

Taxes and the Location of U.S. Business Activity Abroad

Jack Mutti Eric Ohrn
Grinnell College Grinnell College

Festschrift in Honor of Harry Grubert
2018 Office of Tax Analysis Research Conference
U.S. Department of the Treasury
Thursday, September 27, 2018

Taxes and the Location of Real Economic Activity

Of the many aspects of international taxation that **Harry Grubert** pursued, one important interest was the

influence of taxation on the location of real economic activity of US MNEs

- ▶ Grubert and Mutti (1991)
- ▶ Grubert and Mutti (2000)
- ▶ Altshuler et al. (2001)
- ▶ Mutti and Grubert (2004)
- ▶ Grubert (2012)

Responsiveness of international business activity to taxation is important

1. affects tax revenue collected by the US and other governments
2. feeds the political debate over the benefits versus costs of globalization and the consequences of hosting affiliates of MNEs
3. diminishes economic efficiency, because activity is shifted away from locations with the highest before-tax productivity.

Taxes and the Location of Real Economic Activity

In honor of Harry and his contributions to international tax research

We extend and update results from the seminal Grubert and Mutti (1991) paper

- ▶ using data on the activities of U.S. MNEs from 1989 to 2014
- ▶ and a panel fixed effects framework

Taxes and the Location of Real Economic Activity

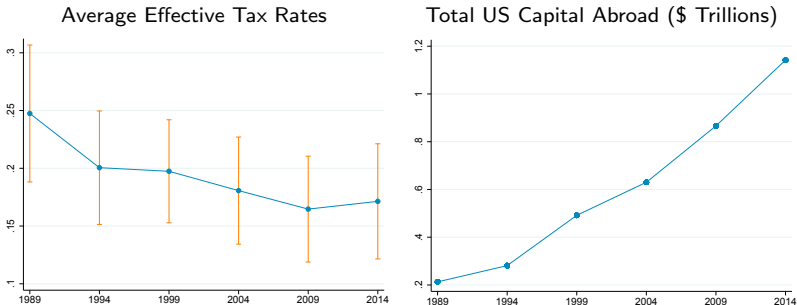
Three findings:

1. ETRs continue influence the business location decisions of U.S. MNEs.
 - ▶ Although our constant elasticity estimates – with values near unity – are smaller than most other papers in the literature
2. Our estimates demonstrate remarkable stability over the sample period, across the various measures of business activity, across various ETR specifications
3. We address potential endogeneity of ETRs to business activity by using changes in statutory tax rates and bases to instrument for changes in effective rates
 - ▶ Consistent with the critique, our IV estimates are larger than baseline elasticities, especially for current year investment and R&D

We believe Harry would be pleased to see that his early work remains relevant, but would approach our results with his characteristic skepticism.

A Changing International Investment Environment

Figure: Trends in Effective Tax Rates and US Capital Installed Abroad



Notes: Panel (a) of Figure 1 presents average effective tax rates for affiliates of US multinational enterprises located abroad. Effective tax rates are computed at the affiliate-country level using SOI data as described in Section 2. Verticals represent one standard deviation in affiliate-country level effective rates for each year. Panel (b) presents the real total capital installed abroad by affiliates of US MNEs. Total capital is computed using BEA data on the operations of majority-owned foreign affiliates. Data presented in both figures is limited to the balanced panel of countries for which both effective tax rates and capital abroad are observed during the years 1989 to 2014.

Framework for Empirical Analysis

We extend the common formulation from several of Grubert's papers to a panel fixed effects environment.

$$\ln(\text{Capital}_{it}) = \alpha_i + \beta_t + \gamma \ln(1 - \text{Avg. ETR})_{it} + \delta \ln(\mathbf{X}_{ijt}) + \epsilon_{it} \quad (1)$$

- ▶ **Capital** or other real business activity measures from BEA Activities of U.S. MNE Benchmark Surveys 1989–2014
- ▶ **Avg. ETR** average effective tax rate from SOI: income taxes paid / current earning and profits of corporations with positive current earnings and profits pretax
- ▶ **X** matrix of exogenous variables
 - ▶ Population and GDP per capita
 - ▶ Trade Openness, Real Exchange Rate, Fraser Index
- ▶ α_i and β_t country and year fixed effects

