
5	2019	Q1	Seed Corporation	United Kingdom	100
5	2019	Q2	Seed Corporation	United Kingdom	75
5	2019	Q3	Seed Corporation	United Kingdom	25
5	2019	Q4	Seed Corporation	United Kingdom	100
5	2019	Q1	Seed Corporation	Germany	50
5	2019	Q2	Seed Corporation	Germany	100
5	2019	Q3	Seed Corporation	Germany	50
5	2019	Q4	Seed Corporation	Germany	125
7	2019	Q2	Delaware, Inc.	Australia	200
7	2019	Q3	Delaware, Inc.	United Kingdom	125
7	2019	Q4	Delaware, Inc.	United Kingdom	100
7	2019	Q1	Delaware, Inc.	Canada	250

Link MNEs in direct investment and trade in services surveys using bridge developed by Bruner and Grimm (2019)

Outside data sources

IRS data → Match by EIN

- R&D cost sharing agreements: direct measure not available in BEA survey data
- Royalties and license fees
- Intangible assets

Patenting → Match by EIN, name, address

- Global patent offices
- Patents acquired through M&A
- Use location of inventors to determine where IP product was created
- Can also track the purchase and sale of patents through M&A and outright sales using third-party data source

Sketch of potential resulting data set

		BEA's trade in services survey		BEA's outward direct investment survey		IRS SOI Data		Orbis IP database	
MNE ID	Country	R&D services payments	R&D services receipts	R&D performed by others	R&D performed for others	R&D cost sharing payments	R&D cost sharing receipts	Patent applications	Patent purchases
1	Germany								
1	Ireland								
1	Vietnam								
2	Netherlands								
2	China								
2	South Korea								
3	Mexico								
3	Canada								
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Note: More variables are available from each source. The variables listed are chosen to illustrate what the resulting data set would look like. The merged data would be confidential and only available to BEA employees and special sworn researchers.

Innovation locations

- The combined data can shed light on innovation in MNEs *throughout the life cycle*
- Countries and/or specific affiliates in the MNE could be identified as creators, owners, and/or users of innovation

Creation	Ownership	Use
• R&D performed • Listed as inventor on patent • R&D cost sharing agreements	• R&D cost sharing agreements • Listed as patent assignee • Receipts of fees for the use of IP	• Payments of fees for the use of IP • R&D intensity of affiliate's industry

Implications of MNE innovation activities

Previous research has shown that U.S. MNEs shift valuable IP to tax-friendly locations abroad

- R&D cost sharing agreements can be used to make these shifts

U.S. research suggests lowered measures of U.S. GDP and increased measures of GDP in host countries

- E.g., Jenniges et al. 2019; Guvenen et al. 2022

Combined data could more accurately identify offshore profit shifting and offer more insights for economic accountants

- Important implications for macroeconomic statistics

Innovation activity by location, 2014

- Previous research suggests that IP is created in non-tax havens, while owned by affiliates in tax havens [Derrick and Steiner, forthcoming]
- Values in table are percent of sum of variable for majority-owned affiliates in a sample R&D intensive MNEs
- R&D funded by affiliate but performed by others could indicate the presence of a cost-sharing agreement (but counterparty is unknown)

Variable	Tax haven*	Non-tax haven*
Total sales	31.1	68.9
Total assets	50.4	49.6
Total liabilities	37.8	62.2
Total gross PPE	13.5	86.5
Employment	7.8	92.2
Value added	18.9	81.1
Total R&D Expenditure	21.2	78.8
R&D funded by affiliate but performed by others	79.9	20.1
Total royalties received	88.8	11.2
Total royalties paid	75.7	24.3

*Tax havens are defined in Gravelle, J. G. (2015). Tax havens: International tax avoidance and evasion. Congressional Research Service report R40623.

Next steps

Identify innovation creators, owners, and users in BEA MNEs

Explore the relationship between foreign affiliates' innovation activities and affiliate performance

Feedback

- Suggestions about the approach?
- Matching techniques successfully used on these data sets?
- Additional data sources?

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