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The Impact of the Tax Cuts and Jobs Act on Foreign Investment in the United States

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ABSTRACT: The 2017 Tax Cuts and Jobs Act (TCJA) sharply reduced effective corporate income tax rates on equity-financed US investment. This paper examines the reform's impact on US inbound foreign direct investment (FDI) and investment in property, plant and equipment (PPE) by foreign-owned US companies. We first model effective marginal and average tax rates (EMTRs and EATRs) by country, industry, and method of finance, and then use those tax rates to calculate the tax semi-elasticities of inbound FDI and PPE investment. We find that both PPE investment and FDI financed with retained earnings responded positively to the TCJA reform, but FDI financed with new equity or debt did not. In country-level PPE regressions, inclusion of macroeconomic controls renders tax rate coefficients insignificant, suggesting that the increase in PPE investment after TCJA was driven by general economic growth. In regressions of FDI financed with retained earnings, however, tax coefficients were robust to inclusion of macroeconomic controls. As the literature predicts, EATRs have a greater impact on cross-border investment than EMTRs. Country-by-industry regressions showed a larger effect of taxes on PPE investment than aggregate country-level regressions, but industry-level tax rates appear to have no effect on earnings retention.

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WORKING PAPERS

The Impact of the Tax Cuts and Jobs Act on Foreign Investment in the United States

Prepared by Thornton Matheson, Alexander Klemm, Laura Power, and Thomas Brosy[1]

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Contents

Glossary

ATR	Average Tax Rate
BEA	Bureau of Economic Analysis
BEAT	Base-erosion Anti-abuse Tax
BTT	Bilateral Tax Treaty
CBO	Congressional Budget Office
CIO	Country of Immediate Origin
CIT	Corporate Income Tax
EATR	Effective Average Tax Rate
EBIT	Earnings Before Interest and Taxes
EBITDA	Earnings Before Interest, Taxes, Depreciation and Amortization
EMTR	Effective Marginal Tax Rate
ETR	Effective Tax Rate
FDI	Foreign Direct Investment
FDII	Foreign-derived Intangible Income
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
IICM	International Investment and Capital Model
IP	Intellectual Property
MACRS	Modified Accelerated Cost Recovery System
MNE	Multinational Enterprise
PPE	Property, Plant and Equipment
TCJA	Tax Cuts and Jobs Act
TPC	Tax Policy Center
UBO	Ultimate Beneficial Owner
US	United States
WHT	Withholding Tax

1. Introduction

This paper examines the early reaction of foreign investment in the United States to the 2017 Tax Cuts and Jobs Act (TCJA), which took effect at the beginning of 2018. TCJA made radical changes to the US corporate income tax, including a 14-point cut in the statutory rate and temporary full expensing of equipment investment ("bonus depreciation"). These measures were viewed by many as likely to increase corporate investment in the US. The Congressional Budget Office (CBO), for example, increased its estimate of real private nonresidential investment by an average of 3.8 percent per year for 2018-2027 following the passage of TCJA (CBO 2017 and 2018). Foreign investment by multinational enterprises (MNEs), being internationally mobile, is particularly sensitive to corporate income taxes.

This paper analyzes two different measures of foreign investment published by the US Bureau of Economic Analysis (BEA). Investment in property, plant and equipment (PPE), which is gathered by survey of MNEs, is available by selected industry and country of ultimate beneficial ownership. Foreign direct investment (FDI), which is drawn from balance of payments statistics, is available by country of immediate origin,[2] method of finance, and selected industries.

The tax measures used are forward-looking corporate-level effective tax rates (ETRs) – both marginal and average - on inbound foreign investment generated by the Urban-Brookings Tax Policy Center's international investment and capital model (IICM). The model calculates rates specific to investor country, finance method, and industry. Disaggregation of FDI and effective tax rates by method of finance, investor country and industry permit exploration of which tax rates most influence inbound US FDI: marginal or effective average tax rates, and US-level or bilateral.

A modified gravity model was applied, in which the different FDI measures were regressed on US and bilateral effective tax rates as well as a set of macroeconomic controls for home and host country gross domestic product (GDP) and US bilateral exchange rates. Research suggests that FDI is a dynamic process, so a dynamic generalized method of moments (GMM) model is estimated.

Regression results find a significant negative correlation between the change in US corporate effective tax rates due to TJCA and both US PPE and FDI financed out of retained earnings. Several regression models find negative and significant impact of effective tax rates on those forms of investment. As the literature on taxation and foreign investment would predict, these forms of foreign investment are more sensitive to effective average tax rates (EATRs) than to effective marginal tax rates (EMTRs). However, the absolute value of most significant tax coefficients found in this study is less than the average found in the literature. No material effect of tax rates was found for FDI financed with new equity or debt—financial flows most closely associated with acquisition of existing US companies.

The finding of a significant impact of effective tax rates on foreign investment was generally stronger for retained earnings than for PPE investment. For most PPE regression models, tax term significance is not robust to controlling for macroeconomic factors that also affect investment. Once home and host country GDP and exchange rates are included as controls, effective tax rates usually have no marginal effect on PPE. This suggests that the growth in PPE investment by majority foreign-owned companies following enactment of TCJA was predominantly driven by economic growth.

[2] So, for example, if a French MNE invests in the US through a subsidiary in the Cayman Islands, CIO data would show the investment as originating in the Cayman Islands.

For FDI financed out of retained earnings, the effect of tax rates was more often robust to the inclusion of macroeconomic controls, indicating a direct effect of tax rates on investment even controlling for aggregate demand and macroeconomic policies. However, these effects are only observable at the country level; country-by-industry regressions reveal little if any effect of effective tax rates on retained earnings. The increase in earnings retention by foreign-owned US companies thus did not correlate closely with industry-level changes in effective tax rates.

The following section reviews the literature on taxation and foreign investment in the US. Section 3 reviews the various measures of FDI, and section 4 presents effective tax rates calculated by the IICM. Section 5 presents the estimation models and results, and section 6 concludes.

2. Literature Review

There is a large literature on the effect of taxes on cross-border investment, which is reviewed in Feld and Heckemeyer (2011) and De Mooij and Ederveen (2008). These meta-studies find an average tax semi-elasticity—that is, percentage change in foreign investment with respect to the percentage point change in tax rate—of roughly -3, with results varying according to measures of FDI and tax rates used.

De Mooij and Ederveen (2008) find an average semi-elasticity of foreign direct investment with respect to effective marginal tax rates (EMTRs) of -2.8; however, studies using effective average tax rates (EATRs) generally find significantly higher semi-elasticities averaging -5.2. The authors also find that studies analyzing PPE (which all use US inbound or outbound data) yield semi-elasticities averaging -4.8 for EMTRs or -7.2 for EATRs. Studies that use corporate microdata tend to find smaller tax elasticities than studies based on aggregate investment measures, which are sometimes disaggregated at the industry level.

Feld and Heckemeyer (2011), who control for a wider variety of study characteristics as well as publication bias, also find an average semi-elasticity of foreign investment to tax rates of -2.8. Correction for publication bias reduces this estimate slightly to about -2.5, depending on the correction method used. Although Feld and Heckemeyer do not find a greater effect for EATRs generally, they do find higher semi-elasticities for bilateral tax rates—both EMTRs and EATRs, with the effect of the latter being substantially larger (-0.8 and -3.4, respectively).

Regarding non-tax controls, gravity models controlling for the geographical distance, GDP and population of home and host countries are common, while time-invariant country characteristics are often absorbed by country fixed or random effects. Bilateral exchange rates, which affect the price of acquisitions, are also often found to be significant.

Within the FDI and taxation literature, a small number of papers examine the effect of corporate taxes on inbound investment into the United States. Early studies of US inbound investment tended to use backward-looking average or statutory tax rates, while more recent research uses effective marginal or average tax rates. More recent studies, beginning with Blonigen and Davies (2004), often incorporates bilateral tax rates, either by controlling for the home country regime (worldwide or territorial)[3] with a dummy variable or by directly incorporating cross-border withholding taxes (WHTs) into effective tax rate calculations.

[3] Worldwide corporate income tax regimes subject the active earnings of the controlled foreign corporations (CFCs) of domestically headquartered MNEs to the domestic corporate income tax, usually giving a credit for foreign taxes paid and often allowing for deferral of taxation until foreign income is repatriated to the domestic parent as a dividend. Territorial regimes, by contrast, exempt active foreign earnings from domestic taxation.

The seminal work on US inbound investment, Hartman (1984), examines the relationship between aggregate annual inbound FDI and average tax rates (ATRs)—the ratio of corporate income and property tax revenues to corporate profits. Hartman considers separately the influence of tax on retained earnings and new transfers from the home country and finds the tax elasticity of the former to be higher.

Slemrod (1990) advances the literature by incorporating effective marginal tax rates (EMTRs), home-country tax regimes, and non-tax controls. In contrast to Hartman (1984), Slemrod finds that the US EMTR negatively impacts new FDI transfers, but not investment financed with retained earnings. He also finds no consistent evidence that home country tax rates or regime type impact foreign investment in the US.

