Online Appendix:

Offshore Profit Shifting and Aggregate Measurement: Balance of Payments, Foreign Investment, Productivity, and the Labor Share*

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A Details of the measurement framework

Entity n in a MNE m operates the technology (we drop time subscripts)

$$y_{mn} = \theta_{mn} k_{mn}^{\alpha_{mn}} \ell_{mn}^{\gamma_{mn}} h_{mn}^{1-\alpha_{mn}-\gamma_{mn}}, \tag{A.1}$$

where y is output, θ is productivity, k is physical capital, ℓ is labor, and h is intangible capital. Profit can be written as

$$\pi_{mn} = y_{mn} c_{mn}(r_{mn}, w_{mn}, q_{mn})(\mu_{mn} - 1), \tag{A.2}$$

where p is the price of the entity's output and $\mu_{mn} = p_{mn}/c_{mn}(r_{mn}, w_{mn}, q_{mn})$ is the gross markup. The unit cost function solves

$$\begin{aligned} c_{mn}(r_{mn}, w_{mn,} q_{mn}) \quad &= \quad \min \; r_{mn} k_{mn} + w_{mn} \ell_{mn} + q_{mn} h_{mn} \\ \text{s.t.} \quad 1 = \quad &\theta_{mn} k_{mn}^{\alpha_{mn}} \ell_{mn}^{\gamma_{mn}} h_{mn}^{1-\alpha_{mn}-\gamma_{mn}} \end{aligned} \tag{A.3}$$

where r is the rental rate of physical capital, w is the wage, and q is the rental rate of intangible capital. The first-order conditions are

$$r_{mn} = \lambda \times \alpha_{mn} \theta_{mn} k_{mn}^{\alpha_{mn}-1} \ell_{mn}^{\gamma_{mn}} h_{mn}^{1-\alpha_{mn}-\gamma_{mn}} \tag{A.4}$$

$$w_{mn} = \lambda \times \gamma_{mn} \theta_{mn} k_{mn}^{\alpha_{mn}} \ell_{mn}^{\gamma_{mn}-1} h_{mn}^{1-\alpha_{mn}-\gamma_{mn}} \tag{A.5}$$

$$q_{mn} = \lambda \times (1 - \alpha_{mn} - \gamma_{mn}) \theta_{mn} k_{mn}^{\alpha_{mn}} \ell_{mn}^{\gamma_{mn}} h_{mn}^{-\alpha_{mn}-\gamma_{mn}} \tag{A.6}$$

This yields

$$c_{mn}(r_{mn}, w_{mn}, q_{mn}) = \xi_{mn} \theta_{mn}^{-1} r_{mn}^{\alpha_{mn}} w_{mn}^{\gamma_{mn}} q_{mn}^{1-\alpha_{mn}-\gamma_{mn}} \tag{A.7}$$

$$y_{mn} = \frac{w_{mn} \ell_{mn}}{\gamma_{mn} c_{mn}(r_{mn}, w_{mn}, q_{mn})} \tag{A.8}$$

$$y_{mn} = \frac{r_{mn} k_{mn}}{\alpha_{mn} c_{mn}(r_{mn}, w_{mn}, q_{mn})} \tag{A.9}$$

$$y_{mn} = \frac{q_{mn} h_{mn}}{(1 - \alpha_{mn} - \gamma_{mn}) c_{mn}(r_{mn}, w_{mn}, q_{mn})}, \tag{A.10}$$

where $\xi_{mn} = \alpha_{mn}^{-\alpha_{mn}} \gamma_{mn}^{-\gamma_{mn}} (1 - \alpha_{mn} - \gamma_{mn})^{-(1-\alpha_{mn}-\gamma_{mn})}$. Each of the three expressions for y yields a version of (4). For example, substitute (A.8) into (A.2) to yield

$$\pi_{mn} = w_{mn} \ell_{mn} \frac{\mu_{mn} - 1}{\gamma_{mn}}. \tag{A.11}$$

A.1 Consistency of the adjustment

When does proportional adjustment work? Without loss of generality, consider a MNE with one parent (p) and one affiliate (a) . The reallocated profit of the parent, using labor compensation as the apportionment factor is

$$\hat{\pi}_p = \frac{w_p \ell_p}{w_p \ell_p + w_a \ell_a} (\pi_p + \pi_a) \tag{A.12}$$

where everything on the right-hand side of (A.12) is observed in the data. If we substitute the appropriate versions of (A.11) into (A.12) we have

$$\hat{\pi}_p = \frac{w_p \ell_p}{w_p \ell_p + w_a \ell_a} (\pi_p + \pi_a) \tag{A.13}$$

$$\hat{\pi}_p = \frac{w_p \ell_p}{w_p \ell_p + w_a \ell_a} \left(w_p \ell_p \frac{\mu_p - 1}{\gamma_p} + w_a \ell_a \frac{\mu_a - 1}{\gamma_a} \right). \tag{A.14}$$

If $\mu_a = \mu_p$ and $\gamma_a = \mu_p$, we have

$$\hat{\pi}_p = w_p \ell_p \frac{\mu_p - 1}{\gamma_p}, \tag{A.15}$$

which recovers the underlying profit as defined in (A.11). If the gross markup or the factor shares differ, this will bias $\hat{\pi}$ in intuitive ways. We can write (A.12) as

$$\hat{\pi}_p = w_p \ell_p \frac{\mu_p - 1}{\gamma_p} \left(\frac{w_p \ell_p + \frac{\mu_a - 1}{\mu_p - 1} \frac{\gamma_p}{\gamma_a} w_a \ell_a}{w_p \ell_p + w_a \ell_a} \right). \tag{A.16}$$

Notice that the first term in the right-hand side of (A.16) is π_p, which is what we are trying to recover. When markups and labor shares are identical, the term in parentheses is one. When the parent has a larger markup, all else equal, the term in parentheses is less than one and we understate the parent's profit. If the parent is more labor-intensive, ($\gamma_p > \gamma_a$) then, all else equal, the parent's profit will be overstated.