$\ln(1 - \text{Avg. ETR})$, allows a direct interpretation of the coefficient as the elasticity of the MNE response to a one percent increase in the net-of-effective-tax rate

Table: Descriptive Statistics

	mean	std dev	25th Percentile	75th Percentile	obs
Avg. ETR	0.201	0.103	0.125	0.258	323
Ln(1-Avg ETR)	-0.233	0.139	-0.298	-0.134	323
Ln(Capital)	3.441	1.823	2.133	4.735	323
Ln(Employees)	3.837	1.640	2.779	4.918	323
Ln(Investment)	1.870	1.868	0.609	3.184	294
Ln(Assets)	5.295	2.135	3.732	6.734	322
Ln(Affiliates)	5.112	1.333	4.143	6.236	323
Ln(R&D)	4.785	2.194	3.099	6.566	254
Ln(Compensation)	2.437	2.008	0.966	3.984	323
Ln(Population)	16.688	1.688	15.524	17.888	323
Ln(GDP per capita)	10.978	1.986	9.829	11.687	323
Trade Openness	84.518	67.913	46.862	94.909	323
Real Exchange Rate	0.665	0.310	0.412	0.900	323
Fraser Index	6.958	1.002	6.385	7.594	323
Local Sales Ratio	0.650	0.199	0.529	0.791	249
OECD Member	0.440	0.497	0.000	1.000	323
Balanced	0.613	0.488	0.000	1.000	323

Notes: Table 1 presents descriptive statistics for the analysis sample. Variable definitions are discussed in the text.

Table: Sensitivity of US Business Activity Abroad to Effective Tax Rates

	(1) Ln(Capital)	(2) Ln(Employees)	(3) Ln(Investment)	(4) Ln(Assets)
Ln(1-Avg ETR)	0.911** (0.408)	1.100*** (0.346)	0.916 (0.579)	0.888*** (0.327)
Ln(Population)	1.542*** (0.515)	0.395 (0.642)	0.702 (0.630)	0.684 (0.762)
Ln(GDP per capita)	1.567*** (0.258)	1.963*** (0.454)	1.969*** (0.303)	1.302*** (0.449)
Trade Openness	-0.000980 (0.00263)	0.000345 (0.00138)	0.000566 (0.00338)	0.00700* (0.00419)
Real Exchange Rate	0.165 (0.196)	-0.0102 (0.284)	0.426 (0.297)	0.768** (0.318)
Fraser Index	0.173** (0.0690)	0.105 (0.0663)	0.0361 (0.105)	0.0917 (0.0667)
Year FE	✓	✓	✓	✓
Country FE	✓	✓	✓	✓
Observations	330	332	300	330
Countries	76	76	74	76
Adj. R ²	0.802	0.650	0.619	0.858

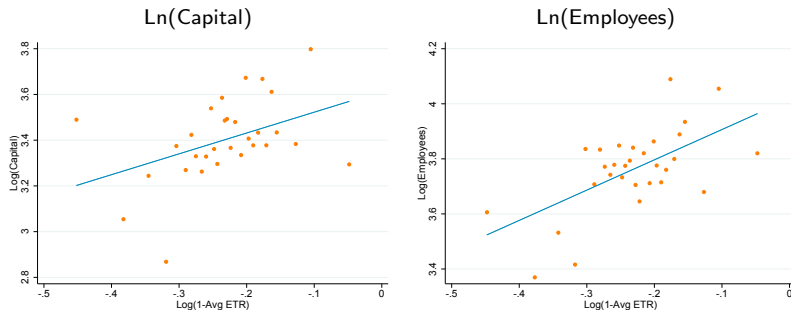
Notes: Table 2 presents estimates from regression of the form in equation (1). All specifications include country and year FE. Standard errors are presented in parentheses and clustered at the country level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Robustness of Estimates

Results Robust to

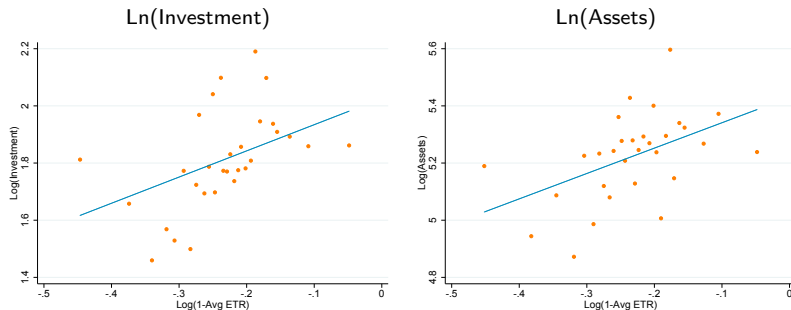
1. Other stock measures of activity: affiliates, compensation
2. First-difference estimates
3. Country-specific linear time trends
4. Introduction of “Check-the-box”
 - ▶ Elasticities stable using post-1997 data

