

Offshore Profit Shifting and Domestic Productivity Measurement

F. Guvenen, R.J. Mataloni Jr., D.G. Rassier, and K.J. Ruhl

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MNE profit shifting

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- ▶ MNE may assign assets in ways that do not reflect production
- ▶ Breaks the link between production and location in NIPAs

Profit shifting example: iPhone

- ▶ Developed in California, built by contract manufacturer in China
- ▶ Hypothetical numbers
 - ▶ Parts and assembly labor \$250
 - ▶ Sale price \$750
 - ▶ No further costs, all phone sold outside the U.S.
 - ▶ \$500 gross profit is a return to design, software, etc. made in U.S.
- ▶ \$250 cogs is not U.S. GDP.
- ▶ If Apple U.S. retains ownership of intangible property
 - ▶ \$500 is an export in U.S. GDP
- ▶ If Apple U.S. legally transfers ownership to affiliate outside of U.S.
 - ▶ Affiliate may underpay for use of intangible property
 - ▶ Return on intangible asset accrues to affiliate; not in U.S. GDP

Assets in U.S.-owned foreign affiliates, 2012

	Ratio of U.S.-owned foreign affiliate total assets to		
	PPE	Compensation	Employment (mil. USD)
World	16.8	39.0	1.8
Canada	6.4	21.2	1.2
Ireland	20.0	142.7	10.9
Luxembourg	1,109.6	1,380.0	121.6
Netherlands	97.7	115.3	8.7
Switzerland	59.9	60.0	7.7
Barbados	41.8	1,444.7	43.3
Bermuda	130.8	1,475.5	155.8
U.K.I., Caribbean	101.2	3,330.2	199.8
Hong Kong	40.3	39.3	2.7
Singapore	18.6	50.3	3.1

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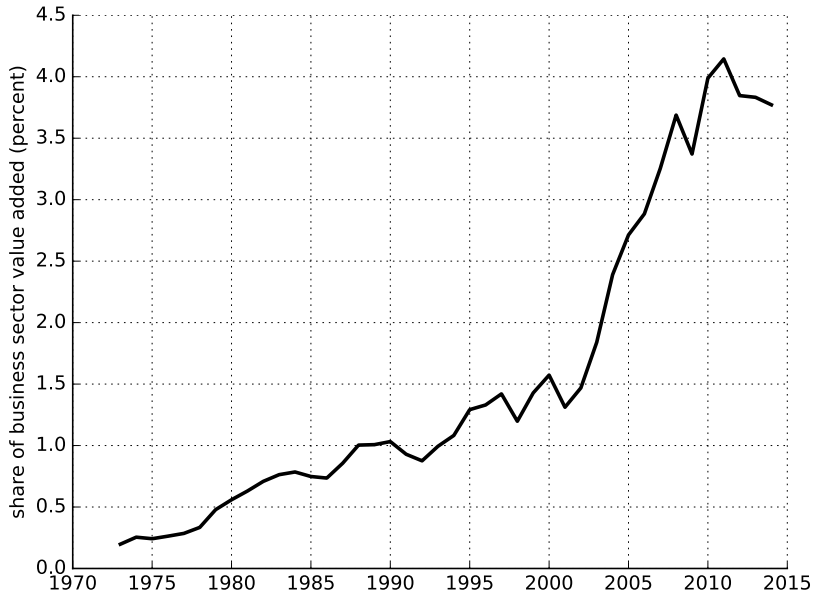
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$$GNP = GDP + \text{income on USDIA} - \text{income on FDIUS} + \dots$$

- ▶ Income on USDIA explodes in the 2000s

Income on U.S. direct investment abroad



Adjusting for profit shifting

- ▶ Reallocate income on USDIA across units of the MNE
- ▶ Reallocations to parent increase GDP

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- ▶ What part of income on USDIA is owed to the parent?