If the MNE consists of N_m entities, then (A.16) becomes

$$\hat{\pi}_{mn} = \pi_{mn} \times \frac{\gamma_n}{\mu_n - 1} \sum_{i=1}^{N_m} \frac{w_{im}\ell_{im}}{\sum_{k=1}^{N_m} w_{km}\ell_{km}} \frac{\mu_i - 1}{\gamma_i}. \tag{A.17}$$

Profit in mn will be overstated if the compensation-weighted average markup-labor-share in the MNE is larger than it is in mn.

B Data appendix

B.1 USDIA: Data and variable construction details

We use data published by the U.S. Bureau of Economic Analysis (BEA) and by the U.S. Bureau of Labor Statistics (BLS). The BEA data include aggregate value added in the national income and product accounts (NIPAs) and value added by industry in the industry economic accounts (IEAs) for the period 1973-2016. We also use annual data for transactions in income on direct investment published by BEA in the international transactions accounts (ITAs) for 1973-2016. The BLS data include, from the labor productivity and costs (LPC) database, aggregate numbers of hours worked for 1973-2016 and number of hours worked by industry for 1987-2016. In addition, we use annual survey-level data collected by BEA on MNEs for 1982–2016 to construct an adjustment series based on the framework outlined in Section 2.

The NIPA data and the IEA data are current as of the annual revision of the NIPAs released in July 2021. The LPC data are current as of January 2022. The ITA data are current as of the annual revision of the ITAs released on June 2021. The MNE survey data we use include surveys conducted for 1982, 1989, and 1994–2016. Some requisite survey-level data on U.S. parents were not collected for 1983–1988 and 1990–1993. However, aggregate statistics on transactions in income (i.e., direct investment income and portfolio income) are available for all years. Thus, we extrapolate backward the nominal adjustment prior to 1982 using the aggregate statistics as an indicator. In addition, we linearly interpolate the nominal adjustment for 1983–1988 and 1990–1993.

Business-sector data

Aggregate business-sector value added published in the NIPAs includes nominal value added published in NIPA Table 1.3.5 and real value added published in NIPA Table 1.3.6, which yield an implicit deflator for business-sector value added. We derive an implied aggregate nominal income-based measure of business-sector value added by subtracting

nominal expenditure-based value added for the non-business sector published in NIPA Table 1.3.5 from aggregate nominal income-based GDP published in NIPA Table 1.10. We deflate the implied aggregate nominal income-based measure using the implicit deflator for business-sector value added.

Adjustment series

We apply survey-level data collected by BEA on MNEs to (6). The survey-level data include financial and operating activities based on income statement information and balance sheet information reported for U.S. parents and their foreign affiliates on U.S. direct investment abroad (USDIA). Depending on the year, the data are reported on either the Annual Survey of U.S. Direct Investment Abroad (form BE-11) or the Benchmark Survey of U.S. Direct Investment Abroad (form BE-10).

The survey-level data provide a source for apportionment factors on U.S. parents and foreign affiliates. The apportionment factors include compensation, net property, plant and equipment (PPE), and net stocks of research and development (R&D) expenditures. Net PPE is a historical cost measure. We build historical cost net stocks of R&D by applying R&D expenditures to a perpetual inventory model with 1989 as the initial starting value and assuming an annual depreciation rate of 26 percent, which is the average depreciation rate for R&D capital for 10 industries in the U.S. NIPAs. The survey-level data also provide a source for earnings reported on U.S. parents and foreign affiliates and provide a source for the U.S. parent's reported voting interest in a foreign affiliate. We infer a parent's share of a foreign affiliate's earnings under separate accounting by multiplying earnings reported for the foreign affiliate by the U.S. parent's reported voting interest. We generate an adjustment by aggregating the survey-level adjustments obtained from (6).

External balance series

Data on trade, foreign direct investment income, and related balances are published in ITA Table 1.1. We calculate the balance on trade and FDI income as shares of GDP and GNP, respectively, from NIPA Table 1.7.5. For the adjusted shares, we add our adjustment to the services trade balance and GDP, and we subtract our adjustment from FDI income. We do not adjust GNP because it is unaffected with the offset between trade in services and FDI income.

FDI returns series

Data on FDI income are available in ITA Table 4.2 (Bureau of Economic Analysis, 2021d). Data on direct investment positions are available in ITA Table 2.1 (Bureau of Economic Analysis, 2021c). We calculate the return on USDIA by dividing after-tax primary income

at historical cost by the average of the beginning and ending direct investment positions. For the adjusted returns, we subtract our adjustment from FDI income. We do not adjust the direct investment positions because they are unaffected with the offsetting transactions for trade in services and FDI income in the financial account. We also generate separate USDIA return series for haven countries and non-haven countries. Haven countries include Bahamas, Barbados, Bermuda, Costa Rica, Hong Kong, Ireland, Liechtenstein, Luxembourg, Netherlands, Panama, Singapore, Switzerland, and the U.K. Islands, Caribbean. Data on USDIA income without current cost adjustment by country and on direct investment positions on a historical cost basis are available in the ITA interactive tables for direct investment by country and industry. We calculate USDIA returns for havens and non-havens similar to our calculations for the aggregate series.

Productivity series

We construct annual and cumulative series of labor productivity growth for 1973–2016. We construct aggregate adjusted and unadjusted productivity growth series that are consistent with Fernald (2015).The NIPA data and the IEA data that we use include real and nominal measures. We use real measures to construct growth rates for the unadjusted series, and we use nominal measures deflated to real measures to construct growth rates for the adjusted series. Real measures from both the NIPAs and the IEAs are based on a chained Fisher formula with a base year of 2012.

We use the aggregate business-sector data to generate separate growth rates and then average across the expenditure- and income-based measures. We then subtract the log growth in the number of hours worked from the log growth in value added to construct annual and cumulative unadjusted series of aggregate labor productivity growth. We generate an adjustment for aggregate nominal expenditure-based business-sector value added and for our implied aggregate nominal income-based business-sector value added by aggregating the survey-level adjustments obtained from (6). We then deflate the adjusted nominal measures using the implicit deflator for business-sector value added and construct annual and cumulative adjusted series of aggregate labor productivity growth by averaging across the adjusted expenditure- and income-based measures and then subtracting the same growth in the number of hours worked that we used in the unadjusted aggregate series.

