

# International Transfer Pricing and Tax Avoidance: Evidence from Linked Tax-Trade Statistics in the UK

Li Liu, Tim Schmidt-Eisenlohr, and Dongxian Guo

International Monetary Fund, Federal Reserve Board, and LSE

# Disclaimers

*This work contains statistical data from HMRC which is Crown Copyright. The research datasets used may not exactly reproduce HMRC aggregates. The use of HMRC statistical data in this work does not imply the endorsement of HMRC in relation to the interpretation or analysis of the information.*

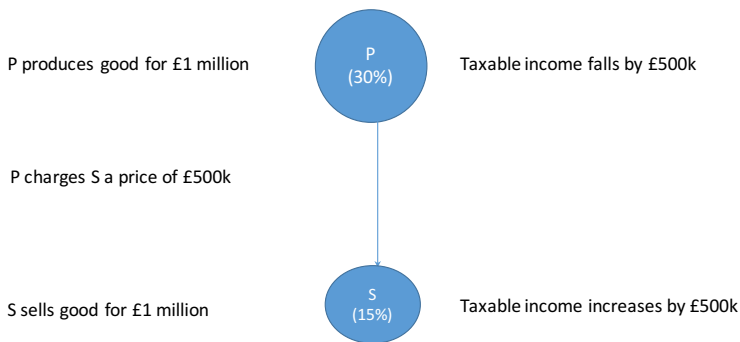
*The views expressed in this presentation are those of the authors and do not necessarily reflect the views of the IMF, its Executive Board, or IMF management. Nor do the views necessarily reflect the position of the Federal Reserve Board or the Federal Reserve System.*

# Introduction

- Profit shifting by multinational companies (MNC) is a large concern for policy makers
  - Unilateral: implementation of various anti-avoidance rules; "Google tax" in the UK (2015) and Australia (2016)
  - Multilateral: the G20/OECD base erosion and profit shifting (BEPS) project
- Common strategies used by MNC to shift profits:
  - Debt shifting
  - Royalties and service fees
  - Transfer mispricing
- Some well-known cases: Google, Apple, Starbucks, Pfizer
  - often through intellectual property rights, licensing etc
- But there are also some well-known TP cases: e.g. Caterpillar

# Transfer Mispricing: A Simple Example

- Manipulating prices of goods and services sold between related parties to shift pre-tax income across countries and to lower local and global tax burden



- 500k of taxable profits shifted; Tax liability decreases by 75,000
- General approach and current international consensus: arm's length principle
  - charge price that would be charged to independent/unrelated buyer
  - in practice difficult/costly to observe ALP

- Early indirect evidence on systematic correlation between pre-tax profits and cross-country tax differentials:
  - Grubert and Mutti (1991), Harris et al. (1993), Hines and Rice (1994), Collin et al. (1998)
- Recent direct evidence (US, France, Denmark, and Germany):
  - Clausing (2003): industry level (U.S.)
  - Bernard et al. (2006), Flaaen (2017): U.S. Census data
  - Vicard (2015), Cristea and Nguyen (2016), Davies et al. (2017), : transaction-level price data (France, Denmark)
  - Hebous and Johannesssen (2015): services trade value (Germany)

# Our Contribution

- Improved identification using a full set of three-way fixed effects:
  - firm-product-country, country-product-year, and firm-product-year
  - Baseline: 1% larger  $\Delta\tau \Rightarrow$  3% **lower** RP price
- New aspects of transfer mispricing:
  - in different international taxation regimes (worldwide vs territorial)
  - in R&D Intensity
  - across different locations (tax havens vs. regular countries)
- Theory: extend model with different international taxation regimes and tax-motivated trade diversion
  - Tax savings =  $\Delta\tau \times (p_a - p_t) \times exports$ , with  $\Delta\tau$  the tax difference;  $p_t$ : transfer price;  $p_a$ : the arm's length price.
- Quantification: around 0.4 - 0.8% of CIT revenue eroded due to transfer mispricing of tangible goods in manufacturing

