

# Transfer Pricing by Multinational Firms: New Evidence from Foreign Firm Ownership

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# Motivation

- ▶ Tax avoidance reduces government revenues, exacerbating the growing government deficits
- ▶ Multinational corporations (MNC) are the primary targets for scrutiny by tax authorities
  - Pay significantly less in taxes than domestic counterparts
  - With activity in multiple jurisdictions, MNCs can **minimize their tax burden by shifting profits** to affiliates in low corporate tax countries
- ▶ International taxation: issue of global concern

# Taxation and Multinational Firms

- ▶ Main policy question:

What are the mechanisms through which MNC minimize tax burden?

- ▶ Many methods to shift profits cross-border. Among them:

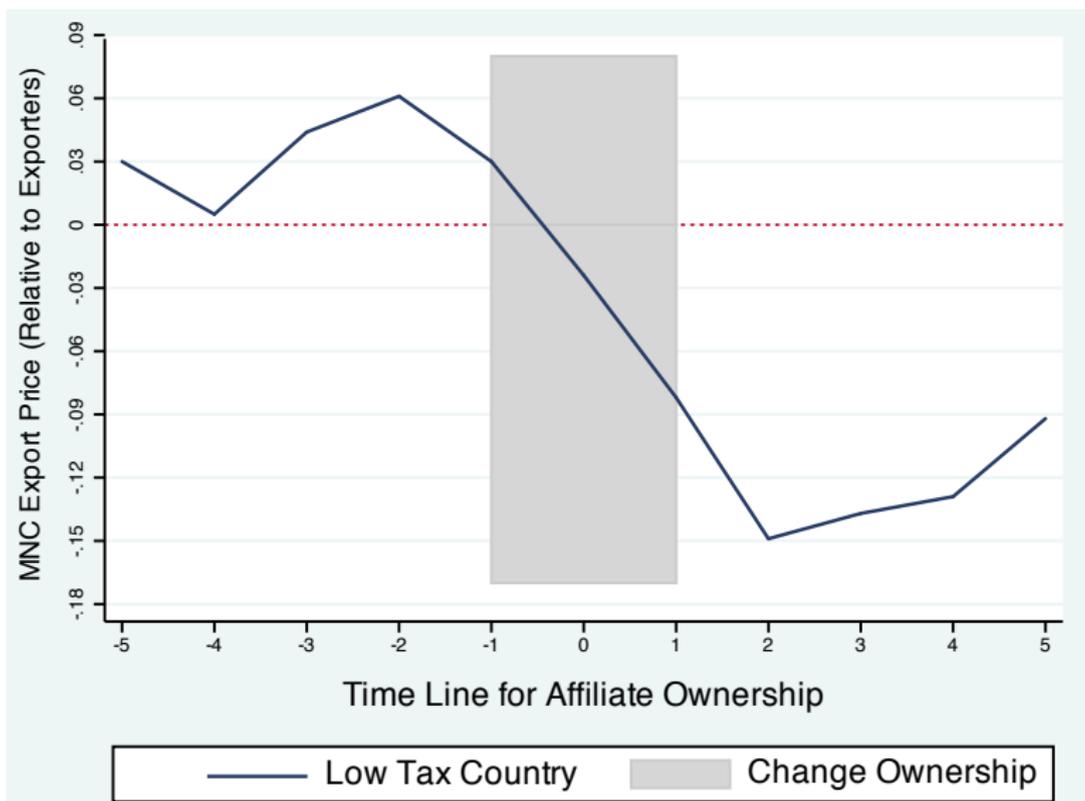
**Transfer pricing** of intra-firm sales

- MNCs have the incentive to set prices for internal transactions such that profits are accumulated in low tax countries

# This Paper

- ▶ **Examine** the extent to which MNCs shift profits worldwide using **transfer pricing** of intra-firm sales
  - *Arm's length principle of taxation*: intra-firm trade must be invoiced in the same way as third-party transactions
- ▶ **Show theoretically** potential **downward biases** with applying the arm's length principle of taxation to detect profit shifting
  - when gains from profit shifting are significant, MNCs alter arm's length transaction prices in the direction of intra-firm sale prices
- ▶ **New estimation strategy** to identify the deviation of transfer prices from counterfactual levels absent profit shifting motives
  - estimate before/after changes in export prices due to new foreign firm ownerships, and correlate them with foreign country tax rates