R&D intensity and IT intensity for productivity calculations

The survey-level data allow us to calculate R&D intensity and IT intensity at the firm level (i.e., U.S. parents and foreign affiliates for a given U.S. MNE). We calculate R&D intensity by dividing firm-level R&D expenditures aggregated across all available years by firm-

level unaffiliated sales aggregated across all available years. We consider R&D-intensive firms and industries to be those with R&D intensity at or above the 75th percentile. We calculate IT intensity separately based on IT usage and IT production. IT-using firms are determined by the proportion of unaffiliated sales generated by entities within a firm that are classified to industries characterized as IT using in Bloom, Sadun and Van Reenen (2012). IT-producing firms are determined by the proportion of unaffiliated sales generated by entities within a firm that are classified to industries characterized as IT producing in Fernald (2015). In each case, IT-using firms and IT-producing firms include firms with an unaffiliated sales proportion greater than 50 percent. Using the survey-level data, we apply adjustments for R&D-intensive firms and IT-intensive firms to the industry-level data to construct the adjusted labor productivity growth series for comparison with the unadjusted series.

Value added by industry published in the IEAs includes nominal and real measures as well as the related chained Fisher price indexes. We generate the growth in unadjusted real value added separately for industries grouped by R&D intensity and IT intensity using the Törnqvist formula. We also generate the growth in the number of hours worked for each group of industries. We then subtract the growth in the number of hours worked from the Törnqvist growth in unadjusted real value added to construct separate annual and cumulative unadjusted series of labor productivity growth for R&D industries, non-R&D industries, IT-using industries, non-IT-using industries, IT-producing industries, and non-IT-producing industries.

We adjust nominal value added for industries grouped by R&D intensity and IT intensity. We generate separate adjustments for R&D-intensive industries and IT-intensive industries by first applying the survey-level data collected by BEA on MNEs to (6) and then aggregating the survey-level adjustments for R&D-intensive firms, IT-using firms, IT-producing firms, and the respective residual firms. We then generate the growth in adjusted nominal value added for each group of industries, and we also generate the growth in prices for each group using the Törnqvist formula. We subtract the growth in prices from the growth in adjusted nominal value added to derive the growth in adjusted real value added. Finally, we subtract the same growth in number of hours worked that we used in the unadjusted series from the growth in adjusted real value added to construct separate annual and cumulative adjusted series of labor productivity growth for R&D industries, non-R&D industries, IT- using industries, non-IT-using industries, IT-producing industries, and non-IT-producing industries.

Labor share series

Data for our calculations of labor and capital shares come from NIPA Tables 1.13 and 7.5. For the labor share, we divide compensation of employees by the sum of corporate business net income and corporate business consumption of fixed capital. For the capital share, we use the same denominator and subtract compensation of employees from the sum to obtain the numerator. To calculate the adjusted series, we add our adjustment to the denominator of the labor share and to the numerator and denominator of the capital share.

For labor share by industry, we use components of value added from the IEAs, which are available for 1987–2016. For each two-digit NAICS sector, we divide compensation of employees by value added to calculate the unadjusted labor share. To calculate the adjusted labor share, we divide compensation of employees by the sum of value added and our industry-level adjustment.

B.2 FDIUS: Data and variable construction details

In Section 6, we need a data set that allows us to compute two statistics: 1) the share of worldwide profits a foreign-owned MNE earns in the United States and 2) the apportionment weights for the affiliates of foreign-owned MNEs operating in the United States.

Profits

For each foreign-owned MNE operating in the United States, we need the worldwide profits of the MNE and the profits earned in the United States. The BEA data report the profits earned by the affiliates in the United States, but not the worldwide profits of the MNE. We obtain worldwide profits from Bureau van Dyke's *Orbis* database.

Apportionment weights

We use compensation and net plant, property, and equipment (PPE) as our apportionment factors and weight them equally to construct the apportionment weight. We require compensation and PPE for affiliates operating in the United States, which are reported in the BEA survey data. As with profits, the BEA data do not report MNE total compensation and PPE—we also obtain this data from *Orbis*.

Matching

We need to match the affiliate operating in the United States reported in the BEA data to its parent in the *Orbis* data. A common numeric identifier does not exist in the two

data sets, so the linking must be done by name matching, which, because of inconsistencies and ambiguities in company names, is imperfect and time consuming. For this reason, we concentrate our efforts on R&D-intensive firms, which we have found, in the outbound FDI data, to be more involved in profit shifting. We do this for the years 2008, 2012, and 2015.

Reapportioning profits

Using the linked BEA-*Orbis* data, we compute reapportioned profits for each MNE operating in the United States. To do so, we compute the apportionment weight for the U.S. operations of the foreign MNE, n as

$$\omega_n^{US} = \frac{1}{2}\frac{w_n^{US}\ell_n^{US}}{w_n\ell_n} + \frac{1}{2}\frac{k_n^{US}}{k_n}, \tag{B.1}$$

where $w\ell$ is compensation and k is PPE. Values denoted with an superscript US are the values of the affiliates operating in the United States and values without a superscript are the worldwide values for the MNE as a whole. Reapportioned profits are $\hat{\pi}_n^{US} = \omega_n^{US}\pi_n$. For example, if a foreign-owned U.S. business had \$5 million in compensation and \$200 million in PPE, and its global firm had \$10 million in compensation, \$500 million in PPE, and \$100 million in profits, the reapportioned profits of the foreign-owned U.S. business would be

$$\$45\text{mil.} = \left(\frac{\$5\text{mil.}}{\$10\text{mil.}} + \frac{\$200\text{mil.}}{\$500\text{mil.}}\right)\frac{1}{2} \times \$100\text{mil.} \tag{B.2}$$