Figure: Sensitivity of U.S. Business Activity Abroad to Effective Tax Rates;
Bin-scatters



Notes: Figure 3 presents bin-scatterplots corresponding to the regression results presented in Table 2. Each bin-scatterplot controls on the time-varying country variables other than taxes, as well as country and year fixed effects.

Figure: Sensitivity of U.S. Business Activity Abroad to Effective Tax Rates;
Bin-scatters



Notes: Figure 3 presents bin-scatterplots corresponding to the regression results presented in Table 2. Each bin-scatterplot controls on the time-varying country variables other than taxes, as well as country and year fixed effects.

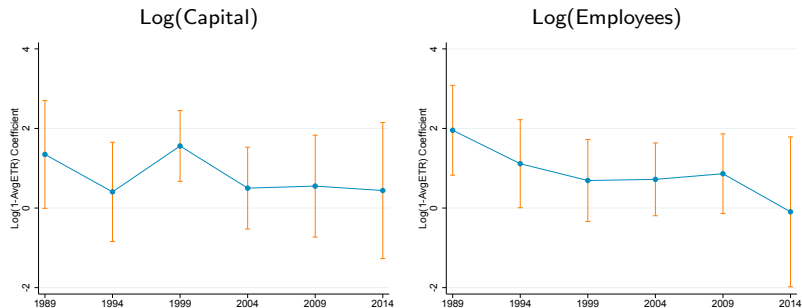
Dynamic Sensitivity

- ▶ To estimate the sensitivity of business activity to ETRs in 1989 we run a regression that includes $\ln(1 - \text{Avg. ETR})$ and $\ln(1 - \text{Avg. ETR})$ interacted with each year other than 1989

$$\ln(\text{Capital}_{it}) = \alpha_i + \beta_t + \gamma_{1989} \ln(1 - \text{Avg. ETR})_{it} + \sum_{t=1994}^{2014} \gamma_t \ln(1 - \text{Avg. ETR})_{it} \times \mathbb{1}(t) + \delta \ln(\mathbf{X}_{ijt}) + \epsilon_{it}.$$

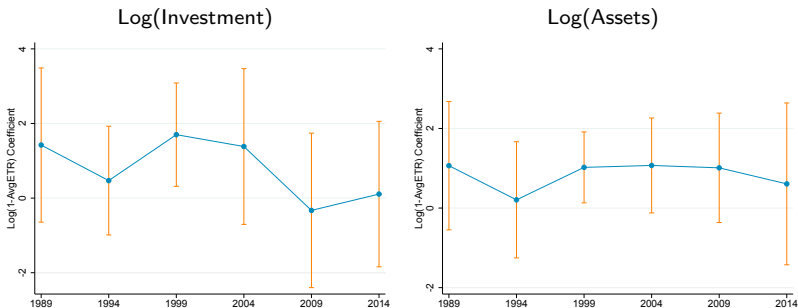
- ▶ γ_{1989} captures the effect of changes in ETRs in 1989 in the presence of country and year FE.
- ▶ We repeat the same process to estimate the effects of ETRs on real business activity in years 1994–2014.

Figure: Dynamic Sensitivity of U.S. Business Activity Abroad to Effective Tax Rates



Notes: Figure 5 presents estimates of the effect of $\text{Log}(1-\text{ETR})$ on each of the four primary outcomes in each survey year 1989, 1994, 1999, 2004, 2009, and 2014. To estimate a coefficient for a given year, run a regression similar to that represented by Equation (1) but include interaction terms between $\text{Log}(1-\text{ETR})$ and each of the other years.