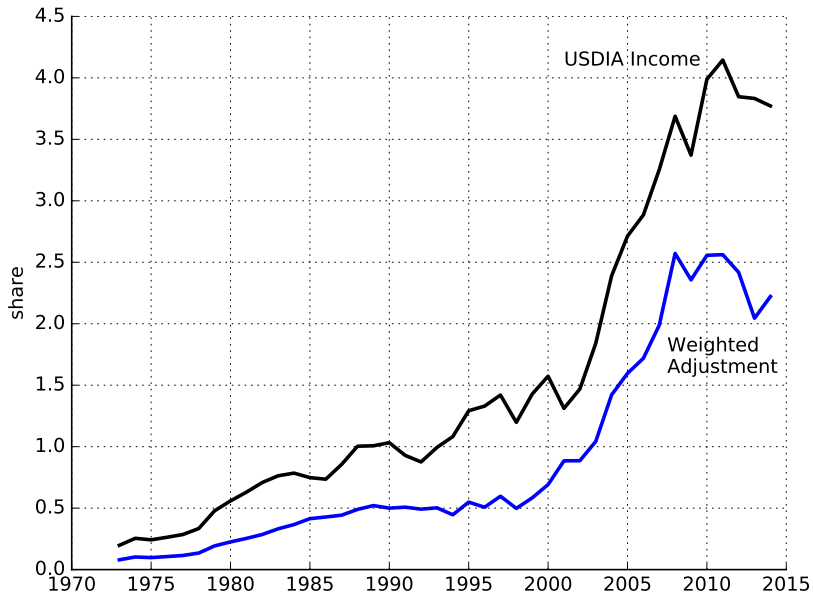
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- ▶ What part of income on USDIA is owed to the parent?
- ▶ Our approach: formulary adjustment
 - ▶ Popular multi-jurisdictional tax adjustment
- ▶ Allocate income proportional to apportionment factors
 - ▶ Apportionment factors: compensation and sales
- ▶ For data reasons, we focus on U.S.-owned MNEs operating abroad
 - ▶ Affiliates of foreign-owned MNEs operating in U.S. in progress

Aggregate formulary adjustment



Overview of results

- ▶ In the aggregate, our adjustment adds
 - ▶ 1973–1994: ~ nothing
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- ▶ Mismeasurement likely to continue (currently ~ 2.5 percent GDP)

Roadmap

1. Introduction
2. Accounting framework
3. Aggregate measurements
4. Industry measurements
5. Profit shifting by foreign MNEs operating in the U.S.

Conceptual framework

- ▶ One U.S. parent m and one foreign affiliate a
- ▶ Take stock of intangible capital as given and created in the U.S.
- ▶ Physical capital k , skilled and unskilled labor (ℓ_s, ℓ_u) , intangible capital h , and productivity z
 - ▶ Parent produces final goods: $y_m = f(z_m, k_m, \ell_{sm}, \ell_{um}, h)$
 - ▶ Affiliate produces final goods: $y_a = f(z_a, k_a, \ell_{sa}, \ell_{ua}, h)$
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- ▶ Intangible capital can be shared
- ▶ Assumptions
 - ▶ Constant returns to scale
 - ▶ Physical capital and labor: located in their production locations
 - ▶ Intangible capital: located anywhere
 - ▶ Perfect factor and good markets

Accounting

- ▶ Who owns intangible capital?
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- ▶ Affiliate earnings

$$\pi_a = py_a - w_s \ell_{sa} - w_u \ell_{ua} - r^k k_a - r^h (1 - \lambda)h - r^h \lambda h + r^h (1 - \lambda)h = r^h (1 - \lambda)h$$

- ▶ Parent earnings

$$\pi_m = py_m - w_s \ell_{sm} - w_u \ell_{um} - r^k k_m - r^h \lambda h - r^h (1 - \lambda)h + r^h \lambda h = r^h \lambda h$$

Accounting with MNEs

- ▶ Expenditure-based U.S. GDP

$$Y^E = py_m + r^h \lambda h - r^h (1 - \lambda) h$$

- ▶ Income-based U.S. GDP

$$Y^I = w_s \ell_{sm} + w_u \ell_{um} + r^k k_m + r^h \lambda h + r^h \lambda h = py_m - r^h h + 2r^h \lambda h$$

- ▶ Payment to parent is “receipts by U.S. reporters [parents] on the use of intellectual property by foreign persons,” part of income on USDIA

$$Y^{\text{USDIA}} = \pi_a = r^h (1 - \lambda) h$$

Productivity

- ▶ Labor productivity (to be consistent with the literature)

$$A = \frac{Y^E}{\ell_m} = \frac{py_m + 2r^h\lambda h - rh}{\ell_m}$$

- ▶ When $\lambda = 1$ entire return to h counted in U.S. GDP
- ▶ When $\lambda < 1$ U.S. GDP and productivity fall