C Figures and tables

TABLE C.1 – Robustness of adjustments in other countries (bil. USD), 2016

	Apportionment weights			
	Weighted	Only compensation	Only PPE	Only R&D
All countries	−140.3	−125.1	−120.8	−167.2
Bermuda	−42.1	−43.0	−42.2	−40.5
Canada	5.6	7.5	5.9	1.7
China	4.3	7.2	7.1	−1.3
France	7.5	12.0	5.8	3.5
Germany	11.2	13.5	8.4	10.9
Ireland	−32.5	−43.8	−8.1	−44.4
Italy	5.2	6.5	6.4	2.3
Japan	3.0	5.8	1.8	1.1
Luxembourg	−25.0	−25.5	−25.2	−23.1
Netherlands	−59.1	−58.9	−57.4	−56.7
Singapore	−14.9	−13.7	−13.5	−16.5
Switzerland	−17.0	−17.6	−20.7	−9.7
United Kingdom	6.4	5.2	−2.6	17.2
U.K.I., Caribbean	−29.5	−30.6	−28.4	−23.9
Other countries	36.6	50.4	41.8	12.2

Notes: The "all countries" entry is the amount added to U.S. GDP times minus one. The "weighted" column is our benchmark adjustment in which compensation, PPE, and R&D stocks are equally weighted.

TABLE C.2 – Aggregate adjustment by directly- and indirectly-held affiliates (billion USD)

	Directly-held affiliates	Indirectly-held affiliates	Net adjustment
1982	16.4	−2.2	14.2
1983	18.5	−3.2	15.4
1984	20.7	−4.1	16.6
1985	22.8	−5.0	17.8
1986	24.9	−5.9	19.0
1987	27.0	−6.9	20.2
1988	29.2	−7.8	21.4
1989	31.3	−8.7	22.6
1990	32.4	−9.6	22.8
1991	33.5	−10.5	23.0
1992	34.7	−11.4	23.3
1993	35.8	−12.3	23.5
1994	36.9	−13.2	23.7
1995	49.3	−13.6	35.7
1996	48.4	−16.8	31.6
1997	60.3	−20.1	40.2
1998	51.9	−23.0	28.8
1999	68.0	−29.0	38.9
2000	80.7	−33.5	47.1
2001	92.7	−26.9	65.7
2002	85.8	−31.0	54.8
2003	103.0	−43.3	59.7
2004	151.1	−64.3	86.8
2005	177.6	−62.6	115.0
2006	190.7	−79.4	111.3
2007	196.0	−73.8	122.3
2008	270.7	−88.5	182.2
2009	248.1	−86.6	161.5
2010	302.1	−112.7	189.5
2011	307.1	−155.0	152.1
2012	290.0	−146.1	144.0
2013	287.6	−166.9	120.6
2014	291.7	−153.1	138.6
2015	276.7	−120.2	156.5
2016	269.5	−129.2	140.3

TABLE C.3 – Industry groupings

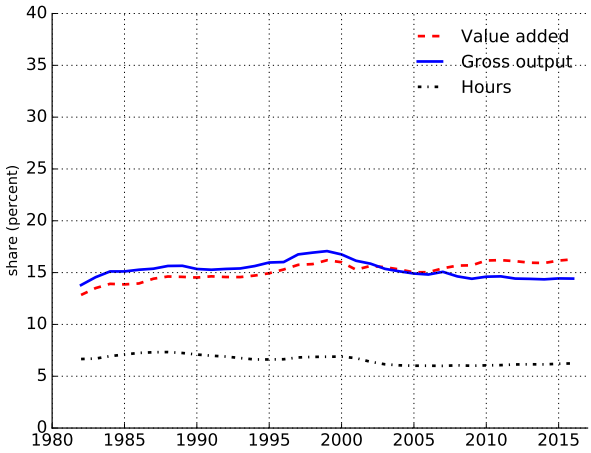
	NAICS Codes	Description
R&D Intensive	325	Chemical Manufacturing
	334	Computer and Electronic Product Manufacturing
	336	Transportation and Equipment Manufacturing
	511	Publishers
	5415	Computer Systems Design
	5417	Scientific R&D Services
IT Producing	334	Computer and Electronic Product Manufacturing
	51	Information
	5415	Computer Systems Design
IT Using	315	Apparel Manufacturing
	333	Machinery Manufacturing
	335	Electrical Equipment, Appliance, and Component Man.
	336	Transportation and Equipment Manufacturing
	337	Furniture and Related Product Manufacturing
	339	Miscellaneous Manufacturing
	42	Wholesale Trade
	44-45	Retail Trade
	51	Information
	532	Rental and Leasing Services
	5417	Scientific R&D Services

Notes: The IT-producing classification is from Fernald (2015). The IT-using classification is from Bloom et al. (2012). The R&D classification is from Moylan and Robbins (2007). ISIC or SIC codes have been converted to the NAICS-based ISI classification used by BEA in its surveys of MNEs.

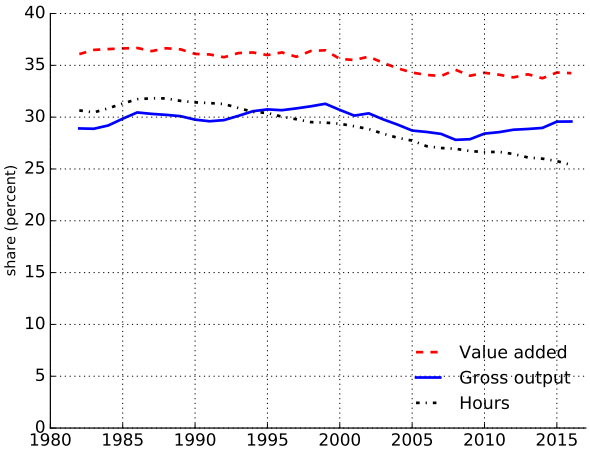
Gross output data are from Bureau of Economic Analysis (2021a) and Bureau of Economic Analysis (2021b).