Figure: Dynamic Sensitivity of U.S. Business Activity Abroad to Effective Tax Rates



Notes: Figure 5 presents estimates of the effect of $\text{Log}(1-\text{ETR})$ on each of the four primary outcomes in each survey year 1989, 1994, 1999, 2004, 2009, and 2014. To estimate a coefficient for a given year, run a regression similar to that represented by Equation (1) but include interaction terms between $\text{Log}(1-\text{ETR})$ and each of the other years.

Attention to Endogeneity

A classic critique of ETRs

- ▶ ETRs may be subject to reverse causality: greater investment → lower ETR
- ▶ Hines Jr. and Rice (1994): such endogeneity will downward bias estimated effects
- ▶ Most likely to influence the flow variables such as investment and R&D

IV Approach

- ▶ Altshuler et al. (2001) use statutory tax rates as ETR instrument
 - ▶ statutory tax rates poor instrument (weak FS)
- ▶ Kawano and Slemrod (2016) provide data on statutory rates plus when a given (OECD) country tightened or relaxed 16 tax base definitions
- ▶ Use Kawano and Slemrod (2016) data as instruments for ETRs
- ▶ Strong first stage! F -stats between 14 and 54

Table: Sensitivity of US Business Activity Abroad to Effective Tax Rates; IV Estimates

(a) OLS Estimates; IV Sample					
	(1) Ln(Capital)	(2) Ln(Emp)	(3) Ln(Investment)	(4) Ln(Assets)	(5) Ln(R&D)
Ln(1-Avg ETR)	0.686 (0.472)	0.441 (0.319)	0.265 (0.455)	0.820* (0.403)	1.676* (0.916)
Observations	96	96	87	96	86
Countries	26	26	26	26	25
Adj. R ²	0.850	0.689	0.775	0.932	0.583

(b) Instrumental Variables Estimates					
	(1) Ln(Capital)	(2) Ln(Emp)	(3) Ln(Investment)	(4) Ln(Assets)	(5) Ln(R&D)
Ln(1-Avg ETR)	1.811* (2.05)	0.747 (1.05)	3.602** (2.78)	1.790* (2.03)	3.175* (1.78)
Observations	96	96	87	96	86
Countries	26	26	26	26	25
Adj. R ²	0.968	0.983	0.899	0.973	0.935
First Stage F Stat	14.58	14.58	53.66	14.58	15.14
Hansen J Stat	12.19	12.23	5.804	15.07	6.834
J Stat <i>p</i> -value	0.272	0.270	0.831	0.130	0.741

Notes: Panel (a) of Table 3 presents estimates from regressions of the form of equation (1), as in Table 2, using only the country-year observations for which the Kawano and Slemrod (2016) data are available. Panel (b) presents estimates IV estimates in which effective tax rates are instrumented Kawano and Slemrod (2016) data.

Alternative ETR Specifications

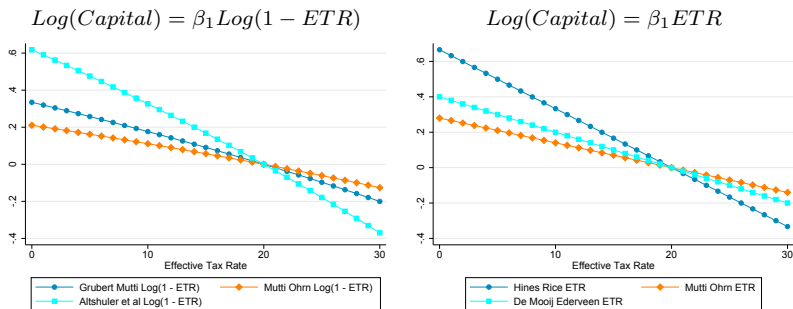
Over time, researchers have specified ETRs in several ways

1. **Constant Elasticity:** $\text{Log}(\text{Capital}) = \beta_1 \text{Log}(1 - \text{ETR})$
 - ▶ Grubert and Mutti (1991)
 - ▶ Altshuler et al. (2001)
2. **Linear:** $\text{Log}(\text{Capital}) = \beta_1 \text{ETR}$
 - ▶ Hines Jr. and Rice (1994)
 - ▶ de Mooij and Ederveen (2003)
3. **Quadratic:** $\text{Log}(\text{Capital}) = \beta_1 \text{ETR} + \beta_2 \text{ETR}^2$
 - ▶ Hines Jr. and Rice (1994)

We estimate parameters from linear and quadratic specifications then compare our estimates against each other and against classic and average parameters in the literature