Formulary adjustment

- ▶ Apportionment factors: variables that correlate with production
 - ▶ Compensation and sales
- ▶ Apportionment weights

$$\omega_n = \frac{1}{2} \times \frac{w_s l_{sn} + w_u l_{un}}{w_s l_{sm} + w_u l_{um} + w_s l_{sa} + w_u l_{ua}} + \frac{1}{2} \times \frac{py_n}{py_m + py_a} \quad n = a, m$$

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- ▶ Allocate income across members of MNE

$$\pi_n^\omega = \omega_n (\pi_a + \pi_m) \quad n = a, m$$

- ▶ And the formulary adjustment to each member is

$$\epsilon_n = \pi_n^\omega - \pi_n \quad n = a, m$$

- ▶ Parent's formulary adjustment + GDP

$$\tilde{Y}^{GDP} = py_m + \lambda r^h h + \epsilon_m$$

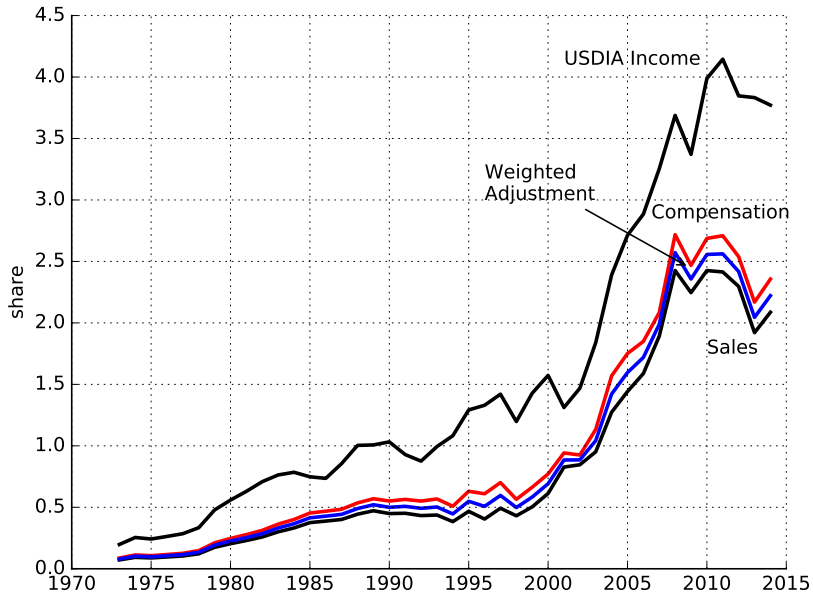
Aggregate adjustments to productivity

Constructing the adjustment in the data

- ▶ Focus on business-sector value added
- ▶ For each entity in each U.S.-owned MNE
 1. Compute ω_n
 2. Compute $\pi_n^\omega = \omega_n(\pi_{a1} + \pi_{a2} + \dots + \pi_m)$
 3. Compute $\epsilon_n = \pi_n^\omega - \pi_n$
- ▶ Adjusted U.S. business-sector value added is