FIGURE C.1 – Industry group shares

(A) R&D-intensive industries



(B) IT-using industries



(C) IT-producing industries

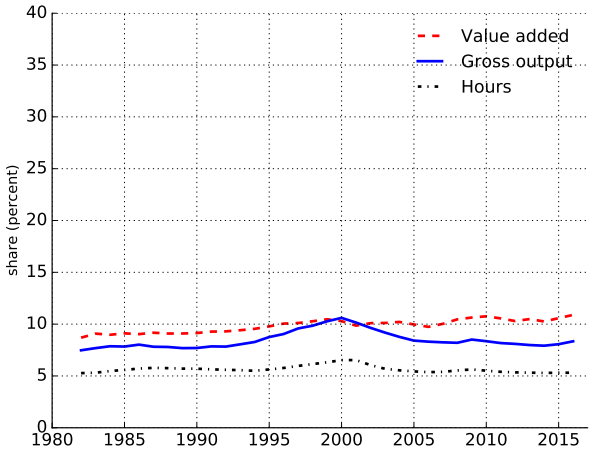
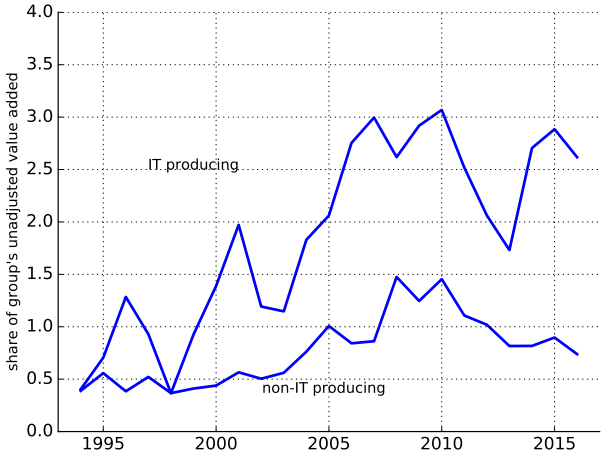
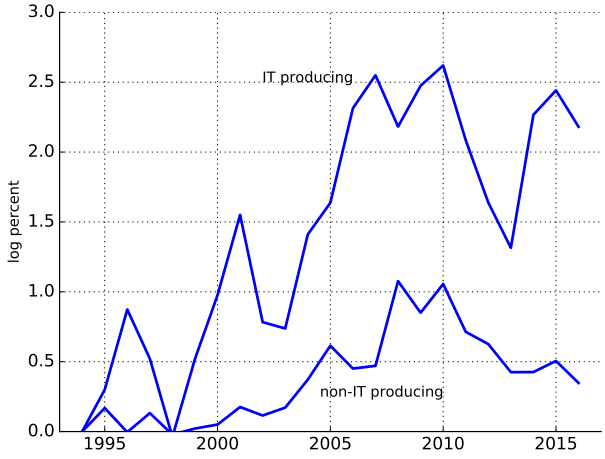


FIGURE C.2 – Industries by IT producing and using intensity

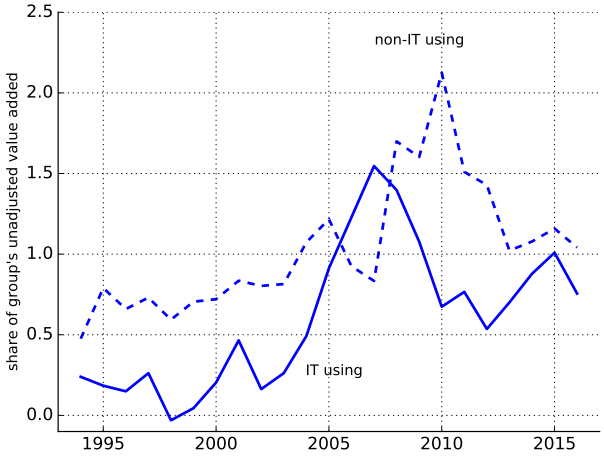
(A) Adjustments, IT producing



(B) Productivity growth, IT producing



(C) Adjustments, IT using



(D) Productivity growth, IT using

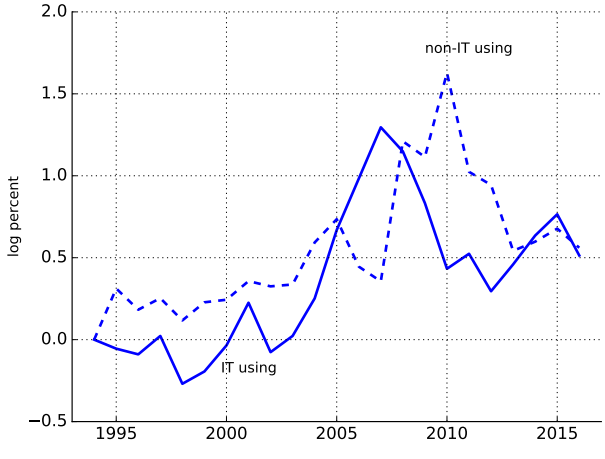
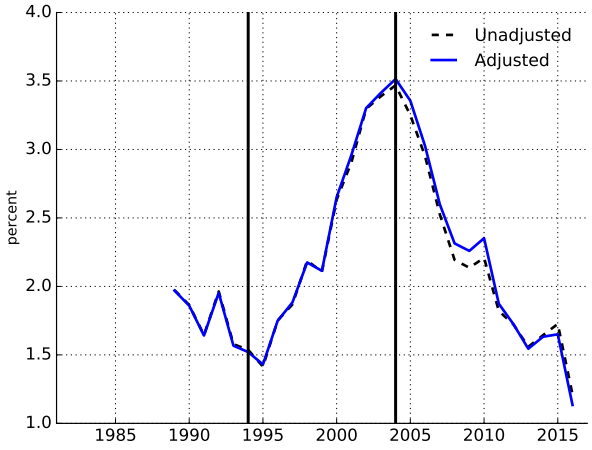
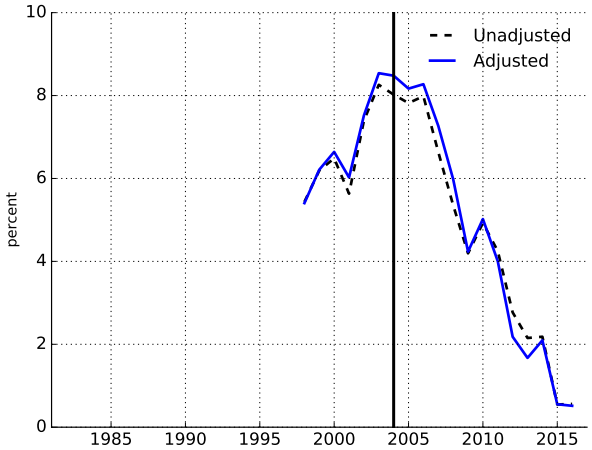