Auerbach and Hassett (1993) examine the impact of EMTRs on inbound FDI following the Tax Reform Act of 1986. They point out that FDI, which consists predominantly of foreign acquisitions of US companies, is unlikely to respond to forward-looking effective tax rates; rather, it is more likely to be driven more by equity market valuations and exchange rates. They therefore focus on investment in PPE by foreign multinationals, which better captures the type of investment affected by effective tax rates. However, they find little empirical evidence to support their hypotheses of the relationship between taxes and different types of foreign investment, and they therefore conclude that the post-1986 wave of inbound acquisitions was not primarily tax motivated.

Swenson (1994) was the first study of inbound US investment to examine sectoral rather than aggregate investment. Comparing the relationship between FDI and both average and marginal tax rate measures, she finds that investment in non-financial sectors responds positively to ATRs, especially investment from home countries with worldwide tax systems. This is consistent with the general equilibrium result that US investment from MNEs based in countries with worldwide tax systems, whose tax burdens are relatively invariant to US tax rates, increases when higher US tax rates drive up the pre-tax return to US assets.

Blonigen and Davies (2004) is the first paper to explore the effect of bilateral tax treaties (BTTs) on US inbound and outbound investment stocks. They do not find treaties to be of significance, which may be due to data limitations: Presence of a treaty is represented by an indicator variable, so the positive and negative effects of treaties—which both lower WHTs and increase information exchange to promote enforcement—may cancel each other out.[4] Also, older BTTs, (which tend to be with OECD countries) have a large positive intercept, but their marginal effect can't be gauged given the limited time series data on FDI, so measurement of marginal effects is limited to more recent treaties.

Agostini (2007) examines the distribution of foreign FDI across US states in reaction to local corporate income tax rates, using BEA data on investment in PPE. His approach highlights the importance of controlling for foreign MNEs' option of investing outside the US: Controlling for this option, he finds an investment tax elasticity of about -1, whereas without this control the elasticity falls to about -0.7. Agostini also finds no significant difference between investment from territorial and worldwide countries.

Wijeweera, Dollery, and Clark (2007) compare the elasticities of US inbound investment with respect to statutory and effective tax rates, while also controlling for home country tax rates. It is the first study on inbound US investment to incorporate Devereux and Griffith's (2003) effective average tax rates, in addition to EMTRs.

[4] Bilateral effective tax rates incorporating cross-border withholding taxes specified in BTTs were introduced to the literature on FDI determinants by Egger et al. (2009). Feld and Heckemeyer's meta-study finds bilateral EATRs to be a highly significant determinant of cross-border investment.

The authors find an elasticity of about -1 for statutory tax rates, as well as a small positive effect of home country rates when controlling for effective tax rates.

Several early studies of the 2017 TCJA constructed forward-looking effective tax rates based on the statutory changes, and some made projections regarding their likely effect on cross-border investment.

Lyon and McBride (2018), DeBacker and Kasher (2018), Beer et al. (2018), Heinemann et al. (2018), and Gravelle and Marples (2019) all estimate that the 14-point drop in the US statutory rate, combined with accelerated depreciation and limitations on interest deductions, reduced effective marginal and average tax rates on equity-financed investment by 11-13 percentage points.[5] They also find that the rate cut, combined with the limitations on interest deductions, sharply increased effective tax rates on debt-financed investment. Studies that analyze the effect of the reform on different asset classes find that, under the general regime, equipment investment received the largest reduction in its effective tax rate, while intellectual property (IP) received the smallest.

As post-reform data become available, an increasing number of empirical studies examine TCJA's impact on total US investment and its composition among assets and industries. Gravelle and Marples (2019) find that, despite TCJA's sharp reduction in corporate tax rates, investment did not respond as robustly as historical elasticities would suggest. They also find that asset-specific investment patterns did not match asset-specific changes in effective tax rates: Post-TCJA investment favored IP-intensive industries, which received a smaller tax cut than machinery and equipment.

Kopp et al. (2019) find that, although investment grew strongly after TCJA, it was driven largely by demand growth, rather than reduced tax rates. The authors attribute the muted investment response to increasing market power and monopolization in the US economy. Similarly, Gale and Haldeman (2021) find that the TCJA tax cuts did not drive post-reform investment growth, which seems to have been better explained by oil prices. Like Gravelle and Marples (2019), they note that the strongest investment growth was in IP, which received the lowest tax cut under TCJA.

Several other post-reform papers—Dharmapala (2018), Dowd et al. (2020), Dyreng et al. (2020), Amberger and Robinson (2021) and Joint Committee on Taxation (2021)—evaluate the early effects of TCJA's corporate tax changes, but they do not focus on how the act affected inbound direct investment. To the best of the author's knowledge, this is the first paper to evaluate the impact of TCJA specifically on foreign PPE investment in the US.

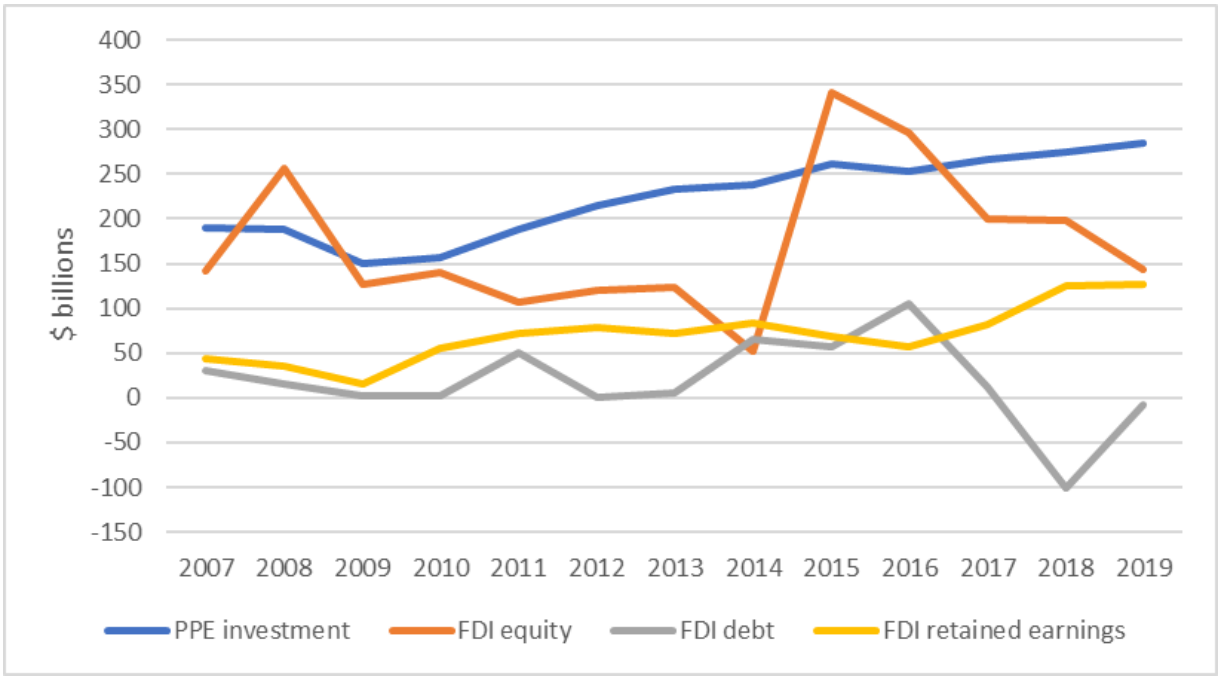
3. Foreign Investment

Inbound investment by foreign-owned multinationals accounts for a significant share of US economic activity. According to the BEA, foreign-owned companies account for roughly 16 percent of US private business capital investment, 15 percent of research and development, 7 percent of business value added, and 6 percent of private-sector employment.[6] According to data reported by the Internal Revenue Service's Statistics of Income Division, foreign-owned corporations also account for about 15 percent of corporate income tax revenue.

[5] However, Beer et al. (2018) found that the equity-financed EMTR fell by only about 5 percentage points.
[6] See https://www.bea.gov/international/di1fdibal.

This paper considers different measures of foreign investment in the US published by the BEA (Figure 1).[7] Data on FDI, which derive from balance of payments statistics, are available by country of immediate origin (CIO), method of finance (new equity, debt, and retained earnings), and selected industries. Investment in PPE by majority foreign-owned US affiliates comes from survey data reported by MNEs. These data are available by country of ultimate beneficial ownership (UBO) and selected industries.

Figure 1. Foreign Investment in the US



Source: BEA.

FDI and PPE reflect different aspects of foreign investment in the US. PPE investment, while of similar magnitude to inbound FDI, does not all stem from cross-border inflows, as it includes domestically financed investment—for example, from retained earnings or borrowing in US capital markets. In contrast to FDI financed with debt and new equity, which are quite volatile, PPE investment show a stable upward trend.

FDI is dominated by acquisitions of existing US companies: According to the BEA, acquisitions accounted for an average of almost 90 percent of inbound FDI between 2014 and 2020, while new establishments accounted for 7 percent and expansions of existing businesses 4 percent.[8] The sharp falloff in equity- and debt-financed FDI after 2015 reflects a tightening of US anti-inversion rules in 2016, as noted by Tabova (2018).[9] FDI financed from retained earnings is much less volatile than equity- and debt-financed FDI, showing a stable upward trend like that of PPE.