## Export price pre/post change in foreign ownership



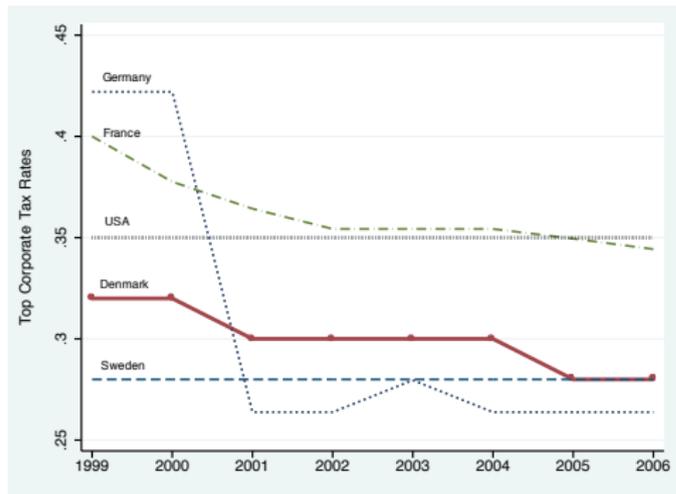
# Growth of Danish Multinationals

Year	Number Firm-Country Pairs			Export Values		
	Exporters	MNC	% MNC	All firms	Related Party*	% Related Party*
1999	45650	1206	2.64	203.3	40.5	19.92
2000	46725	1309	2.80	224.3	46.4	20.69
2001	47346	1477	3.12	237.7	57.6	24.23
2002	47976	1487	3.10	233.1	66.9	28.70
2003	46230	1586	3.43	230.3	66.0	28.66
2004	44890	1799	4.01	223.6	78.9	35.29
2005	42497	1755	4.13	229.6	77.7	33.84
2006	43030	1907	4.43	241.1	80.2	33.26

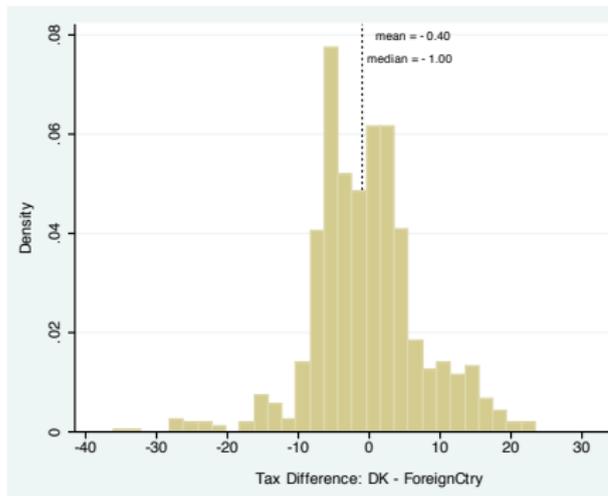
\* Related-party exports are defined as the value of exports by MNCs to those countries where they own an affiliate.

[▶ Return to Intro](#)

# Corporate Tax Rate in Denmark



Tax Rates: Denmark and Its Main Trade Partners



Tax wedge:  $tax_{DK} - tax_j$

# Literature Review

Large empirical literature on profit shifting by multinationals.  
Less evidence on particular mechanisms, such as transfer pricing.

- ▶ **Indirect evidence**: relate taxes to profit rates across countries
  - ▶ Grubert and Mutti (1991); Hines and Rice (1994); Bartelsman and Beetsma (2003); Egger, Eggert and Winner (2010)
- ▶ **Aggregate data**: related-party trade data at industry level
  - ▶ Swensen (2001)
- ▶ **Cross-sectional variation**: contemporaneous price difference between arm's length and intra-firm transaction prices
  - ▶ Clausing (2003); Bernard, Jensen and Schott (2006)
- ▶ **U.S. Evidence**: data availability

# Main Findings

- ▶ Direct evidence of transfer pricing by Danish multinationals.

A 10 % increase in the absolute difference in tax rates:

- 6-10 % lower export prices to *low corporate tax rate* countries
- no robust evidence of higher export prices to *high corporate tax rate* countries

- ▶ Transfer pricing is more prominent for:

- trade in differentiated goods
- countries with double taxation agreements
- countries with poor judicial quality

- ▶ Back-of-envelope calculation for year 2006:

Forgone tax revenues from underreported exports to low tax countries  $\approx$  3.2 % of Danish MNCs tax returns

# Outline

- ▶ Theory Framework
- ▶ Estimation Method + Identification Strategy
- ▶ Data Sources
- ▶ Results
- ▶ Conclusions

# Theory Framework

Main goal:

- ▶ characterize the optimal **pricing decision** of a multinational
- ▶ for a product traded **intra-firm (TP)** and **arm's length (AL)**
- ▶ in the presence of **tax rate differences** across locations, which give rise to **profit shifting** motives