FIGURE C.3 – Annual labor productivity growth rates

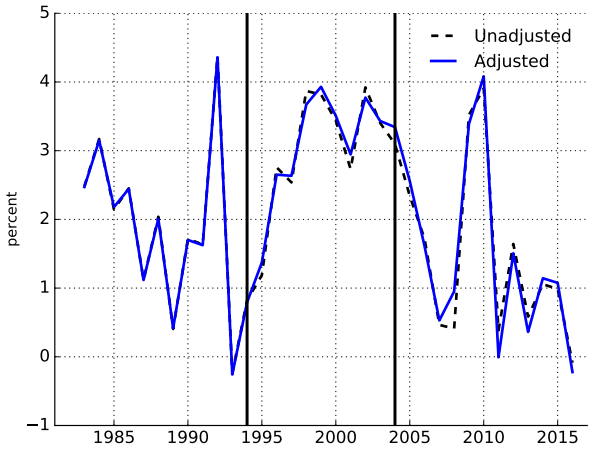
(A) Aggregate (moving average)



(B) R&D-intensive industries (moving average)



(C) Aggregate



(D) R&D-intensive industries

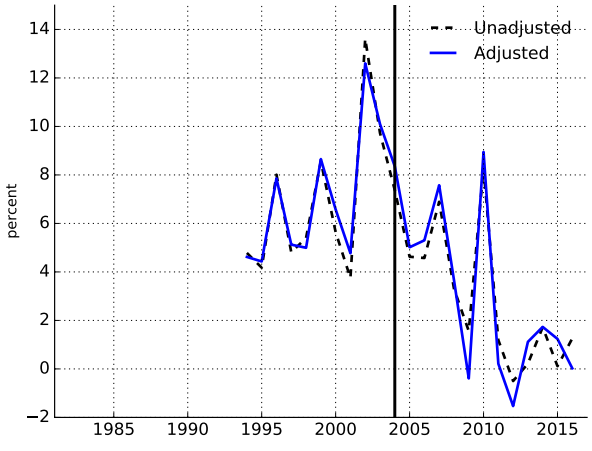
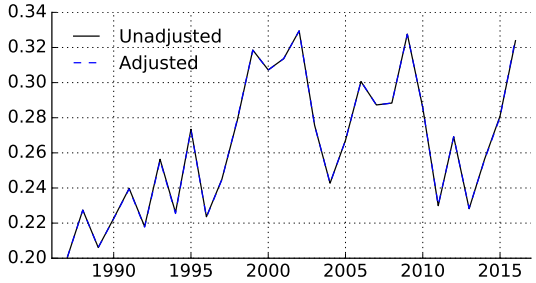
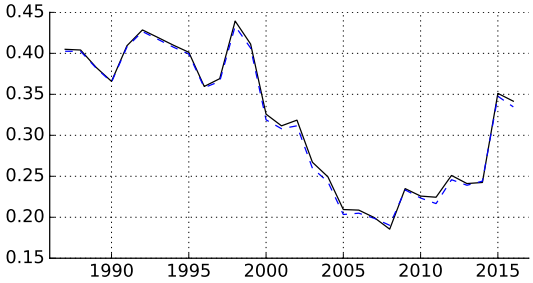


FIGURE C.4 – Labor shares by industry

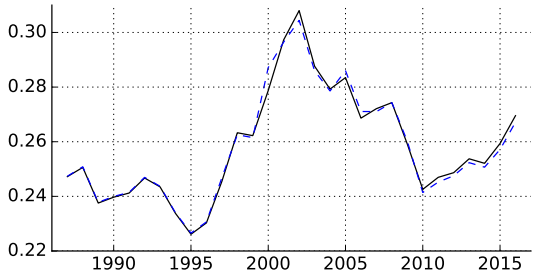
(A) Agriculture, forestry, fishing, and hunting