$$\tilde{Y}^{\text{VA}} = Y^{\text{VA}} + \sum_{m \in M} \epsilon_m$$

Aggregate formulary adjustment



Constructing the adjustment in the data

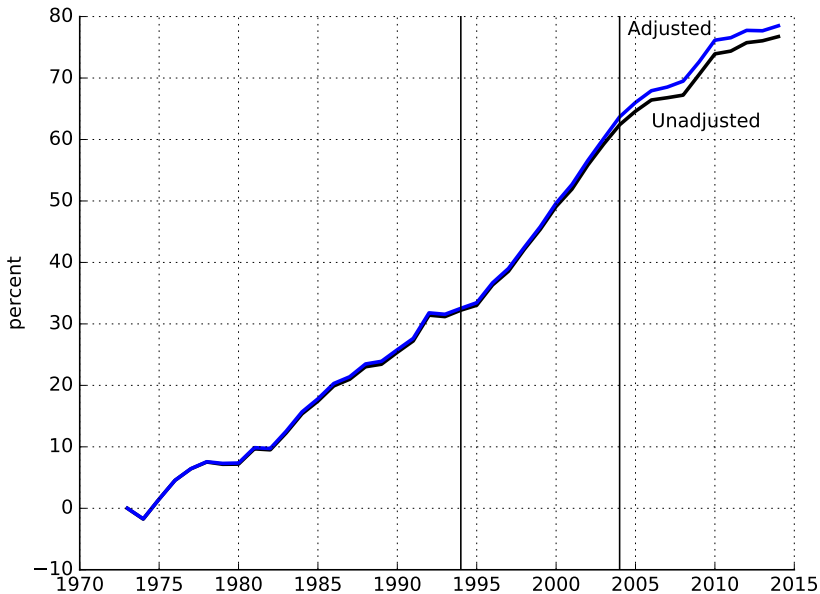
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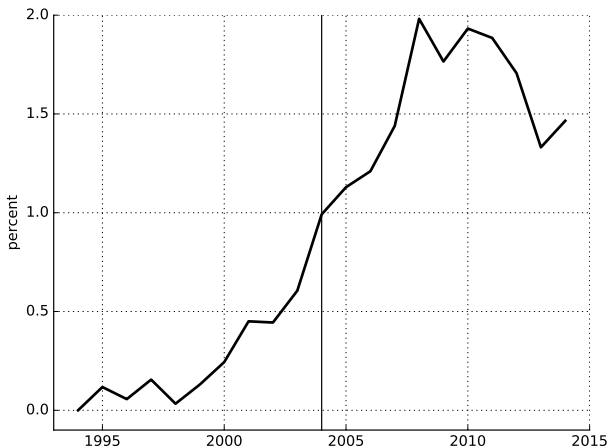
- ▶ Adjusted productivity is

$$\tilde{A} = \frac{\tilde{Y}^{\text{VA}}}{\ell_m}$$

Aggregate cumulative labor productivity growth



Increase in aggregate cumulative labor productivity growth



	Cumulative		Annual	
	Unadjusted	Adjusted	Unadjusted	Adjusted
1973–1994	32.2	32.5	1.53	1.55
1994–2014	44.5	46.0	2.23	2.30

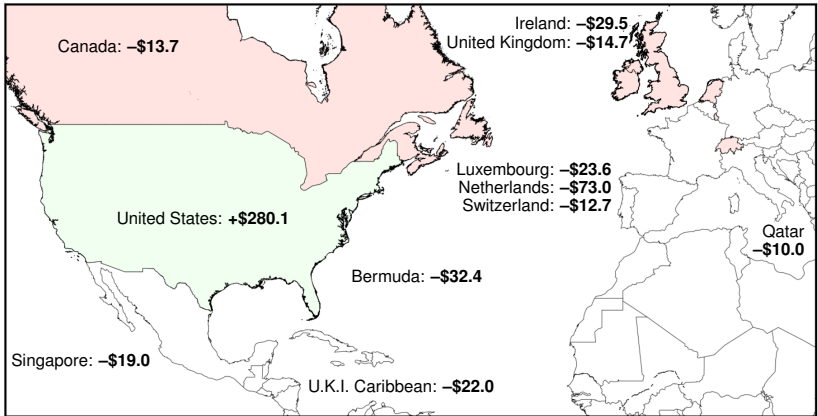
Adjustments in other countries, 2012

- ▶ **Positive adjustments:** Japan, France, Italy, Russia, Argentina, Greece, Turkey, Libya, Germany, and Kenya
 - ▶ Adjustments are too small to pass confidentiality checks
 - ▶ Japan, France, Italy, Greece, and Germany have tax rates that exceed the OECD average

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- ▶ **Negative adjustments:** Netherlands, Bermuda, Ireland, Luxembourg, U.K.I. Caribbean, Singapore, U.K., Switzerland, Canada, Qatar
 - ▶ Tax havens: Netherlands, Bermuda, Ireland, Luxembourg, U.K.I. Caribbean, Singapore, Switzerland
 - ▶ Important locations of U.S. MNE production: Canada, U.K.