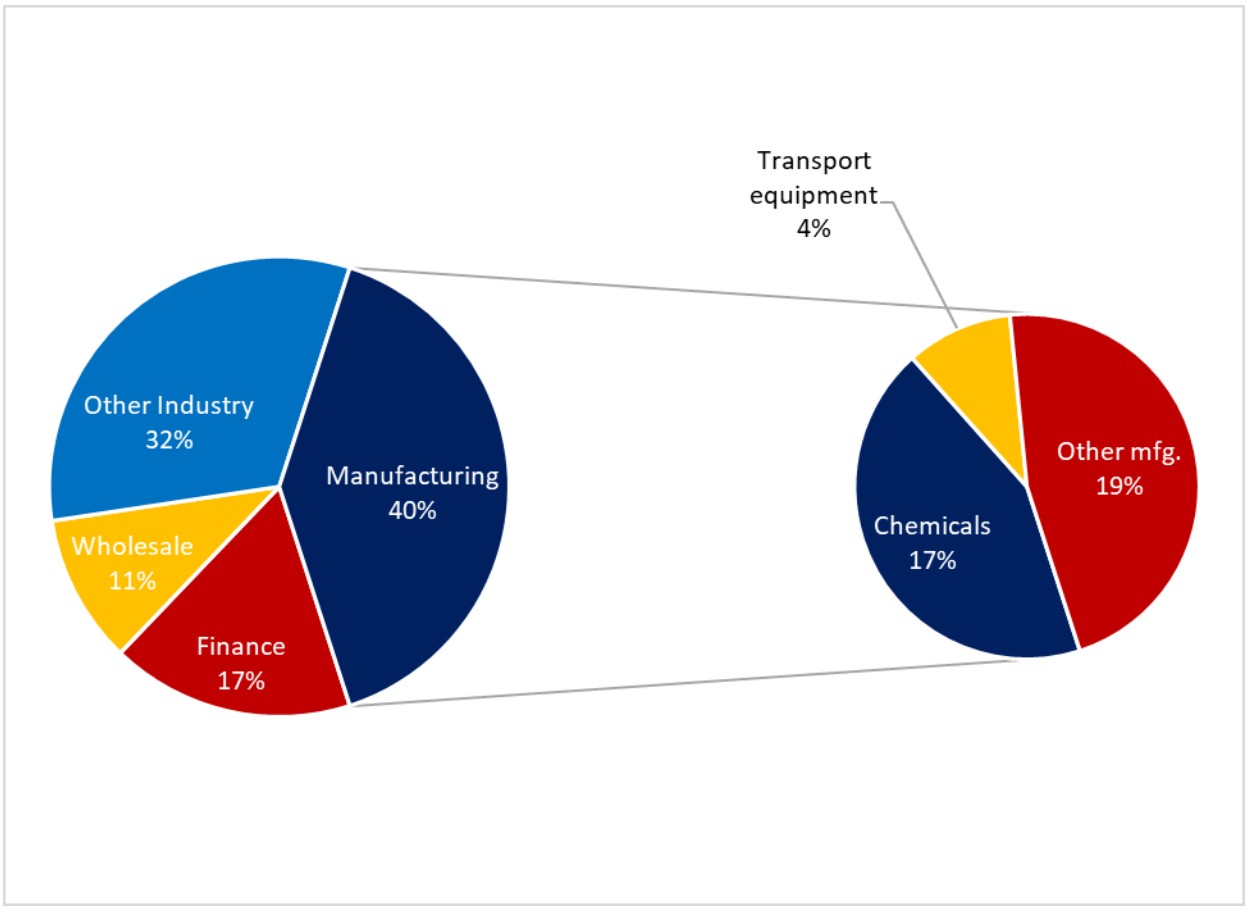
[7] Generally, FDI is defined as investment that establishes an at least 10 percent ownership stake in the target entity. However, our analysis of BEA survey data on property, plant and equipment focuses on US affiliates that are majority-owned by foreign corporations.

[8] https://apps.bea.gov/iTable/iTable.cfm?reqid=2&step=1&isuri=1#reqid=2&step=1&isuri=1

[9] Inversions are transactions that effectively convert a US corporation into a foreign-owned corporation, usually by foreign acquisition of a US company. These acquisitions create US capital inflows most commonly reflected in inbound FDI financed with equity and/or debt.

US inbound investment is concentrated in manufacturing, which accounts for about 40 percent of the 2019 FDI stock (Figure 2). Finance and wholesale are the next largest sectors, with 17 and 11 percent, respectively. Within manufacturing, the largest investment subsector is chemicals (predominantly pharmaceuticals), which accounts for 17 percent of the inbound FDI stock. Transportation equipment (mostly car manufacturing) is the next largest category, accounting for about 4 percent of the FDI stock, and foreign investment in the wholesale sector is dominated by transport equipment trade.

Figure 2. US Inbound FDI Stock by Industry



Source: BEA.

4. Effective Tax Rates

TCJA made sweeping changes to corporate taxation, including the following changes that have been integrated into the effective tax rates calculated by the Tax Policy Center's IICM.[10]

- The federal statutory tax rate was reduced from 35 percent to 21 percent
- "Bonus depreciation" (expensing) of assets with lives of up to 20 years was increased from 50 percent to 100 percent during 2018-2022 and then phased down by 20 percent per year during 2023-2027.
- Interest deductions were limited to 30 percent of earnings before interest, taxes, depreciation, depletion and amortization (EBITDA) during 2018-2021, and 30 percent of earnings before interest and taxes (EBIT) beginning in 2022.
- The foreign-derived intangible income (FDII) regime applies a reduced tax rate of 13.125 percent to export-related income that exceeds a 10 percent return on US tangible assets.

The IICM calculates corporate-level EMTRs and EATRs for US corporations based on the methodology described in Devereux and Griffith (2003). The EMTR measures the "tax wedge" on a marginal investment that just breaks even after taxes. The EATR—the ratio of the present value of corporate income taxes to the present value of pre-tax profits—captures the average tax liability over the life of an investment that earns profits exceeding the normal return to capital, or "rents".

The EATR was created to reflect the extensive investment decisions (market entry) by multinational enterprises, which select among various jurisdictions for the location of projects that often yield firm-specific economic profits. As described in Devereux and Griffith (2003), a corporate-level EATR can be interpreted as a weighted average of the corresponding EMTR and the statutory corporate tax rate, with the weight depending on the level of profitability: As the level of profitability falls toward the marginal break-even level, the EATR approaches the EMTR, and as profitability rises, the EATR approaches the statutory rate.

The IICM parameters used to generate ETRs for this paper, which are calibrated to the reference period of 2014-2019, are an inflation rate of 2 percent and a nominal interest rate of 4 percent. In line with common practice, a nominal profit rate of 20 percent is assumed for calculation of EATRs.[11] The present value of depreciation allowances is based on detailed BEA data on asset stocks by industry, classified into the depreciation categories of the US modified accelerated cost recovery system (MACRS). For a detailed description of the IICM, see Matheson (2021).[12]

The main effect of TCJA on corporate ETRs was to substantially reduce marginal tax rates on equity-financed investment and to increase marginal tax rates on debt-financed investment (Figure 3).[13] Between 2017 and 2018, the EMTR on equity finance fell by 19 percentage points, while the EMTR on debt finance rose more

[10] TCJA also introduced the following measures that are not incorporated into the IICM model: (1) The base-erosion anti-abuse tax (BEAT), an alternative minimum tax levied at a 5-12.5 percent rate that disallows deduction of certain payments to foreign related parties; and (2) elimination of carrybacks of net operating loss deductions (NOLDs) and limitation of NOLD carryforwards generated after 2017 to 80 percent of their value. The data required to empirically estimate the impact of the BEAT on effective tax rates are not yet available, and that impact is complex, since the BEAT can increase ETRs both directly and indirectly. The change in NOLD rules is similarly not incorporated due to the difficulties of empirically estimating its impact on ETRs.