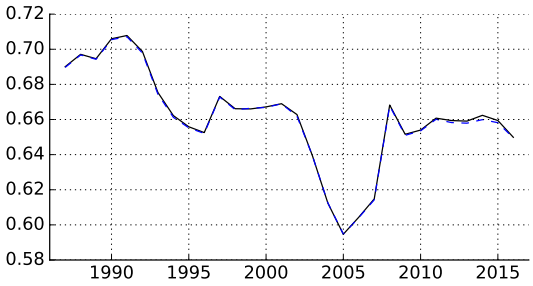
(B) Mining



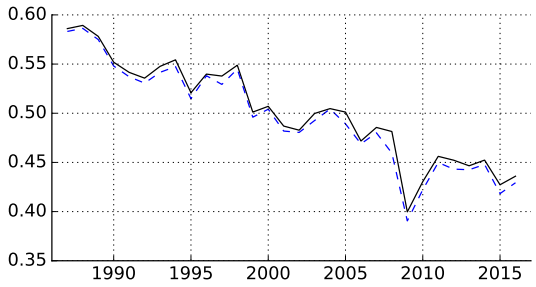
(C) Utilities



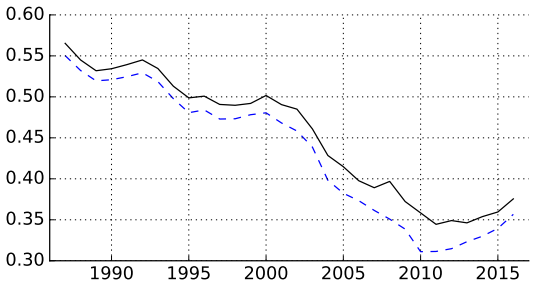
(D) Construction



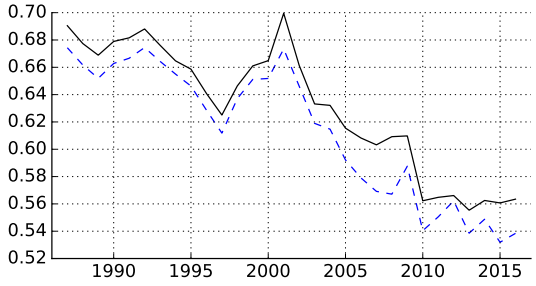
(E) Food, textiles, and apparel



(F) Petroleum, chemicals, plastics, wood, paper



(G) Computers, electrical equip., vehicles



(H) Wholesale trade

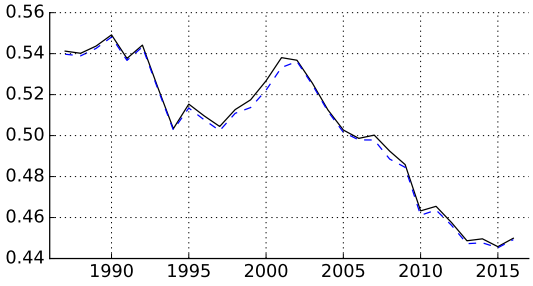
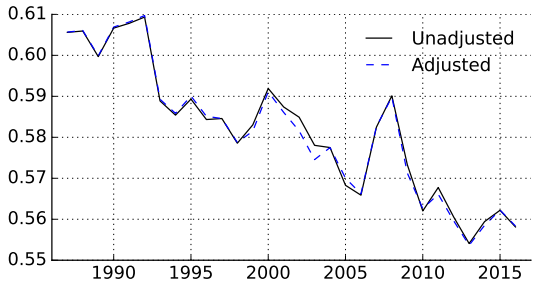
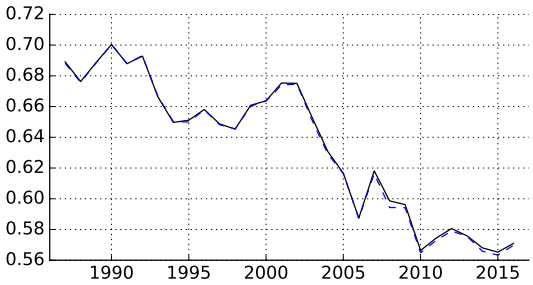


FIGURE C.5 – Labor shares by industry, continued

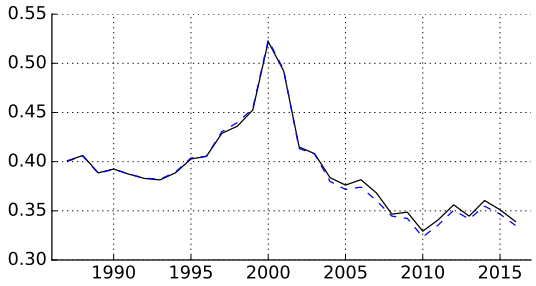
(A) Retail trade



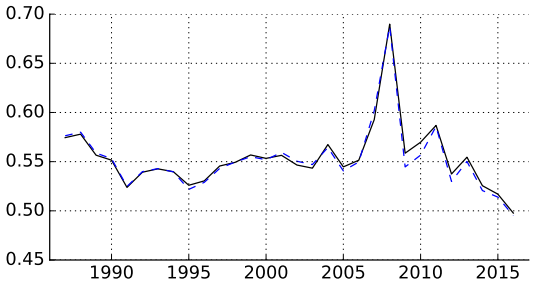
(B) Transportation and warehousing



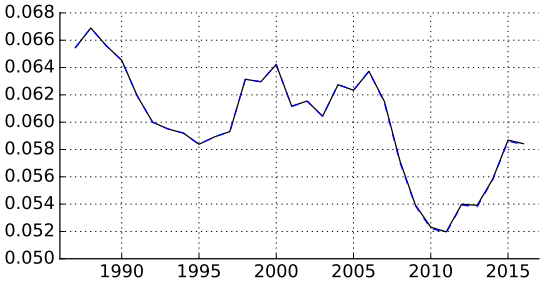
(C) Publishing, information, data processing



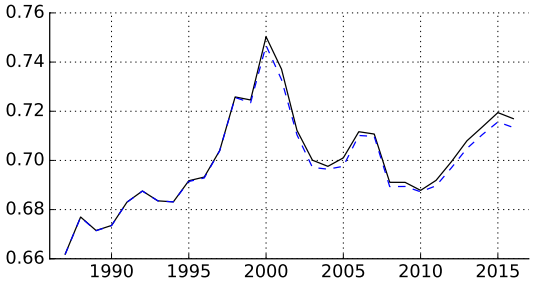
(D) Finance and insurance



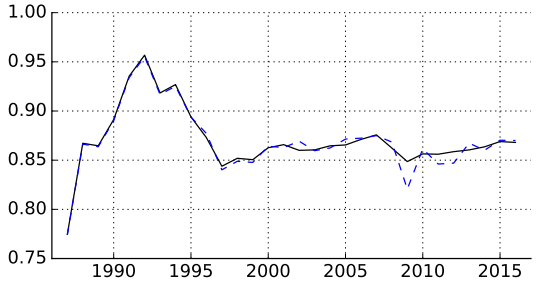
(E) Real estate and leasing



(F) Legal, computer system design, scientific R&D



(G) Management of companies and enterprises



(H) Administrative and waste management services

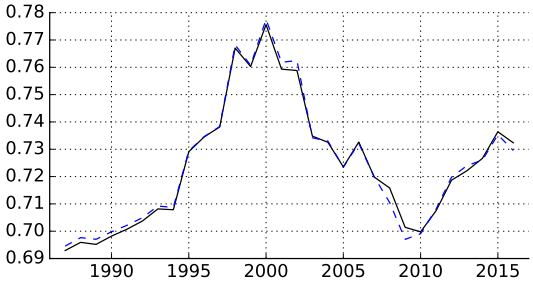
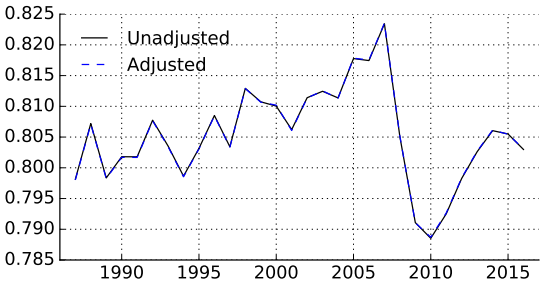
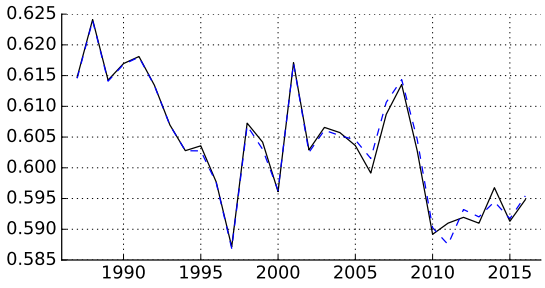