Partial equilibrium model

- ▶ Focus on a multinational firm: parent + foreign affiliate

# Theory Framework

Set-up (Bernard, Jensen, Schott (2006)):

- ▶ 2-country model + frictionless trade
- ▶ single product firm ( $k$ )
- ▶ iso-elastic demand structure ( $\sigma =$  demand elasticity)
- ▶ corporate tax rates differ across countries:

$\tau$  = corporate tax rate in the foreign country

$\tau + h, \forall h$  = corporate tax rate in the home country

$\Rightarrow h$  denotes the tax wedge

# Taxation Problem of a Multinational Corporation

Simplifying assumptions:

- ▶ All production takes place at the parent firm
- ▶ Parent firm exports goods to affiliated and unaffiliated parties
- ▶ Foreign affiliates act as distribution centers, selling locally finished goods imported from the parent firm

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Each firm chooses price and quantity to maximize **after-tax profits**

Each firm acts as separate entity for taxation purposes

## Foreign Affiliate' Problem

$q_f$  = quantity imported from parent firm

$c_f$  = intra-firm 'incentive' price ( $\neq$  transfer price)

$p_f$  = product re-sale price in the local market

$p_{tp}$  = transfer price consistent with arm's length taxation principle

After tax profits maximized by the foreign affiliate ( $f$ ):

$$\begin{aligned}\pi_f &= \tilde{\pi}_f - tax_f \\ &= (p_f q_f - c_f q_f) - \tau(p_f q_f - p_{tp} q_f)\end{aligned}$$

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$$\begin{aligned}\pi_f &= \tilde{\pi}_f - tax_f \\ &= (p_f q_f - c_f q_f) - \tau(p_f q_f - p_{tp} q_f)\end{aligned}$$

$\Rightarrow$  Optimal sale price set by the foreign affiliate is:

$$p_f = \frac{1}{1 - \tau} \frac{\sigma}{\sigma - 1} (c_f - \tau p_{tp})$$

## Parent Firm's Problem

- ▶ Produce final goods at a constant marginal cost  $c$
- ▶ Earn revenue from trading intra-firm and arm's length ( $al$ )
- ▶ After-tax profits for the parent firm ( $p$ ):

$$\begin{aligned}\pi_p &= \tilde{\pi}_p - tax_p \\ &= [p_{al}q_{al} + c_f q_f - c(q_{al} + q_f)] - (\tau + h)[p_{al}q_{al} + p_{tp}q_f - c(q_{al} + q_f)]\end{aligned}$$

$\Rightarrow$  choose  $\{c_f, p_{tp}, p_{al}\}$  to maximize global profits  $\pi_p + \pi_f$

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⇒ choose  $\{c_f, p_{tp}, p_{al}\}$  to maximize global profits  $\pi_p + \pi_f$

- ▶ **Penalty function** for deviations from arm's length pricing rule:

$$\frac{\lambda}{2} [(p_{al} - p_{tp})q_f]^2$$

# Transfer Pricing

Maximizing global corporate profits subject to penalty leads to:

$$p_{al} - p_{tp} = \frac{h}{\lambda q_f}$$

- ▶  $h > 0$  (low foreign tax)  $\Rightarrow p_{al} > p_{tp}$  (*underprice* intra-firm exports)
- ▶  $h < 0$  (high foreign tax)  $\Rightarrow p_{al} < p_{tp}$  (*overprice* intra-firm exports )
- ▶  $h = 0$  (same tax rate)  $\Rightarrow p_{al} = p_{tp}$ .

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This is the prediction existing empirical studies take to the data.  
In what follows, we show  $p_{al} - p_{tp}$  may be **downward biased**.

# Transfer Pricing

- ▶ Optimal arm's length export price:

$$p_{al} = \left( \frac{\sigma}{\sigma - 1} c \right) \cdot \frac{1}{1 + \kappa\left(h, \frac{q_{al}}{q_f}\right)}, \quad \kappa'\left(h, \frac{q_{al}}{q_f}\right) > 0$$

- ▶ Optimal transfer price:

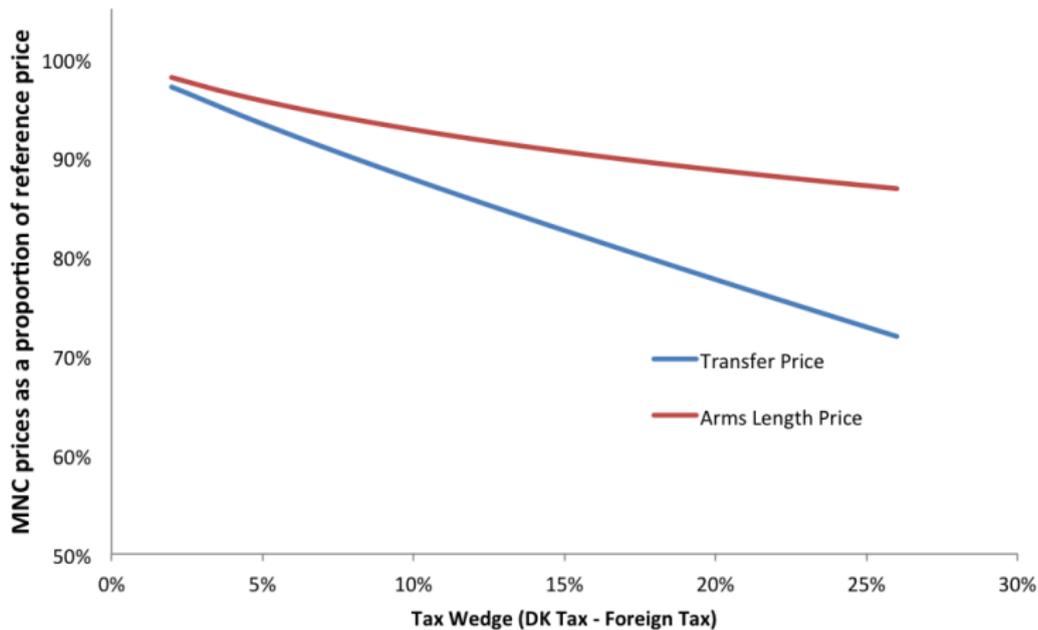
$$p_{tp} = \left( \frac{\sigma}{\sigma - 1} c \right) \cdot \frac{1}{1 + \kappa\left(h, \frac{q_{al}}{q_f}\right)} - \frac{h}{\lambda q_f}$$

- ▶ Transfer price absent profit shifting motives (i.e.,  $h = 0$ ):

$$p_0 \equiv p_{tp}|_{h=0} = \frac{\sigma}{\sigma - 1} c$$

- ▶ Note also:  $p_{al}|_{h=0} = p_{tp}|_{h=0} = p_0$ .

# Numerical Solutions $(\frac{p_{al}}{p_0}, \frac{p_{tp}}{p_0})$



# Transfer Pricing

$p_{tp} - p_0$  measures the **true effect of foreign taxes** on transfer pricing

$p_{al} - p_0$  measures the **bias** from the deviation in arm's length prices to conceal transfer pricing

## Prediction 1:

- i. If  $h > 0$  (low foreign tax)  $\Rightarrow p_0 > p_{al} > p_{tp}$
- ii. If  $h < 0$  (high foreign tax)  $\Rightarrow p_0 < p_{al} < p_{tp}$
- iii. If  $h = 0$  (same tax rate)  $\Rightarrow p_0 = p_{al} = p_{tp}$ .
- iv.  $\frac{d(p_{tp} - p_0)}{dh} < 0$ .

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# Transfer Pricing

$p_{tp} - p_0$  measures the **true effect of foreign taxes** on transfer pricing

$p_{al} - p_0$  measures the **bias** from the deviation in arm's length prices to conceal TP manipulations

## Prediction 1:

- i. If  $h > 0$  (low foreign tax)  $\Rightarrow p_0 > p_{al} \geq \bar{p}_{MNC} \geq p_{tp}$
- ii. If  $h < 0$  (high foreign tax)  $\Rightarrow p_0 < p_{al} \leq \bar{p}_{MNC} \leq p_{tp}$
- iii. If  $h = 0$  (same tax rate)  $\Rightarrow p_0 = p_{al} = \bar{p}_{MNC} = p_{tp}$
- iv.  $\frac{d(p_{tp} - p_0)}{dh} < 0$ .

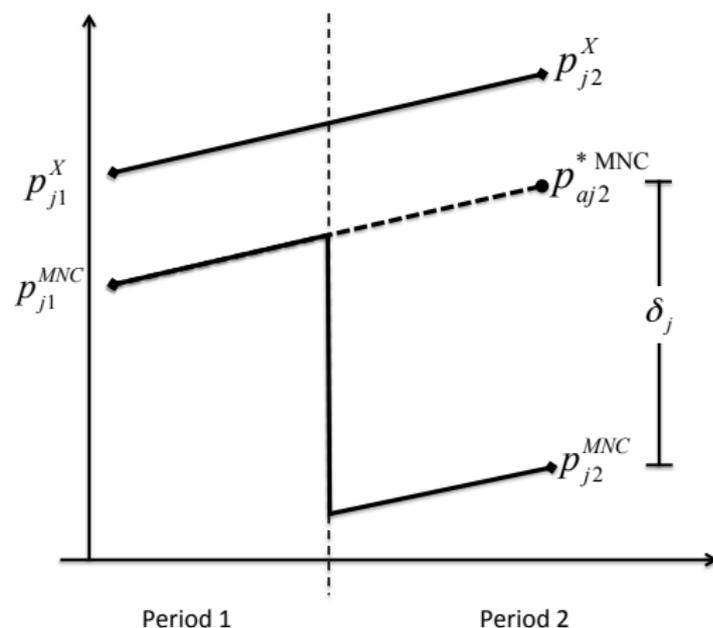
where  $\bar{p}_{MNC} \equiv s_{al} \cdot p_{al} + (1 - s_{al}) \cdot p_{tp}$ .