We ask “**What is the effect of decreasing the ETR from 20% to 10%?**”

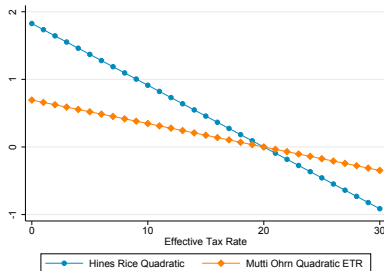
Figure: Comparison of Estimates Across Papers and Specifications



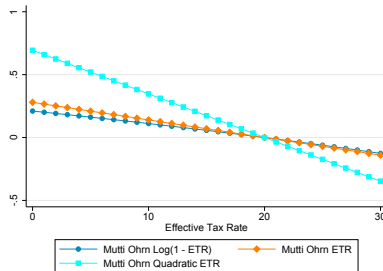
Notes: The projections for each of the studies presented are based on setting to zero the product of the estimated tax coefficient times the relevant tax term calculated for a tax rate of 20 percent. For other values of the tax rate the predicted change in log points of capital is the product of the estimated tax coefficient times the difference in the relevant tax term at the new tax rate minus the value of the tax term at the 20 percent tax rate.

Figure: Comparison of Estimates Across Papers and Specifications

$$\text{Log}(\text{Capital}) = \beta_1 \text{ETR} + \beta_2 \text{ETR}^2$$



Alternate Mutti Ohrn (2018) Specs



Notes: The projections for each of the studies presented are based on setting to zero the product of the estimated tax coefficient times the relevant tax term calculated for a tax rate of 20 percent. For other values of the tax rate the predicted change in log points of capital is the product of the estimated tax coefficient times the difference in the relevant tax term at the new tax rate minus the value of the tax term at the 20 percent tax rate.

Conclusion

We use the framework that Grubert's work introduced to assess how the allocation of real activity by MNEs across their foreign affiliates responds to taxation.

We believe this extension of Grubert's empirical analysis is persuasive confirmation of many of his original insights.

- ▶ panel data with country & year FE
 - ↪ results are less likely to be influenced by idiosyncratic factors
- ▶ results consistent across business activity measure
- ▶ Some year-to-year variation in the tax coefficients from year to year
 - ↪ only small downward trend in effect on employment
- ▶ Investment and R&D estimates larger when instrumenting for ETRs
 - ↪ estimates, if anything, are downward biased
- ▶ form in which the tax variable enters plays a minor role if greatest interest focuses on tax rates near the sample average

We would not try to speak for Harry, given his ability to appreciate features of the law and the data that we may have completely missed, but we hope that he would approve a careful attempt to address a tax policy issue that remains important.

Thank you for your comments and feedback.

mutti@grinnell.edu

ohrneric@grinnell.edu
www.ericohrn.com

References

- Altshuler, Rosanne, Harry Grubert, and T Scott Newlon**, "Has US investment abroad become more sensitive to tax rates?," in James R. Hines Jr., ed., *International taxation and multinational activity*, University of Chicago Press, 2001, pp. 9–38.
- de Mooij, Ruud A. and Sjef Ederveen**, "Taxation and foreign direct investment: a synthesis of empirical research," *International tax and public finance*, 2003, 10 (6), 673–693.
- Grubert, Harry**, "Foreign taxes and the growing share of US multinational company income abroad: Profits, not sales, are being globalized," *National Tax Journal*, 2012, 65 (2), 247–282.
- **and John Mutti**, "Taxes, tariffs and transfer pricing in multinational corporate decision making," *The Review of economics and Statistics*, 1991, pp. 285–293.
- **and —**, "Do taxes influence where US corporations invest?," *National Tax Journal*, 2000, pp. 825–839.
- Hines Jr., James R. and Eric M. Rice**, "Fiscal paradise: Foreign tax havens and American business," *The Quarterly Journal of Economics*, 1994, 109 (1), 149–182.
- Kawano, Laura and Joel Slemrod**, "How do corporate tax bases change when corporate tax rates change? With implications for the tax rate elasticity of corporate tax revenues," *International Tax and Public Finance*, 2016, 23 (3), 401–433.
- Mutti, John and Harry Grubert**, "Empirical asymmetries in foreign direct investment and taxation," *Journal of International Economics*, 2004, 62 (2), 337–358.