# Model: Set-up

- Consider an MNC facing a demand function  $q(p)$
- Governments punish deviations from the arm's length price:

$$-\frac{\lambda}{2}[(p_a - p_t)^2]q_f$$

- Let  $\gamma \in \{\gamma_W, \gamma_T\}$  denote the value of £1 after-tax profits in a low-tax country relative to £1 after-tax profits at home
  - Under the territorial system:  $\gamma_T = 1$
  - Under the worldwide system:  $\gamma_W < 1$
- Overall post-tax profits of the MNC are given by:

$$\begin{aligned} \Pi = & \underbrace{(1 - \tau_h)(p_a - c)q_a}_{\text{arm's-length } \Pi} + \underbrace{[\gamma(1 - \tau_f)p_f - (1 - \tau_h)c]q_f}_{\text{related-party } \Pi} \\ & - \underbrace{p_t((1 - \tau_h) - \gamma(1 - \tau_f)q_f)}_{\text{tax cost of transfer price}} - \underbrace{\frac{\lambda}{2}[(p_a - p_t)^2]q_f}_{\text{penalty}} \end{aligned}$$

# Optimal transfer price

- FOC for  $p_t$  delivers:

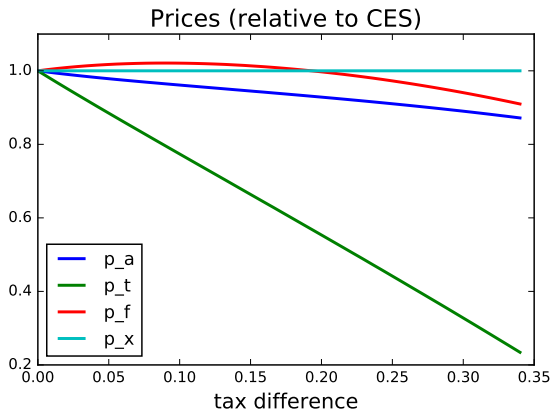
$$p_t = p_a - \frac{(\gamma - 1 + \tau_h - \gamma\tau_f)}{\lambda}$$

- $p_t < p_a$ : transfer price manipulation
- Transfer price manipulation is stronger under the territorial system:

$$\frac{\partial(p_a - p_t)}{\partial\gamma} > 0$$



# Simulation: Prices

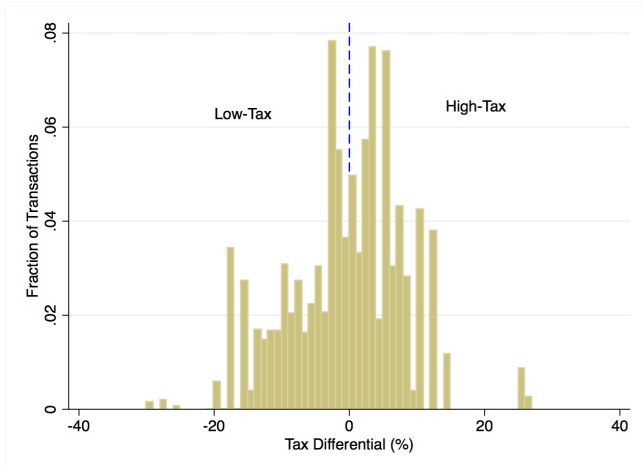


- Transfer price falls in tax difference
- Related-party final price below standard CES price when tax difference large enough

- Trade Statistics:
  - Transaction-level data for the universe of UK imports and exports during 2005-2011
  - 8-digit commodity codes, trade values and quantities, destinations, etc to compute the **firm-product-destination-year** unit price
- CT600: Universe of UK Corporation Tax records
  - detailed **tax position** of all companies in the UK
  - precise information on their **qualifying R&D spending**
- FAME Ownership data:
  - information on **ownership** to determine stand-alone vs. MNC, and ultimate owner
  - **location** of overseas affiliates
- Restricted to **UK multinationals in manufacturing** for clean identification