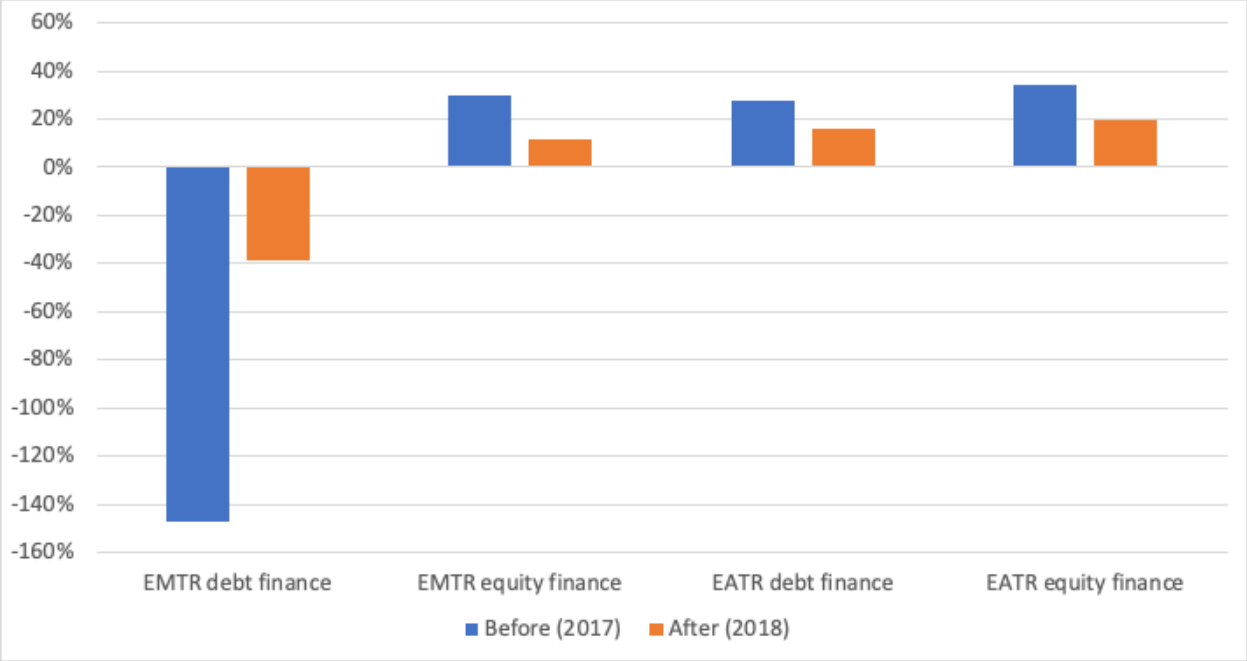
[11] See, for example, Hanappi (2018).

[12] For this paper the model described in Matheson (2021) has been refined to include the effects of the research and experimentation tax credit and the FDII regime.

[13] Tax rates depicted in figure 3 portray corporate-level income taxes only and do not incorporate investor-level taxes on capital income.

than 100 percentage points (but remained negative). Effective tax rates on equity-financed investments were reduced by both a lower statutory rate and the movement from accelerated depreciation to full expensing of machinery and equipment. Prior to TCJA, debt financing was deeply subsidized at the margin due to the high statutory rate and minimal restrictions on interest deductions; following TCJA, this subsidy was sharply reduced due largely to the lower statutory tax rate and stricter limits on interest deductibility.

Figure 3. US Effective Tax Rates Before and After TCJA



Source: Authors' calculation.

By contrast, EATRs for the profit level considered were positive for both debt- and equity-financed investment before and after the TCJA reform. (The higher the profit level, the more closely the debt EATR resembles the equity EATR.) In response to TCJA, the EATR on debt fell about 12 percentage points, while the EATR on equity-financed investment fell about 15 percentage points.

All else equal, TCJA should have reduced the "debt bias" of the US corporate tax, triggering a shift from debt finance to equity finance. This effect should be strongest for marginally profitable companies or intensive investment decisions since the differential between debt and equity EATRs declines much less than for EMTRs. Since most MNEs are assumed to earn economic profits over the course of the business cycle, the effect of TCJA on the financial composition of cross-border investment may therefore be attenuated.

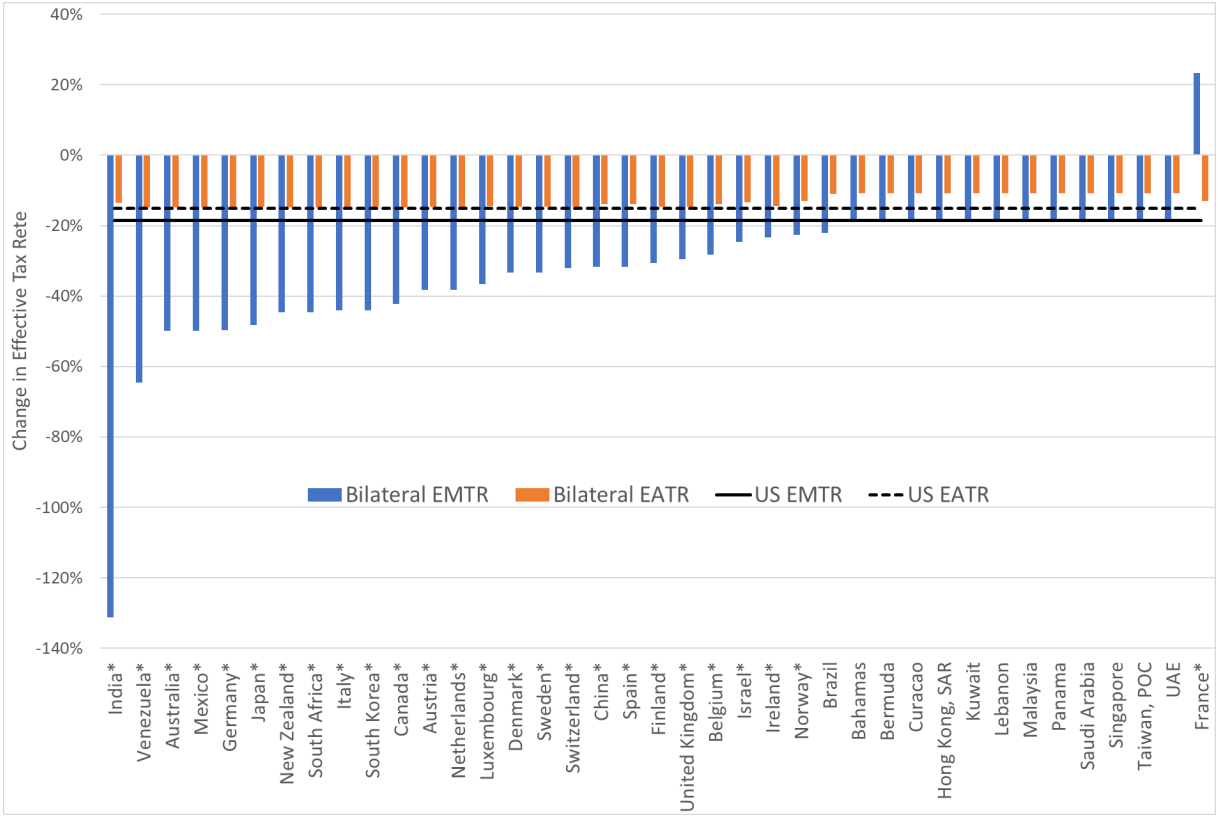
Effective tax rates calculated by the IICM vary by investor country, depending on cross-border withholding taxes on interest and dividends as well as home country corporate income tax rates. The US domestic law cross-border withholding tax rate on both dividends and interest is currently 30 percent, but that rate is usually substantially lower for countries with bilateral US tax treaties (see Appendix A). Calculated ETRs reflect taxes on the foreign corporate parent, but not individual investors in that company.

Reflecting current corporate tax practices outside the US,[14] home country tax regimes are modeled as "territorial", meaning that dividends to the foreign parent are subject to taxation only in the US (including any cross-border withholding taxes). For equity-financed investment, the investor-level dividend tax rate equals the cross-border withholding tax rate on dividends specified by either US domestic law or by a US bilateral tax treaty, where applicable.

By contrast, interest income distributed by US foreign-owned affiliates is usually taxable in the investor country. For debt-financed investment, the investor-level debt tax rate is therefore the greater of the cross-border withholding tax rate on interest and the home-country corporate income tax rate, inclusive of the average subnational corporate tax rate, where applicable.

Figure 4 shows the country-level changes in equity ETRs induced by TJCA for countries included in the BEA FDI data. The US-only ETRs, which do not incorporate cross-border or home-country taxes, are also shown. All countries experienced declines in EATRs for equity-financed investments, and countries that have tax treaties with the US (designated by an asterisk) experienced greater declines in their EATRs than countries without a tax treaty due to their lower cross-border WHTs.

Figure 4. Change in Effective Tax Rates on Equity-Financed Inbound Investment by Country, 2017–18



Source: Authors' calculations. Economies denoted with an asterisk (*) have bilateral tax treaties with the US.