Reattribution of U.S. MNE earnings, 2012 (bil. USD)



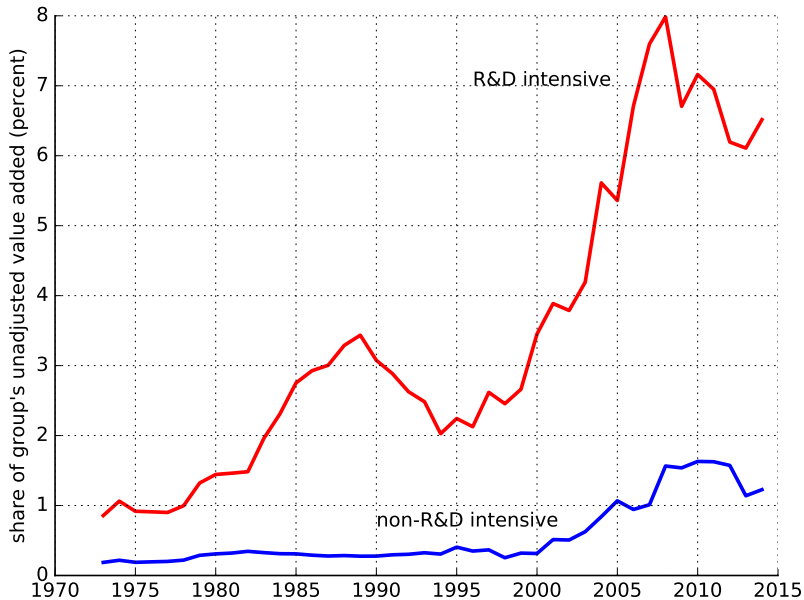
Industry-level adjustments

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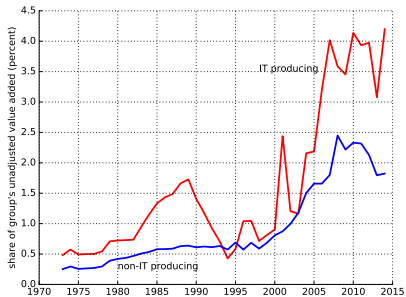
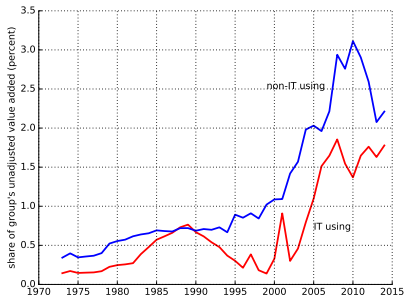
- ▶ Assign industries to groups based on
 - ▶ IT using, IT producing (Bloom et al 2012; Fernald 2014)
 - ▶ R&D intensity (75th percentile MNEs by R&D/Sales)
- ▶ As before, compute a formulary adjustment for each MNE
- ▶ Add the MNE's adjustment to the industry value added