Empirical challenge:  $p_0$  **not observable** (counterfactual reference p)

# Estimation Strategy

- ▶ **Difference-in-Difference-in-Differences (DDD)** estimation method to measure  $\bar{p}_{MNC} - p_0$ 
  - ▶ Treatment #1: establishment of new foreign affiliates
  - ▶ Treatment #2: variation in foreign corporate tax rates
- ▶ Estimate the effect of owning an affiliate in a foreign market on the price of a product exported to that market, differentiating between countries of various corporate tax rates

# Identification Strategy (DDD method)



x = exporter in t=1, 2

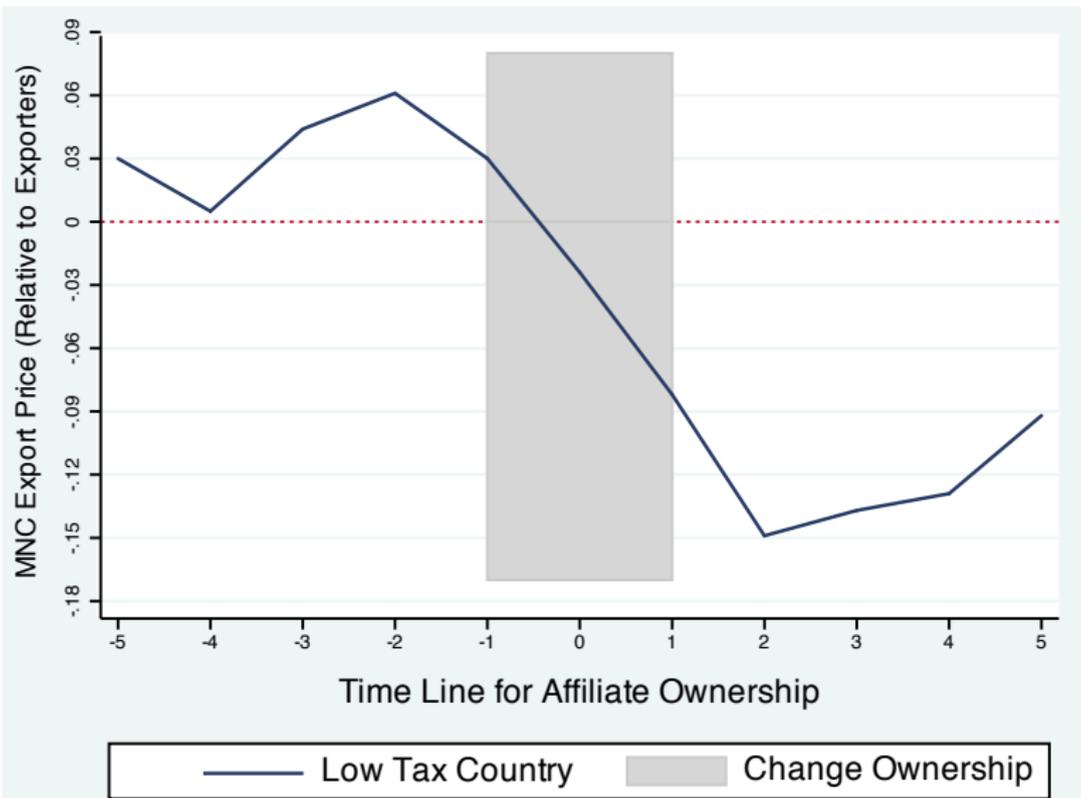
MNC = exporter in t=1, MNC in t=2

$$p_{j2}^{*MNC} = p_{j1}^{MNC} + (p_{j2}^X - p_{j1}^X)$$

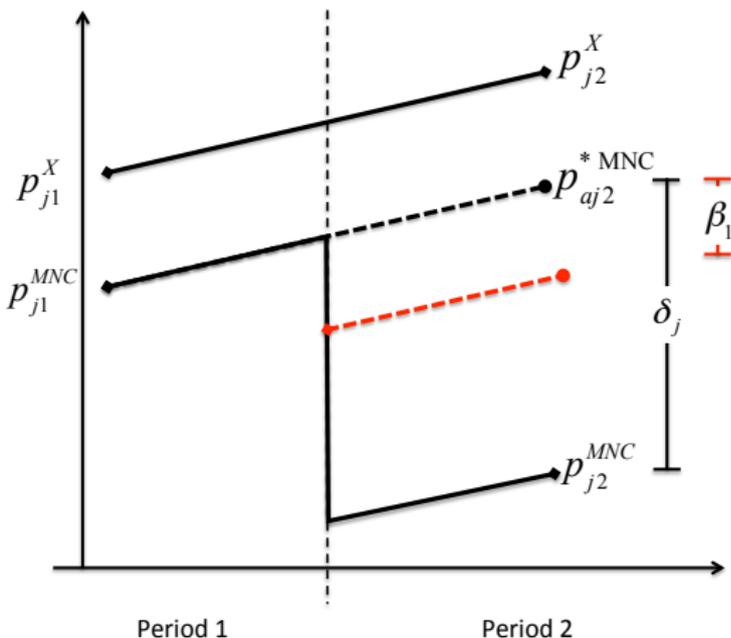
Treatment #1: ownership

$$\delta_j = p_{j2}^{MNC} - p_{j2}^{*MNC} \text{ (DD estim.)}$$

## Export price pre/post change in foreign ownership



# Identification Strategy (DDD method)



$x$  = exporter in  $t=1, 2$

MNC = exporter in  $t=1$ , MNC in  $t=2$

$$p_{j2}^{*MNC} = p_{j1}^{MNC} + (p_{j2}^X - p_{j1}^X)$$

Treatment #1: ownership

$$\delta_j = p_{j2}^{MNC} - p_{j2}^{*MNC} \text{ (DD estim.)}$$

Treatment #2:  $\Delta$  tax rate ( $h$ )

$$\delta_j = \beta_1 + \beta_2 * h_j$$

$$\Rightarrow \beta_2 = \frac{\delta_j - \delta_{j'}}{h_j - h_{j'}}$$

# Estimation Strategy

Difference-in-Difference-in-Differences (DDD) estimation model:

$$\ln P_{ijkt} = \beta_1 \text{DAff}_{ijt} + \left[ \beta_2 I^{\text{LowTax}} + \beta_3 (1 - I^{\text{LowTax}}) \right] \times |\Delta \tau_{jt}| \times \text{DAff}_{ijt} + \\ + X_{jt} \delta + X_{it} \gamma + \alpha_{ijk} + \alpha_t + \alpha_{t, \text{LowTax}} + \alpha_{t, \text{HighTax}} + \epsilon_{ijkt}$$

- $i$  = firm;  $j$  = foreign market;  $k$  = product (HS 8);  $t$  = year
- $\text{DAff} = 1/0$  if a firm owns an affiliate in country  $j$  at time  $t$
- $I^{\text{LowTax}} = 1/0$  if  $\text{tax}_j < \text{tax}_{DK}$
- $X_i = \{ \text{Sales}, \text{Employment} \}$
- $X_j = \{ \text{Pop}, \text{GDP}, \text{ExRate}, \text{TaxRate} \}$

► Endog

# Data Sources

1. **Firm** level data:
  - administrative records maintained by Statistics Denmark
2. **Customs transaction** level data:
  - export flows by firm, product and destination, provided by Statistics Denmark
3. **Ownership** data:
  - annual firm reports submitted to the National Bank of Denmark and provided by Experian
4. Statutory **corporate tax rate** data:
  - University of Michigan + OECD

▶ Statutory vs. Effective Taxes

Sample coverage:

- ▶ manufacturing firms observed over 1999-2006

▶ Summary Stats

## Data Limitations

- ▶ No information about the type of trade transaction: related party vs. arm's length
- ▶ Observed average unit export price is a weighted average of intra-firm ( $tp$ ) and arm's length ( $al$ ) export prices:

$$P_{ijkt} = (1 - s_{al}) \cdot P_{ijkt}^{tp} + s_{al} \cdot P_{ijkt}^{al}$$

- ▶ If share of arm's length trade  $s_{al} > 0 \Rightarrow$  estimates are a low bound of actual transfer price manipulations