All countries except France experienced a decline in their EMTRs. Generally, bilateral EMTRs relate negatively to home-country CIT rates due to the CIT rate's effect on the corporate discount rate, which equals the nominal

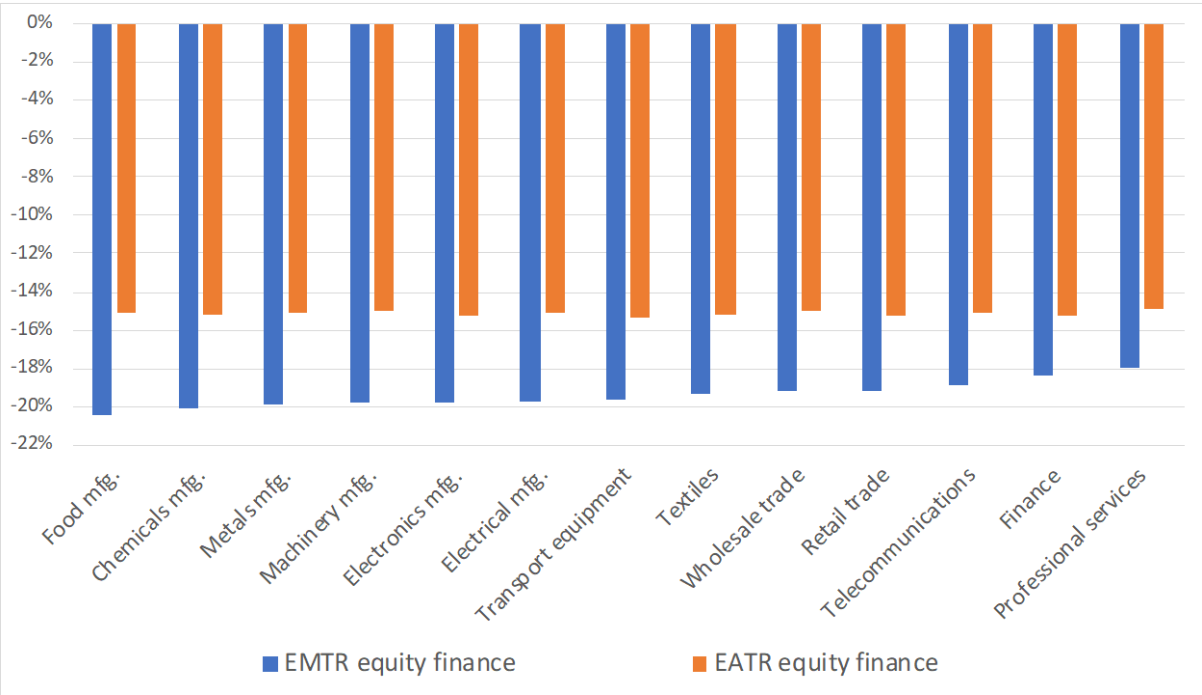
[14] See PricewaterhouseCoopers (2013).

interest rate (4 percent) multiplied by one minus the greater of the cross-border withholding tax on interest and the home-country CIT rate.[15] The increase in France's EMTR is thus driven by the 10-point reduction in its own CIT rate, which took effect in 2018. Countries with higher CIT rates, such as India (35 percent), experienced greater reductions in their EMTRs.

Effective tax rates (and their change in response to TCJA) also vary by industry, driven by industries' different asset compositions. In general, industries that invest relatively heavily in equipment (in contrast to structures and IP) benefitted more from TCJA's expansion of bonus depreciation, while industries that rely heavily on intellectual property also benefitted from the FDII regime.

Figure 5 shows effective tax rates for equity-financed investment for industry groups detailed in the BEA FDI data. Although all sectors benefitted from reduced tax rates under TCJA, the sectors that benefitted the least – professional services and finance – rely less on physical and IP investment. Manufacturing industries, which invest heavily in equipment, benefitted the most.

Figure 5. Change in Effective Tax Rates by Industry, 2017–18



Source: Authors' calculations.

5. Models and Data

FDI is often evaluated using a "gravity model" (Kahouli and Maktouf, 2015), according to which bilateral investment is a function of two economies' size (GDP) and geographical distance, often with the inclusion of additional controls such as tax rates, infrastructure, and education level. This paper therefore examines investment as a function of home and host country GDP, bilateral exchange rates, and US or bilateral effective tax rates. Time-invariant and slow-moving country characteristics such as geographical distance are elided by

[15] See Matheson (2021).

either country intercepts or first differencing of the data.[16] Two different regression structures were considered: an error component model[17] and system GMM model.

Since capital projects often unfold over the course of multiple years, cross-border investment may be sequentially correlated.[18] System GMM models control for autocorrelation by including lagged dependent variables as regressors, while in the error components model, autocorrelation was addressed by controlling for the previous-period capital stock. In most cases, GMM and random effects models yielded similar results. Since the lagged dependent variable in the GMM regressions is usually significant, the GMM model is validated, and those results are therefore presented.[19] As the variance of the observation-specific error term may differ across countries (or country-industry pairs), robust standard errors clustered at the country or country-industry level are presented.

Several different measures of the effective tax rate are used for each dependent variable to gauge their relative effects. All dependent variables are regressed on both US and bilateral EMTRs and EATRs. Given results from the literature, the coefficient on EATRs is expected to be larger. For FDI, the effective tax rates in each model reflect the relevant financing method: new equity, retained earnings, or debt.[20] Debt-financed FDI is regressed only on US and bilateral EMTRs, since the share of debt finance chosen for a given investment should depend on the EMTR only. Since the finance method for PPE investment is unclear, it is regressed on ETRs for equity finance in keeping with the common practice in the literature. The expected sign of the coefficient on all tax terms is negative.

Foreign investment measures are in logs, while the effective tax rate is in percentage points. The coefficient on the effective tax rate is therefore the semi-elasticity of investment with respect to the tax rate. Since some FDI observations are negative (i.e., there is a net capital outflow), the smallest feasible constant is added to all observations in each series to render all values positive prior to the log transform. To focus on the impact of TCJA and keep the time frame consistent across series,[21] the FDI regressions are confined to data from 2014-2019.[22]

At least two different versions of each regression model are presented: a univariate model that controls only for the relevant tax rate and the lagged dependent variable, and a multivariate model that also controls for macroeconomic factors. Macroeconomic variables used in the core multivariate models are US and home country GDP and foreign exchange rates, which are from the IMF database. These values are also transformed into logs, so their coefficients represent elasticities.

The expected sign on US GDP is positive: a stronger US economy should encourage inbound GDP. The sign on the home-country GDP is indeterminate since a stronger home economy could either encourage or discourage outbound investment. Likewise, the coefficient on the US exchange rate could be either positive or

[16] Over short time periods, such as the 6-year period examined in this study, human and public capital endowments do not vary much, so they are absorbed by country fixed effects. Time fixed effects are not included, since they would be collinear with US GDP.

[17] Hausman tests (Hausman, 1978) were conducted to determine whether there were systematic differences between the random- and fixed-effects estimators. For almost all specifications, the null hypothesis of no systematic correlation was not rejected.

[18] The BEA's "new FDI" data series, which evaluates FDI by country of UBO and transaction type—acquisitions, new establishments, and expansions—confirms the dynamic nature of FDI by decomposing it into first-year and related future investment.

[19] Random effects regression results are available from the authors upon request.

[20] For US-level ETRs, the tax rates on new shares and retained earnings are identical, since the ETRs reflect only corporate-level taxes.

[21] New FDI data by country of UBO are only available from 2014.

[22] Since data on FDI by UBO are available for only 2014-2019, the GMM models of FDI by UBO, which use two years of lags as instruments, cover only 2016-2019.

negative: a stronger US dollar, which increases the ratio of foreign currencies to US dollar, could discourage inbound investment by making US assets more expensive or encourage it by raising the value of future earnings.

For models where tax rates were found to have a significant effect – PPE and FDI financed with retained earnings – additional robustness checks were also performed. Macroeconomic controls used for robustness checks include the US federal funds rate and the US budget balance, which are from the St. Louis Federal Reserve database, and the average annual S&P 500 price-to-earnings ratio, which reflects US stock market valuation.[23]

Robustness checks also include two dummy variables describing home investor countries: The "high-income" dummy variable takes on a value of one for home countries classified by the World Bank as high-income countries, and is zero otherwise. High-income countries and investment hubs are listed in the appendix. The "investment hub" dummy variable takes on a value of 1 for countries whose inbound plus outbound FDI stocks exceed 300 percent of their GDP.

Summary statistics of regression variables are shown in Table 1. The mean bilateral EMTR is lower than the mean US-level EMTR, despite the added layer of cross-border taxation, because all tax rates are limited to the corporate level only. Therefore, the discount rate used to calculate the US EMTR is the nominal interest rate, while the foreign discount rate is the nominal interest rate multiplied by one minus the maximum of the home-country CIT rate and the bilateral WHT on interest.[24] Bilateral EATRs can also be below US EATRs for this reason, but on average they are higher.

Table 1. Descriptive Statistics of Country-Level Regression Variables

Variable	No. Obs.	Mean	Std. Dev.	Min	Max
			Units		
EMTR equity US	234	0.24	0.09	0.11	0.30
EMTR equity bilateral	234	-0.08	0.42	-2.20	0.38
EATR equity US	234	0.29	0.07	0.19	0.34
EATR equity bilateral	234	0.36	0.11	0.17	0.51
Dollar exchange rate	226	78.30	297.7	0.29	1,508
Federal Funds Rate	234	0.94	0.81	0.09	2.16
US federal budget balance (% of GDP)	234	-3.40	0.71	-4.60	-2.43
S&P 500 Price/Earnings ratio	234	3.10	0.11	2.90	3.22
			USD Billions		
Property Plant and Equipment (PPE)	198	7.4	13.9	0.0	64.7
Debt-financed FDI	200	0.5	7.2	(32.8)	49.5
Equity-financed FDI	148	7.7	19.4	(108.3)	122.6
Retained earnings-financed FDI	152	3.2	5.1	(5.5)	21.2
Foreign Country GDP	221	1,322	2,148	5.7	14,400
US GDP	234	19,350	1,350	17,530	21,430

Sources: BEA, IMF, fred.stlouisfed.org, www.multpl.com (Shiller P/E ratio), and authors' calculations.