$$\tilde{Y}^{RD} = \sum_{i \in I^{RD}} Y_i + \sum_{m \in M^{RD}} \epsilon_m$$

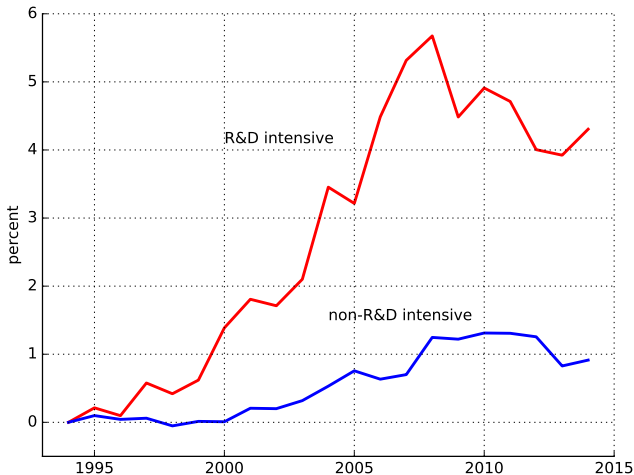
Adjustment by R&D intensity



Adjustment by IT usage and production

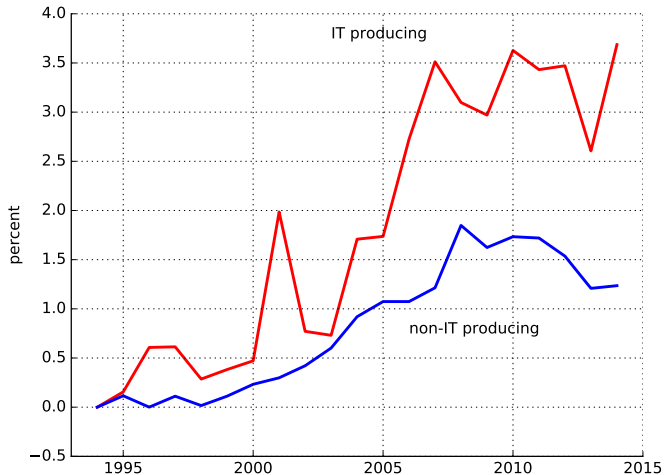


Increase in cumulative labor productivity growth: R&D intensity



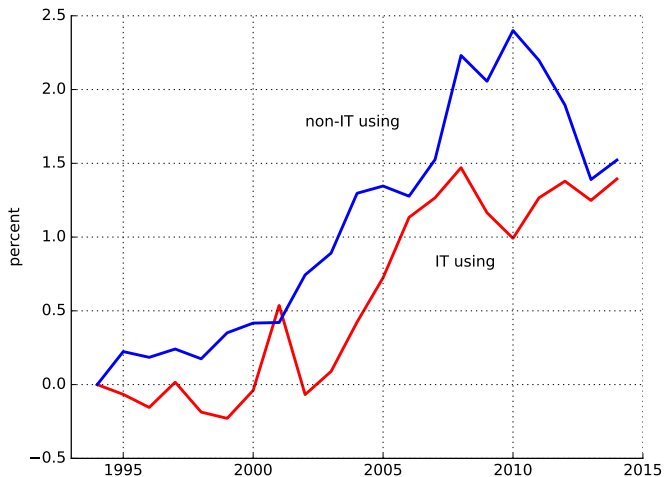
	R&D intensive		non-R&D intensive	
	Unadjusted	Adjusted	Unadjusted	Adjusted
1973–1994	57.1	58.2	25.5	25.6
1994–2014	94.5	98.8	27.6	28.5

Increase in cumulative labor productivity growth: IT producing



	IT producing		non-IT producing	
	Unadjusted	Adjusted	Unadjusted	Adjusted
1973–1994	96.2	96.1	23.9	24.2
1994–2014	142.3	146.0	25.5	26.8

Increase in cumulative labor productivity growth: IT using



	IT using		non-IT using	
	Unadjusted	Adjusted	Unadjusted	Adjusted
1973–1994	52.4	52.7	28.9	29.2
1994–2014	72.5	73.9	27.5	29.0

Foreign MNEs operating in the United States

Adjusting for foreign-owned affiliates

- ▶ Survey: U.S.-owned affiliates operating abroad very good
- ▶ Survey: foreign parents operating affiliates in U.S. not very good
- ▶ U.S. tax rates create incentives to understate income earned in U.S. by affiliates of foreign multinationals (FDIUS)

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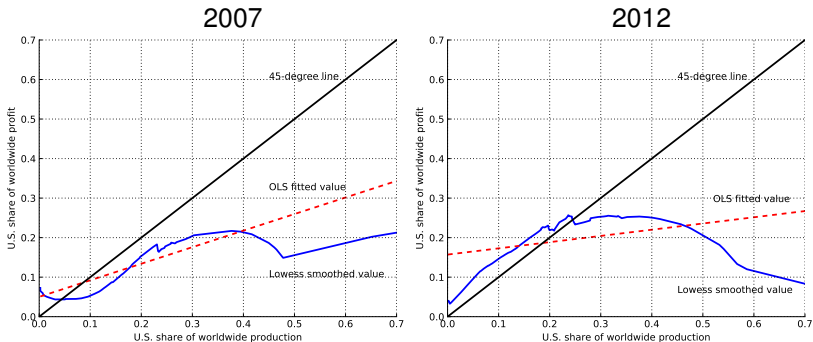
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- ▶ Match BEA data on affiliates in the U.S. with data from Orbis on the foreign parent. No common identifier.
- ▶ Match about 100 technology intensive foreign-owned affiliates operating in U.S.

Profits and production of foreign MNEs



- ▶ MNEs with significant U.S. operations earn most of their profit outside of the United States

Summary

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- ▶ Formulary apportionment shows
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 - ▶ Larger for R&D-intensive industries
- ▶ Other places this mismeasurement could matter
 - ▶ Capital's share of income
 - ▶ Rate of return on U.S.-owned foreign assets vs. foreign-owned U.S. assets
 - ▶ Importance of C- and S-corps in business income