# Baseline Estimates

	Dependent Variable: $\log \text{UnitVal}_{ijkt}$		
	Basic	Foreign Owned	Pre-MNC Control
	(1)	(2)	(3)
Affiliate	.019 (.021)	.019 (.021)	.024 (.022)
Affiliate $\times  \Delta\tau_{jt}  \times I^{LowTax}$	-.570 (.272)**	-.571 (.272)**	-.533 (.271)**
Affiliate $\times  \Delta\tau_{jt}  \times I^{HighTax}$	.275 (.274)	.274 (.274)	.238 (.266)
Foreign owned		.002 (.008)	.002 (.008)
Pre-MNC Indicator $\times$ Low Tax			.031 (.023)
Pre-MNC Indicator $\times$ High Tax			-.011 (.029)
Firm $\times$ Country $\times$ Product FE	yes	yes	yes
{ $I^{LowTax}$ , $I^{HighTax}$ } $\times$ Year FE	yes	yes	yes
Obs.	1,203,111	1,203,111	1,203,111
$R^2$	.898	.898	.898

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Standard errors clustered at country-year level in parentheses.

# Continuous Affiliates vs. New Establishments

	Dependent Variable: Log $UnitVal_{ijkt}$	
	Continuous (1)	New Affiliates (2)
Affiliate		-0.033 (.026)
Affiliate $\times  \Delta\tau_{jt}  \times I^{LowTax}$	-.636 (.318)**	-.913 (.300)***
Affiliate $\times  \Delta\tau_{jt}  \times I^{HighTax}$	.027 (.279)	1.261 (.643)*
Firm $\times$ Country $\times$ Product FE	yes	yes
{ $I^{LowTax}$ , $I^{HighTax}$ } $\times$ Year FE	yes	yes
Obs.	736,228	1,083,235
$R^2$	.901	.901

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Standard errors clustered by country-year in parentheses.

# Differentiated Goods Only

	Dependent Variable: $\text{Log } \text{UnitVal}_{ijkt}$		
	All Sample (1)	Continuous Affiliates (2)	New Affiliates (3)
Affiliate	.018 (.027)		-.040 (.036)
Affiliate $\times  \Delta\tau_{jt}  \times I^{LowTax}$	-.648 (.323)**	-.736 (.361)**	-.967 (.353)***
Affiliate $\times  \Delta\tau_{jt}  \times I^{HighTax}$	.409 (.321)	-.008 (.321)	1.668 (.886)*
Firm $\times$ Country $\times$ Product FE	yes	yes	yes
$\{I^{LowTax}, I^{HighTax}\} \times$ Year FE	yes	yes	yes
Obs.	790,561	476,194	712,163
$R^2$	.885	.889	0.889

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Standard errors clustered by country-year in parentheses.

# Robustness: Sensitivity Analyses

	Dependent Variable: $\text{Log } \text{UnitVal}_{ijkt}$			
	Baseline	Double Tax Agreement	Poor Judicial Quality	Intra-firm Q Increase
Affiliate	0.019 (.021)	0.024 (.027)	0.017 (.047)	-0.182 (.032)***
Affiliate $\times  \Delta\tau_{jt}  \times I^{LowTax}$	-0.570 (.272)**	-0.634 (.291)**	-0.816 (.356)**	-1.072 (.622)*
Affiliate $\times  \Delta\tau_{jt}  \times I^{HighTax}$	0.275 (.274)	0.304 (.867)	1.251 (.698)*	0.589 (.277)
Firm $\times$ Country $\times$ Product FE	yes	yes	yes	yes
$\{I^{LowTax}, I^{HighTax}\} \times$ Year FE	yes	yes	yes	yes
Obs.	1,203,111	871,457	550,773	1,203,111
$R^2$	0.898	0.896	0.900	0.898

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Standard errors clustered by country-year in parentheses.

# Summary of Results

1. Relative to exporters, Danish multinational firms set:
  - ▶ 6-10 % lower export prices to *low tax rate* countries as a result of 10 % increase in the absolute tax rate difference.
  - ▶ no robust evidence of higher export prices to *high corporate tax rate* countries
2. Transfer price manipulations are larger in the case of:
  - ▶ differentiated goods
  - ▶ double taxation agreement countries
  - ▶ countries with poor judicial systems

## Back-of-Envelope Calculations

- ▶ Tax revenue lost due to the profit shifting activities of multinational firms via transfer price manipulations:

$$\text{Lost Export Revenue} = \sum_{j \in \text{LowTax}} \left( \hat{\beta}_3 (\text{tax}_{Dk} - \text{tax}_j) \cdot X_{MNC,j} \right)$$

- ▶ Using export data for year 2006, we find:
  - ▶ \$141 million underreported export revenues from lower than arm's length transfer prices to affiliates in low tax countries
  - ▶ \$40 million in forgone corporate tax revenues  $\approx 3.24\%$  of total tax receipts from MNCs

## Conclusions

- ▶ Multinational firms can minimize their global tax burden by shifting profits to low tax countries via transfer pricing
- ▶ Firm level panel data and a triple difference estimation strategy to identify the extent of transfer price manipulations
- ▶ Exploit variation in export prices in response to acquisitions of new affiliates in countries of different corporate tax rates
- ▶ Find that multinationals underreport exports to low tax countries, leading to economically important losses in tax revenues

Thank You!