[23] https://data.nasdaq.com/data/MULTPL-sp-500-ratios

[24] This interpretation implies that the alternative investment is a US bond.

6. Regression Results

Country-level analysis

We look first at investment in PPE, which as Auerbach and Hassett (1993) point out is the measure of FDI most likely to respond to changes in effective tax rates. Table 2 shows a clear pattern of ETR significance: The estimated tax semi-elasticities are negative and significant in all the univariate regressions (odd-numbered columns) but insignificant in the multivariate regressions that include macroeconomic controls (even-numbered columns). Consistent with the literature, the coefficients in the univariate regressions are higher for EATRs than for EMTRs. However, their absolute values, which range from 0.3 to 1, are well below the average semi-elasticities found in the literature.

Table 2. Regressions of PPE Investment

	1	2	3	4	5	6	7	8
US EMTR	-0.46**	0.16						
	0.21	*0.63*						
Bilateral EMTR			-0.27**	0.05				
			0.12	*0.16*				
US EATR					-0.57**	0.20		
					0.26	*0.78*		
Bilateral EATR							-1.04**	-0.49
							0.41	*0.60*
Home GDP		0.33**		0.34**		0.33**		0.26**
		0.15		*0.16*		*0.15*		*0.10*
US GDP 1/		0.77		0.75		0.77		0.14
		0.71		*0.52*		*0.71*		*0.73*
Dollar exchange rate 1/		-0.14		-0.16		-0.14		-0.13
		0.11		*0.11*		*0.11*		*0.08*
Lagged dependent variable 1/	0.74***	0.66***	0.74***	0.65***	0.74***	0.66***	0.82***	0.71***
	0.09	*0.13*	*0.09*	*0.13*	*0.09*	*0.13*	*0.08*	*0.11*
No. observations	190	188	190	188	190	188	190	188
No. countries	36	36	36	36	36	36	36	36
AR(2) test p-value	0.13	0.14	0.12	0.14	0.12	0.14	0.12	0.12
Hansen test p-value	0.49	0.97	0.72	1.00	0.48	0.97	0.29	1.00

Standard errors in italics; ***p<0.01, **p<0.05, *p<0.1
1/ instrumented variable
ETRs assume finance with new equity

Source: Authors' calculations.

This pattern of tax rate significance suggests that, while foreign investment in US PPE increased following TCJA, that increase was chiefly driven by macroeconomic factors. Once those factors are controlled for, tax rates played no marginal role in stimulating investment. Nonetheless, the positive correlation found in the univariate regressions suggests that the tax cut played an indirect role in stimulating PPE by stimulating overall economic growth. This result echoes the findings of Kopp et al. (2019), who find that increases in investment following enactment of TCJA were driven largely by growth of aggregate demand.

In all models, the lagged dependent variable is consistently positive and significant, with an average value of 0.72, indicating that PPE investment displays strong positive serial correlation. The values are slightly lower in

the multivariate regressions. Home country GDP growth is also positively significant, with an average elasticity of 0.32, indicating that stronger home country growth stimulates outbound investment. US GDP growth and bilateral exchange rates are not individually significant. The null hypotheses for second-order serial correlation of regression residuals and the Hansen test of overidentifying restrictions are not rejected, indicating that the system GMM specification is appropriate.

Equity-financed FDI (Table 3) is negatively correlated with ETRs in the univariate regressions (odd-numbered columns), but only the model using the bilateral EATR (column 7) is significant. Inclusion of macroeconomic controls (even-numbered columns) increases the value of tax rate coefficients – sometimes sharply - but those coefficients are never significant. Positive correlations of tax terms in the multivariate regressions may reflect the falloff in inbound acquisitions of US companies that following the tightening of inversion regulations in 2016 and continued into the post-TCJA years.

Table 3. Regressions of Equity-Financed FDI by Country

	1	2	3	4	5	6	7	8
US EMTR	-0.74	2.37						
	0.79	*2.40*						
Bilateral EMTR			-0.18	-0.11				
			0.12	*0.10*				
US EATR					-0.96	2.89		
					0.98	*2.89*		
Bilateral EATR							-0.45*	0.67
							0.26	*3.06*
Home GDP		-0.05		-0.05		-0.05		0.01
		0.07		*0.05*		*0.07*		*0.49*
US GDP 1/		4.93		1.83		4.86		0.71
		5.05		*1.87*		*4.91*		*0.48*
Dollar exchange rate 1/		-0.05		-0.07		-0.05		-0.05
		0.06		*0.07*		*0.06*		*0.56*
Lagged dependent variable 1/	-.03***	-0.08***	-0.03***	-0.08***	-0.03***	-0.08***	-0.03***	-0.06***
	-0.01	*0.02*	*0.01*	*0.01*	*0.01*	*0.02*	*0.01*	*0.01*
No. observations	115	109	115	109	115	109	115	109
No. countries	29	28	29	28	29	28	29	28
AR(2) test p-value	0.35	0.45	0.35	0.38	0.35	0.45	0.35	0.37
Hansen test p-value	0.14	1.00	0.23	1.00	0.12	1.00	0.28	0.00

Standard errors in italics; ***p<0.01, **p<0.05, *p<0.1
1/ instrumented variable
ETRs assume finance with new equity

Source: Authors' calculations.

In all equity-financed FDI models, coefficients on lagged dependent variables are negative and highly significant. This indicates that equity-financed FDI tends to "bunch" in certain years, with relatively high values succeeded by relatively low values and vice versa. However, the autocorrelation coefficient is very small, with an average coefficient value of -0.06. None of the macroeconomic controls is individually significant.

Most equity-financed FDI models do not reject the null hypotheses of no second-order autocorrelation or robustness. The exception is the multivariate model using the bilateral EATR (column 8), which strongly rejects the Hansen test hypothesis, indicating that that model is likely misspecified.

Debt-financed FDI (Table 4) is consistently negatively correlated with EMTRs for debt-financed investment, but the tax coefficients never rise to the level of significance.[25] Similar to the equity-financed FDI results, coefficients on the lagged dependent variables are negative and significant, albeit of relatively small in absolute value, and none of the macroeconomic controls is individually significant. Second-order autocorrelation of regression residuals is not found for any model, but the Hansen test null hypothesis is rejected in the two univariate models (columns 1 and 3).

Table 4. Regressions of Debt-Financed FDI by Country

	1	2	3	4
US EMTR	-0.25	-0.55		
	0.20	*0.42*		
Bilateral EMTR			-0.45	-1.23
			0.34	*0.88*
Home GDP		0.03		0.03
		0.11		*0.10*
US GDP 1/		1.06		1.35
		1.29		*1.22*
Dollar exchange rate 1/		0.47		0.45
		0.40		*0.38*
Lagged dependent variab	-0.06***	-0.11**	-0.05***	-0.11**
	0.01	*0.05*	*0.01*	*0.05*
No. observations	179	173	179	173
No. countries	38	37	38	37
AR(2) test p-value	0.35	0.36	0.34	0.37
Hansen test p-value	0.03	0.93	0.10	0.93

Standard errors in italics; ***p<0.01, **p<0.05, *p<0.1
1/ instrumented variable
ETRs assume finance with debt

Source: Authors' calculations.

The insignificance of tax terms with respect to equity- and debt-financed FDI, which are both strongly correlated with acquisitions of existing US companies, appears to corroborate Auerbach and Hassett's observation that foreign acquisitions are not particularly tax-sensitive. Rejection of the Hansen test null in some cases also suggests that our regression model is not well specified to describe acquisition-driven FDI.

Regression results for FDI financed out of retained earnings (Table 5) are more similar to the PPE results than FDI financed with debt or new equity. Estimated tax coefficients are negative and significant in all univariate regressions (odd-numbered columns), but unlike for PPE, they remain significant in the multivariate regressions using bilateral ETRS (columns 4 and 8). The estimated semi-elasticities are also considerably larger in absolute value than those found for PPE, ranging from 0.7 to 3.7, and as the literature would predict, they are substantially larger for EATRs than for EMTRs.

[25] In the random effects regression of equity-financed FDI (Table 3a), the tax coefficients are negative and significant in the univariate bilateral EMTR and EATR models (columns 3 and 7). However, their values are quite low at -0.2 and -0.3, respectively.