⇒ Final dataset includes 931,773 observations at the firm-product-year level for 1,256 unique companies in manufacturing during 2005-2011

# Tax Differential with UK



# Empirical Strategy

Baseline specification:

$$\ln p_{ijkt} = \alpha_{ijk} + \alpha_{jkt} + \alpha_{ikt} + (\beta_1 \Delta \tau_{jt} \times I_{low,t} + \beta_2 \Delta \tau_{jt} \times I_{high,t}) \times AFF_{ij} + \varepsilon_{ijkt} \quad (1)$$

With:

- $p_{ijkt}$ : unit value of exports by firm  $i$ , selling product  $k$  to country  $j$  at time  $t$
- $\Delta \tau_{jt} = |\tau_{jt} - \tau_{UK,t}|$
- $AFF_{ij}$ : indicator dummy, 1 if firm  $i$  has an affiliate in country  $j$
- $I_{low,t}$ : indicator if destination tax rate below UK rate
- $\alpha_{ijk}$ : firm-destination-product fixed effect
- $\alpha_{jkt}$ : destination-product-year fixed effect
- $\alpha_{ikt}$ : firm-product-year fixed effect

⇒  $\beta_1$ : **negative** if MNCs shift profits to low-tax countries

# Evidence on tax-motivated transfer mispricing

$\Delta r_{jt} \times$	(1)	(2)
$I_{low,t} \times AFF_{ij}$	-0.030*** (0.011)	-0.027*** (0.011)
$I_{high,t} \times AFF_{ij}$	-0.007 (0.006)	-0.000 (0.006)
$AFF_{ij} \times Post_t$		0.132*** (0.043)
$I_{low,t} \times AFF_{ij} \times Post_t$		-0.015*** (0.005)
$I_{high,t} \times AFF_{ij} \times Post_t$		-0.008 (0.007)
$R^2$	0.973	0.974
$N$	387,709	315,330

- For exports to low-tax jurisdictions, a one percentage point lower destination tax rate, on average, reduces RP trade prices by 3 percent
- In line with Clausing (2003), but an order of magnitude larger than Cristea and Nguyen (2016) and Vicard (2015).

which increased after the 2009 territorial reform

$$Post_t = year_t > 2009$$

$\Delta\tau_{jt} \times$	(1)	(2)
$I_{low,t} \times AFF_{ij}$	-0.030*** (0.011)	-0.027** (0.011)
$I_{high,t} \times AFF_{ij}$	-0.007 (0.006)	-0.000 (0.006)
$AFF_{ij} \times Post_t$		0.132*** (0.043)
$I_{low,t} \times AFF_{ij} \times Post_t$		-0.015*** (0.005)
$I_{high,t} \times AFF_{ij} \times Post_t$		-0.008 (0.007)
$R^2$	0.973	0.974
$N$	387,709	315,330

Following the reform, there was more transfer price manipulation:

- Low-tax destinations: 1% larger  $\Delta\tau \Rightarrow$  additional 1.5% **lower** RP price

# Heterogeneous Effects in R&D Intensity

$\Delta_{rjt} \times AFF_{ij} \times$	(1)	(2)	(3)	(4)	(5)
$I_{low,t}$				-0.033 (0.028)	-0.034 (0.030)
$I_{low,t} \times R\&D_{low,i}$	-0.010 (0.015)		-0.025 (0.023)		
$I_{low,t} \times R\&D_{medium,i}$	0.000 (0.017)		-0.015 (0.025)	0.014 (0.015)	0.017 (0.015)
$I_{low,t} \times R\&D_{high,i}$	-0.064*** (0.016)		-0.073*** (0.025)	-0.044* (0.024)	-0.041* (0.022)
$I_{low,t} \times Size_{small,i}$		-0.004 (0.019)	0.026 (0.022)		
$I_{low,t} \times Size_{medium,i}$		-0.037* (0.022)	-0.000 (0.004)		-0.020 (0.026)
$I_{low,t} \times Size_{large,i}$		-0.041*** (0.015)	0.009 (0.027)		-0.015 (0.022)
$I_{low,t} \times Diff_i$				0.019 (0.033)	0.033 (0.032)
$I_{high,t}$	-0.007 (0.006)	-0.007 (0.006)	-0.006 (0.006)	-0.009 (0.006)	-0.009 (0.006)
$R^2$	0.973	0.973	0.973	0.973	0.973
$N$	387,709	373,767	373,767	331,787	321,221