# Endogeneity of FDI Investments

- ▶ MNCs locate affiliates to take advantage of transfer pricing
  - ▶  $Daff = 1$   $\Leftrightarrow$  gain from transfer pricing  $|p_{tp} - p_0|$  is **large**
  - ▶  $Daff = 0$   $\Leftrightarrow$  gain from transfer pricing  $|p_{tp} - p_0|$  is **small**
- ▶ Main determinants of transfer price manipulations  $|p_{tp} - p_0|$ :
  - ▶ foreign tax rate
  - ▶ quality of institutions (enforcement of tax avoidance penalty)
  - ▶ share of intra-firm trade  $\leftrightarrow$  vertical/distribution FDI

Regression controls and fixed effects already account for these.

▶ Return to Regression Model

# Examples of Well-Known Danish Multinationals



VESTAS Wind Turbine



▶ Return

# Statutory vs. Effective Corporate Tax Rates

- ▶ Studies investigating the impact of taxation on location of investments typically use *effective corporate tax rates*
  - ▶ Concerns about *effective corporate tax rates*:
    - ▶ Measured with error, especially when calculated at firm level
    - ▶ Endogenous to the investment decision and to profit shifting
    - ▶ Possibly correlated with country characteristics (inflation, business cycle, domestic reforms)
- ⇒ This paper uses data on *statutory corporate tax rates*
- ▶ drawback: do not reflect all the tax benefits a firm qualifies to at the time of investment

▶ Return

# Summary Statistics

	Mean	St. Dev.	Min	Max
	(1)	(2)	(3)	(4)
<i><u>Firm Characteristics</u></i>				
Log Price	4.982	1.783	.397	9.552
Log Quantity	4.500	2.918	.000	18.572
Log Employment	4.556	1.654	-4.605	9.440
Log Sales	11.886	1.715	.693	17.045
<i><u>Firm Level Indicator Variables</u></i>				
Non-MNC Exporters	.483	.500	.000	1.000
Majority-owned Affiliate (Daff50)	.114	.317	.000	1.000
Acquired Affiliates (during sample)	.027	.163	.000	1.000
Sold Affiliates (during sample)	.011	.106	.000	1.000
Foreign owned	.178	.382	.000	1.000
<i><u>Country Characteristics</u></i>				
Statutory Corporate Tax Rate	.283	.069	.085	.450
Low Corporate Tax Rate Dummy	.544	.498	.000	1.000
High Corporate Tax Rate Dummy	.349	.477	.000	1.000
Low Tax Wedge ( $\text{CorpTax}_{DK} - \text{CorpTax}_j$ )	.061	.056	.008	.235
High Tax Wedge ( $\text{CorpTax}_j - \text{CorpTax}_{DK}$ )	.049	.024	.010	.150

## Robustness: Level Changes and Marginal Effects

	Dependent Variable: Log $UnitVal_{ijkt}$	
	(1)	(2)
Affiliate	.019 (.021)	.002 (.023)
Affiliate $\times I^{LowTax}$		.005 (.025)
Affiliate $\times  \Delta\tau_{jt}  \times I^{LowTax}$	-.570 (.272)**	-.490 (.297)*
Affiliate $\times I^{HighTax}$		.061 (.031)**
Affiliate $\times  \Delta\tau_{jt}  \times I^{HighTax}$	.275 (.274)	-.341 (.420)
Firm $\times$ Country $\times$ Product FE	yes	yes
{ $I^{LowTax}$ , $I^{HighTax}$ } $\times$ Year FE	yes	yes
Obs.	1,203,111	1,203,111
$R^2$	.898	.898
<b>Marginal Effects:</b>		
Low Tax Country		-0.025 (.015)*
High Tax Country		0.045 (.016)***

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Standard errors clustered by country-year in parentheses.

# This Paper: Evidence from Denmark

- ▶ Firm-level dataset on the export transactions of Danish firms
- ▶ Multinationals play a large role in Denmark's foreign trade:  
30-40 % of trade flows [▶ MNC SumStats](#) [▶ Danish MNCs](#)
- ▶ Denmark operates a territorial tax system:
  - foreign income is exempt from taxation in Denmark
- ▶ Priority of tax authorities to uncover profit shifting mechanisms
  - ▶ 28% of Danish and 30% of foreign multinationals paid zero corporate taxes during the period 2006-2008