Table 5. Regressions of Retained Earnings-Financed FDI by Country

	1	2	3	4	5	6	7	8
US EMTR	-1.53***	-2.35						
	0.49	*1.65*						
Bilateral EMTR			-0.72***	-0.67***				
			0.14	*0.15*				
US EATR					-1.91***	-2.97		
					0.61	*2.08*		
Bilateral EATR							-2.49***	-3.68***
							0.38	0.74
Home GDP		0.08		0.09		0.08		-0.03
		0.07		*0.14*		*0.07*		*0.07*
US GDP 1/		-1.37		0.40***		-1.40		-1.64**
		1.82		*0.15*		*1.82*		*0.71*
Dollar exchange rate 1/		0.12		0.22*		0.13		0.22*
		0.13		*0.12*		*0.12*		*0.12*
Lagged dependent variable	0.12***	0.05	0.13***	0.09	0.12***	0.06	0.14***	0.05
	0.05	*0.06*	*0.03*	*0.08*	*0.05*	*0.07*	*0.04*	*0.05*
No. observations	113	109	113	109	113	109	113	109
No. countries	28	28	28	28	28	28	28	28
AR(2) test p-value	0.59	0.43	0.57	0.58	0.59	0.49	0.62	0.45
Hansen test p-value	0.42	1.00	0.38	0.00	0.42	1.00	0.43	1.00

Standard errors in italics; ***p<0.01, **p<0.05, *p<0.1
1/ instrumented variable
ETRs assume finance with retained earnings

Source: Authors' calculations.

Similar to PPE (and in contrast to equity- and debt-financed FDI), the estimated autocorrelation coefficients for FDI financed with retained earnings are positive. However, they are much lower in value than for PPE and only significant in the univariate models (odd-numbered columns), indicating that earnings retention by foreign investors in the US is not serially correlated once macroeconomic factors are taken into account.

Among the macroeconomic controls, US GDP and the bilateral exchange rate are individually significant in models using bilateral tax rates (columns 4 and 8). The exchange rate coefficients are positive, indicating that countries with currencies that weakened against the dollar retained more earnings in the US. The sign of the coefficient on US GDP flips between the EMTR and EATR models, however, complicating its interpretation. There is clearly interaction between the tax terms and US GDP: In models where inclusion of macroeconomic controls makes the tax term coefficient more negative (columns 2, 6, and 8), the correlation between FDI and US GDP is negative, but where inclusion of macroeconomic controls increases the tax coefficient (column 4), the correlation between FDI and US GDP is positive (as expected).

All models of FDI financed with retained earnings pass the Arellano-Bond test for second-order autocorrelation, and most also pass the Hansen test of overidentifying retrictions. However, the multivariate model using bilateral EMTRs (column 4) rejects the Hansen test null of robustness, indicating that that model may be misspecified.

Additional robustness checks were run for dependent variables that showed sensitivity to tax terms in multiple regression models—that is, for PPE and FDI financed with retained earnings. For economy, results presented are limited to models using bilateral tax rates.

For PPE (Table 6), inclusion of controls for US fiscal and monetary policy and stock market valuations in the univariate models from Table 2, columns 3 and 7, renders the tax terms in those models insignificant (Table 6, columns 1 and 3). This result is similar to the effect of including GDP and the exchange rate in those models (Table 2, columns 4 and 8) and reinforces the conclusion that the increase in investment that followed TCJA was driven primarily by macroeconomic factors.

Table 6. Additional Regressions of PPE Investment by Country

	1	2	3	4	5	6	7	8
Bilateral EMTR	-0.26	0.06			-0.32***	0.00		
	0.23	*0.19*			*0.10*	*0.10*		
Bilateral EATR			-1.56	-0.63			-1.05**	-0.34
			1.20	*0.96*			*0.51*	*0.41*
Federal funds rate	-0.01	0.02	-0.17	-0.08				
	0.13	*0.14*	*0.21*	*0.23*				
US budget balance	-0.01	0.04	-0.11	-0.07				
	0.13	*0.14*	*0.18*	*0.13*				
S&P 500 P/E Ratio	0.08	-0.05	0.24	0.15				
	0.25	*0.23*	*0.30*	*0.26*				
Investment hub dummy					0.05	0.36**	0.05	0.39**
					0.19	*0.17*	*0.18*	*0.16*
High income dummy					0.54**	0.51**	0.21	0.26
					0.27	*0.23*	*0.16*	*0.23*
Home GDP		0.35**		0.24**		0.45***		0.37***
		0.16		*0.11*		*0.14*		*0.10*
US GDP		0.94		0.16		0.63		0.41
		1.94		*2.46*		*0.43*		*0.46*
Dollar exchange rate		-0.16*		-0.13*		-0.1		-0.13
		0.09		*0.07*		*0.10*		*0.09*
Lagged dependent variable	0.79***	0.64***	0.84***	0.72***	0.68***	0.57***	0.81***	0.64***
	0.10	*0.14*	*0.13*	*0.12*	*0.16*	*0.09*	*0.11*	*0.09*
No. observations	190	188	190	188	190	188	190	188
No. countries	36	36	36	36	36	36	36	36
AR(2) test p-value	0.12	0.14	0.10	0.11	0.13	0.14	0.12	0.12
Hansen test p-value	0.28	0.99	0.30	0.97	0.54	1.00	0.13	1.00

Standard errors in italics; ***p<0.01, **p<0.05, *p<0.1
1/ instrumented variable
ETRs assume finance with new equity

Source: Authors' calculations.

Inclusion of dummy variables for high-income home countries and investment hubs do not eliminate the significance of tax terms in univariate regressions (Table 6, columns 5 and 7.) The high-income dummy is positive and significant in PPE models using the bilateral EMTR (columns 5 and 6), but not in models using the bilateral EATR (columns 7 and 8). In the EMTR models, high-income countries invested about 0.5 percent more than lower-income countries. The investment hub dummy is insignificant when included in the "univariate" models in columns 5 and 7, but positive and significant in the multivariate models shown in columns 6 and 8. In these models, investment hub countries invested almost 0.4 percent more than other countries, controlling for

their high-income status. (All investment hub countries are high-income, but not all high-income countries are investment hubs.)

For FDI financed with retained earnings, including additional macroeconomic controls (Table 7, columns 1-4) not only preserves the significance of the tax coefficients, but also increases their absolute value relative to the corresponding regressions in Table 5. In contrast to the PPE regressions, home country income level and investment hub status are usually insignificant. The high-income dummy is never significant, and the investment hub dummy is only significant in the multivariate model using bilateral EMTRs (column 7), where it indicates that investment hubs retained about 0.3 percent more earnings than other investor countries. Also, the Hansen null hypothesis is not rejected in any of the models shown in Table 7, alleviating misspecification concerns raise by the model in Table 5, column 4.

Table 7. Additional Regressions of Retained Earnings-Financed FDI by Country

	1	2	3	4	5	6	7	8
Bilateral EMTR	-0.73***	-0.77**			-0.77***	-0.82***		
	0.17	*0.35*			*0.18*	*0.19*		
Bilateral EATR			-2.74***	-4.01***			-2.54***	-3.40***
			0.53	*1.47*			*0.48*	*0.97*
Federal funds rate	0.06	0.16	-0.14	-0.19				
	0.17	*0.35*	*0.16*	*0.14*				
US budget balance	0.03	-0.13	-0.11	-0.15				
	0.19	*0.28*	*0.21*	*0.31*				
S&P 500 P/E Ratio	-0.29	-0.16	-0.21	-0.09				
	0.41	*0.82*	*0.49*	*0.75*				
Investment hub dummy					0.24	0.34*	0.17	0.31
					0.17	*0.18*	*0.15*	*0.22*
High income dummy					0.00	0.15	0.07	0.05
					0.18	*0.29*	*0.17*	*0.26*
Home GDP		-0.01		-0.11		0.02		-0.01
		0.11		*0.07*		*0.08*		*0.07*
US GDP		-2.99		-0.75		-0.29		-1.38
		3.60		*3.18*		*0.46*		*0.87*
Dollar exchange rate		0.22		0.23*		0.20*		0.24
		0.36		*0.14*		*0.11*		*0.17*
Lagged dependent variable	0.12***	0.02	0.09*	0.02	0.13***	0.06	0.14***	0.05
	0.04	*0.09*	*0.05*	*0.07*	*0.04*	*0.05*	*0.05*	*0.06*
No. observations	113	109	113	109	113	109	113	109
No. countries	28	28	28	28	28	28	28	28
AR(2) test p-value	0.61	0.36	0.49	0.39	0.58	0.45	0.62	0.44
Hansen test p-value	0.95	1.00	0.86	1.00	0.42	1.00	0.39	1.00

Standard errors in italics; ***p<0.01, **p<0.05, *p<0.1
1/ instrumented variable
ETRs assume finance with retained earnings

Source: Authors' calculations.

Country-by-industry analysis

Since effective tax rates vary by industry depending on asset composition—some industries investing more heavily than others in asset classes that benefit from bonus depreciation and/or FDII—we also examine country-by-industry level data. As GMM is an asymptotic method, the robustness of which increases with the number of groups, results should be particularly reliable in this regression. For FDI financed with new equity

and debt, tax coefficients were always insignificant (as in the country-level regressions), so results for only PPE and FDI financed with retained earnings are shown.

It should be noted that country-by-industry level data are available for fewer countries than country-level data. This is particularly true for PPE, where industry-level observations are available for only seven high-income countries: Canada, France, Germany, Japan, the Netherlands, Switzerland, and the UK. At least part of the divergence between country-level and country-by-industry level results is therefore due to sample restriction.