- High R&D firms manipulate transfer prices substantially more
- Tangible goods mispricing seems to complement profit shifting via intangible assets

# Heterogeneous Effects in R&D Intensity

$\Delta_{t,j} \times AFF_{ij} \times$	(1)	(2)	(3)	(4)	(5)
$I_{low,t}$				-0.033 (0.028)	-0.034 (0.030)
$I_{low,t} \times R\&D_{low,t}$	-0.010 (0.015)		-0.025 (0.023)		
$I_{low,t} \times R\&D_{medium,t}$	0.000 (0.017)		-0.015 (0.025)	0.014 (0.015)	0.017 (0.015)
$I_{low,t} \times R\&D_{high,t}$	-0.064*** (0.016)		-0.073*** (0.025)	-0.044* (0.024)	-0.041* (0.022)
$I_{low,t} \times Size_{small,t}$		-0.004 (0.019)	0.026 (0.022)		
$I_{low,t} \times Size_{medium,t}$		-0.037* (0.022)	-0.000 (0.004)		-0.020 (0.026)
$I_{low,t} \times Size_{large,t}$		-0.041*** (0.015)	0.009 (0.027)		-0.015 (0.022)
$I_{low,t} \times Diff_i$				0.019 (0.033)	0.033 (0.032)
$I_{high,t}$	-0.007 (0.006)	-0.007 (0.006)	-0.006 (0.006)	-0.009 (0.006)	-0.009 (0.006)
$R^2$	0.973	0.973	0.973	0.973	0.973
$N$	387,709	373,767	373,767	331,787	321,221

- High R&D firms manipulate transfer prices substantially more
- Tangible goods mispricing seems to complement profit shifting via intangible assets
- Robust to controlling for firm size



# Heterogeneous Effects in R&D Intensity

$\Delta_{t,j} \times AFF_{ij} \times$	(1)	(2)	(3)	(4)	(5)
$I_{low,t}$				-0.033 (0.028)	-0.034 (0.030)
$I_{low,t} \times R\&D_{low,t}$	-0.010 (0.015)		-0.025 (0.023)		
$I_{low,t} \times R\&D_{medium,t}$	0.000 (0.017)		-0.015 (0.025)	0.014 (0.015)	0.017 (0.015)
$I_{low,t} \times R\&D_{high,t}$	-0.064*** (0.016)		-0.073*** (0.025)	-0.044* (0.024)	-0.041* (0.022)
$I_{low,t} \times Size_{small,t}$		-0.004 (0.019)	0.026 (0.022)		
$I_{low,t} \times Size_{medium,t}$		-0.037* (0.022)	-0.000 (0.004)		-0.020 (0.026)
$I_{low,t} \times Size_{large,t}$		-0.041*** (0.015)	0.009 (0.027)		-0.015 (0.022)
$I_{low,t} \times Diff_i$				0.019 (0.033)	0.033 (0.032)
$I_{high,t}$	-0.007 (0.006)	-0.007 (0.006)	-0.006 (0.006)	-0.009 (0.006)	-0.009 (0.006)
$R^2$	0.973	0.973	0.973	0.973	0.973
$N$	387,709	373,767	373,767	331,787	321,221

- High R&D firms manipulate transfer prices substantially more
- Tangible goods mispricing seems to complement profit shifting via intangible assets
- Robust to controlling for firm size and the type of goods

# Driven by Tax Havens?

Haven classification based on Hines (2005)