FIGURE C.6 – Labor shares by industry, continued

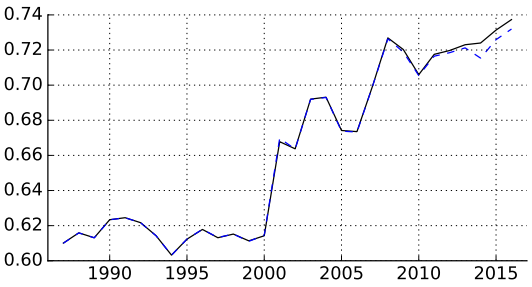
(A) Education, health care, and social assistance



(B) Arts and entertainment



(C) Other services, except government



D Profit shifting strategies of MNEs

Intangible assets have long been a defining feature of multinational enterprises (MNEs). Hymer (1976, pp. 42–43) is widely acknowledged as the first scholar to recognize that domestic firms venture abroad to exploit their proprietary intangible assets (such as patents and brand recognition) and that it is the market power from those assets that allows these firms to overcome the liability of foreignness and to operate abroad successfully. What is unique about the last few decades is that the importance of intangible assets in firms' balance sheets has been growing at an accelerating rate. Data in Lev and Gu (2016, p. 82) show that the contribution of investment in intangible assets to production grew at roughly a 1.1 percent annual rate in 1977–1994 compared with a 1.4 percent annual rate in 1994–2011. This rise in the importance of intangible assets has created an extra incentive for U.S. MNEs to shift the ownership of their intangible assets to foreign affiliates in tax haven countries to reduce their global tax liability.

U.S. tax laws regarding the intrafirm transfer of intangible assets are long-standing, but the codification and enforcement of those laws have become a major focus of both the IRS and the corporate sector in the last few decades. Current guidelines covering the intrafirm transfer of intangible assets are covered by Section 482 of the U.S. tax code. Bose (2002) notes that these guidelines have existed in some form ever since the creation of the IRS in 1917 but that, in the last few decades, firms have tried to develop tax strategies that exploit ambiguities in those guidelines and the IRS has, in turn, tried to tighten its guidelines to eliminate ambiguity. The original guiding principle for U.S. tax treatment of the transfer of intangible assets came out of the Tax Reform Act of 1986. That Act amended Section 482 to require that when intangible assets are transferred between units of an MNE, the receiving unit must pay a price to the providing unit that is commensurate with the expected income from that asset.

D.1 Cost sharing agreements

Firms can structure an intrafirm transfer of intangible assets in different ways, but one of the most common legal structures is a cost sharing agreement (CSA). In a CSA, one geographic unit of an MNE—typically a foreign affiliate in a tax haven country—shares the cost of developing a new technology with its U.S. parent and, in return, is granted rights to royalties on a portion of the sales of products or services using that technology. Under IRS guidelines, the foreign affiliate cannot be granted royalties on sales in the United States, so the affiliate is typically granted rights to royalties on sales in the rest of the world.

IRS guidelines on CSAs have been updated several times since the 1986 Act. In 1995,

the idea of a "buy-in payment" was introduced to account for the value of preexisting technology that could be embedded in a new technology governed by a CSA. In 2005, the idea of a "platform contribution" was introduced to account for the value of other U.S. headquarters services that could be embedded in a product or service whose technology was governed by a CSA. These contributions could include services such as "resources, capabilities, or rights, such as expertise in decision-making concerning research and product development, manufacturing or marketing intangibles or services, and management oversight and direction." The IRS codified the 2005 guidance on CSAs in its 2008 Temporary Regulations and its 2011 Final Regulations. In testimony to the Senate in 2013, Harvard law professor Stephen Shay described the pre-2011 regulations as "much more relaxed" than the post-2011 regulations (Senate Committee on Homeland Security and Government Affairs, 2013). This comment suggests that the combined IRS guidance on "buy-in payments" and "platform contributions" gradually made it much more difficult for MNEs to use CSAs to transfer intangible assets over the 2005–2011 period.

D.2 Deferral and hybrid entities

Prior to the December 2017 tax reform, U.S.-based businesses were subject to a worldwide tax system rather than a territorial tax system so that their worldwide profits were essentially taxed at the U.S. statutory rate. On the face of it, this principle would seem to eliminate the advantage of moving intangible assets (and their associated income) to tax havens. However, there were exceptions to the general principle. One exception was that foreign-sourced income was generally not taxed until it was repatriated to the United States, as long as it was actively invested abroad. One way for MNEs to indefinitely defer U.S. taxation was to declare foreign earnings as "permanently reinvested" abroad.

The difference between the pre-reform 35 percent corporate statutory federal income tax rate in the United States and the 12.5 percent rate in Ireland, for example, should have been incentive enough for U.S. MNEs to seek to shift profits offshore, but there could be even further inducements, such as hybrid entities. A hybrid entity is a unit of an MNE that is recognized by the tax authority of its home or host country but not recognized by the tax authority of the other country. Through the creation of complex holding structures, MNEs have, at times, been able to exploit differences in the pre-reform tax rules to create foreign entities that were essentially stateless and therefore free from tax. One of these structures, spanning an ownership chain that crosses the United States, Bermuda, Ireland, and the Netherlands, is known as the "double Irish with a Dutch sandwich" strategy. In October of 2014, however, Ireland changed its tax laws to eliminate this loophole.

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