$\Delta\tau_{jt} \times$	Tax Havens Only (1)	Non-Tax Havens (2)	Full Sample (3)
$I_{low,t} \times AFF_{ij}$	0.001 (0.024)	-0.029** (0.012)	-0.030** (0.012)
$I_{high,t} \times AFF_{ij}$	0.030 (0.131)	-0.008 (0.006)	-0.007 (0.006)
$I_{low,t} \times AFF_{ij} \times Haven_j$			-0.001 (0.021)
$I_{high,t} \times AFF_{ij} \times Haven_j$			0.077 (0.200)
$R^2$	0.991	0.973	0.973
$N$		22,895	332,266 387,709

- No evidence with tax havens only sample
- Results hold when focusing on non-haven countries

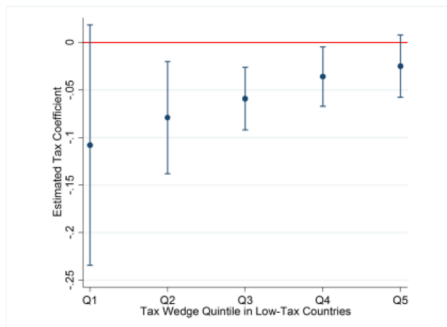
# Driven by Tax Havens?

$\Delta\tau_{jt} \times$	Tax Havens Only (1)	Non-Tax Havens (2)	Full Sample (3)
$I_{low,t} \times AFF_{ij}$	0.001 (0.024)	-0.029** (0.012)	-0.030** (0.012)
$I_{high,t} \times AFF_{ij}$	0.030 (0.131)	-0.008 (0.006)	-0.007 (0.006)
$I_{low,t} \times AFF_{ij} \times Haven_j$			-0.001 (0.021)
$I_{high,t} \times AFF_{ij} \times Haven_j$			0.077 (0.200)
$R^2$	0.991	0.973	0.973
$N$		22,895	332,266 387,709

- No evidence with tax havens only sample
- Results hold when focusing on non-haven countries

# Non-Linear Tax Effects

$$\ln p_{ijkt} = \alpha_{ijk} + \alpha_{jkt} + \alpha_{ikt} + \sum_{q=1}^5 \beta_q \times I_{qt} \times AFF_{ij} + \varepsilon_{ijkt} \quad (2)$$



## Effect on trade flows?

Dependent variable:	$\ln(\text{Weight})$	$\ln(\text{UnitPrice})$	$\ln(\text{TotalValue})$
	(1)	(2)	(3)
$\Delta\tau_{jt} \times I_{low,t} \times AFF_{ij}$	-0.027 (0.020)	-0.032*** (0.011)	-0.059** (0.024)
$\Delta\tau_{jt} \times I_{high,t} \times AFF_{ij}$	-0.012 (0.008)	-0.007 (0.006)	-0.019** (0.010)
$R^2$	0.975	0.973	0.968
$N$	380,655	380,655	380,655

- MNC do not sell more to low-tax countries to shift additional profits
- If anything, they are selling somewhat lower quantities
- However, effects may be at the firm-country and not the product level

# Quantification

	Pure price effect		Value effect	
	Shifted profits	Foregone taxes	Shifted profits	Foregone taxes
Total	600.7	168.2	1,201.4	336.4

- About 0.4-0.8 percent of total UK corporate tax revenues lost due to transfer mispricing on manufacturing goods
- In line with estimates for France by Davies et al. (2017)

$$shifted\ profits = \sum_{c=1}^C \beta_1 \times I_{low,c} \times \Delta\tau_c \times exports_c$$

# Conclusions

- Evidence on transfer mispricing by UK multinationals in manufacturing
  - Systematic transfer price manipulation
  - Intensified after the 2009 tax reform
  - Concentrated in high R&D firms
  - About 0.4 - 0.8 percent loss in corporate income tax revenue
- Not just tax havens / mostly linear in tax difference
- No evidence for trade diversion towards low-tax countries
- Additional results (mispricing stronger for):
  - Goods shipped more frequently
  - Goods with larger share in total exports
- Policy implications for TP audit, tax authorities in other countries and beyond?