Tax terms in country-by-industry regressions of PPE investment (Table 8) show a somewhat similar significance pattern to the country level regressions in Table 2. That is, they are usually negative and significant in univariate regressions (odd-numbered columns) but insignificant in models that include macroeconomic controls (even-numbered columns). However, this pattern is less consistent than at the country level: in the univariate model using bilateral EMTRs (column 3), the tax coefficient is insignificant, while in the multivariate model using bilateral EATRs (column 8), it is significant. Also, the significant tax coefficients are generally greater in absolute value than at the country level, although their significance level is generally lower.

Table 8. Regressions of PPE Investment, Country-by-Industry

	1	2	3	4	5	6	7	8
US EMTR	-0.51**	0.19						
	0.20	*0.36*						
Bilateral EMTR			-0.09	0.03				
			0.09	*0.06*				
US EATR					-1.56*	-1.11		
					0.83	*0.69*		
Bilateral EATR							-1.58*	-1.15*
							0.87	*0.68*
Home GDP		0.04		0.10		-0.02		-0.04
		0.13		*0.15*		*0.17*		*0.17*
US GDP 1/		1.78**		1.63*		0.37		0.47
		0.77		*0.90*		*1.07*		*1.15*
Dollar exchange rate 1/		-0.04		-0.01		-0.05		-0.04
		0.05		*0.05*		*0.06*		*0.06*
Lagged dependent variable 1/	0.86***	0.95***	0.83***	0.82***	0.75***	1.03***	0.78***	1.01***
	0.14	*0.12*	*0.16*	*0.14*	*0.14*	*0.11*	*0.15*	*0.12*
No. observations	377	377	377	377	377	377	377	377
No. countries	76	76	76	76	76	76	76	76
AR(2) test p-value	0.23	0.34	0.19	0.32	0.20	0.27	0.20	0.26
Hansen test p-value	0.33	0.14	0.28	0.15	0.05	0.15	0.08	0.14

Standard errors in italics; ***p<0.01, **p<0.05, *p<0.1
1/ instrumented variable
ETRs assume finance with new equity

Source: Authors' calculations.

As in the country-level PPE regressions, the lagged dependent variable is highly significant in the country-by-industry regressions, and the average correlation coefficient is even higher at 88 percent. However, the Arellano-Bond test never rejects the null hypothesis of no second-order autocorrelation of regression residuals at a 10 percent significance level. The Hansen test for overidentifying restrictions does reject the null hypothesis of robustness in the univariate models using EATRs (columns 5 and 7), which calls into question the validity of the significant tax coefficients found in those models.

Tax coefficients in the regressions of country-by-industry FDI financed with retained earnings (Table 9), though significant in univariate models with bilateral tax rates (columns 3 and 7), are all very close to zero. These results suggest that, although bilateral tax rates have a strong effect on earnings retention at the country level (Table 5), that effect does not correlate well with the variation in ETRs found at the industry level. This result appears to corroborate Gravelle and Marples' (2019) finding that increases in investment following TCJA did not correlate with industry-level changes in effective tax rates.

Table 9. Regressions of Retained Earnings-Financed FDI, Country-by-Industry

	1	2	3	4	5	6	7	8
US EMTR	0.00	0.01						
	0.01	*0.01*						
Bilateral EMTR			-0.01*	-0.00				
			0.00	*0.00*				
US EATR					0.00	-0.00		
					0.01	*0.01*		
Bilateral EATR							-0.03*	-0.01
							0.02	*0.01*
Home GDP		0.01**		0.01*		0.01**		0.01**
		0.00		*0.00*		*0.00*		*0.00*
US GDP 1/		0.01		0.00		0.00		-0.00
		0.02		*0.01*		*0.02*		*0.01*
Dollar exchange rate 1/		-0.01*		-0.01**		-0.01*		-0.01**
		0.00		*0.00*		*0.00*		*0.00*
Lagged dependent variable 1/	-0.18	-0.09	-0.17	-0.09	-0.19	-0.08	-0.14	-0.10
	0.21	*0.23*	*0.23*	*0.23*	*0.22*	*0.23*	*0.24*	*0.23*
No. observations	1,217	1,104	1,165	1,076	1,217	1,104	1,165	1,076
No. countries	359	338	341	328	359	338	341	328
AR(2) test p-value	0.41	0.33	0.40	0.33	0.41	0.32	0.38	0.34
Hansen test p-value	0.72	0.78	0.49	0.62	0.72	0.84	0.11	0.80

Standard errors in italics; ***p<0.01, **p<0.05, *p<0.1
1/ instrumented variable
ETRs assume finance with retained earnings

Source: Authors' calculations.

Country-by-industry analysis also suggests different effects of other controls from those found in Table 5. Coefficients on the lagged dependent variable are generally insignificant, indicating that earnings retention is not sequentially correlated at the industry level—a result that throws into question the validity of the GMM model at this level of disaggregation. Earnings retention is positively correlated with home country GDP and negatively correlated with the dollar exchange rate, but these effects are both very small.

7. Conclusions

Country-level analysis finds that majority foreign-owned US subsidiaries increased both earnings retention and PPE investment following enactment of TJCA. Estimated tax semi-elasticities in univariate regressions of these measures on US and bilateral effective tax rates are invariably negative and significant. As the literature would predict, the semi-elasticities are larger for EATRs than for EMTRs, but most estimates are less in absolute value than the average value of about -3 found in other studies.

The increase in PPE investment that followed TCJA appears to have been driven by largely by macroeconomic factors rather than the cut in corporate rates. Once US and home-country GDP, dollar exchange rates, and US monetary and fiscal policy are controlled for, effective tax rates were found to have no significant marginal effect on cross-border PPE investment. However, lower income taxes likely affected investment indirectly by boosting economic growth. A similar pattern of tax rate significance was found in PPE regressions at the country-by-industry level.

The impact of effective tax rates on earnings retention, by contrast, was robust to inclusion of macroeconomic controls. Country-level regressions using bilateral tax rates found a significant direct effect of tax rates on earnings retention, even controlling for GDP, exchange rates, and US fiscal and monetary policies. This suggests that earnings retention responded not only to higher economic growth resulting from the TCJA's substantial tax cuts, but also directly to the tax cut itself. It makes sense that TCJA's sharp reduction of the US corporate tax rate from the top of the global range to around average would have a powerful effect on foreign-owned companies' willingness to retain earnings in United States. However, the change in earnings retention does not correlate well with changes in industry-level tax rates: in country-by-industry regressions of retained earnings, estimated coefficients were very small and usually insignificant.

We find little evidence that FDI financed with new equity or debt responded to the changes in effective tax rates introduced by TJCA. This is perhaps not surprising, since these financial flows are closely associated with acquisitions of existing US companies, which is likely to be less tax-sensitive than investment in tangible assets.

Overall, these findings are consistent with those found in other studies of TCJA's early effects on investment. Kopp et al. (2019) find that US investment following TCJA was driven largely by growth in aggregate demand, rather than directly by tax reductions. Similarly, Gale and Haldeman (2021) find that, although US investment grew following enactment of TCJA, that growth was driven by declining oil prices rather than the reduction in US business tax rates. (However, they do note an increase in intellectual property investment, which could have been driven at least partly by FDII.) And Gravelle and Marples (2019) find that investment growth did not correlate well with industry-level changes in effective tax rates.

Kopp et al. (2019) attribute the weak investment response following TCJA to growing market power in the US economy. Monopolistic competition increases the share of economic profits ("rents") in corporate earnings, so that the corporate income tax evolves toward a rent tax. Another factor contributing to this effect is the structure of the US CIT itself: Even prior to TCJA, features such as 50 percent bonus depreciation and research and development expensing emulated a rent tax. Since rent taxes affect investment behavior less than income taxes (due to zero or very low EMTRs), investment rises less in response to a reduction in rent tax rates. Further, investors could have doubted the longevity of TCJA, especially in the case of a large, irreversible investment.

Another cause for the lack of investment response to TCJA could have been the law's implementation late in the business cycle. By 2018 the US economy had been expanding consistently for 8 years, so corporate investment may already have peaked. Given that the study only includes the first two years of data post TCJA, it is also possible that a greater investment response could emerge later—assuming that the law remains stable. Future years' data could reveal whether a higher level of foreign investment might eventually emerge—for example, if the stronger growth in IP investment seen in 2018 and 2019 lays the groundwork for later physical investment. However, the large effects of the Covid-19 pandemic and associated fiscal policies will be difficult to disentangle from those of TCJA itself.

Appendix A. Countries

	Tax Treaty	High Income	Investment Hub
Australia	1	1	0
Austria	1	1	0
Bahamas	0	1	1
Belgium	1	1	0
Bermuda	0	1	1
Brazil	0	0	0
Canada	1	1	0
China	1	0	0
Curacao	0	1	1
Denmark	1	1	0
Finland	1	1	0
France	1	1	0
Germany	1	1	0
Hong Kong, SAR	0	1	1
India	1	0	0
Ireland	1	1	1
Israel	1	1	0
Italy	1	1	0
Japan	1	1	0
Kuwait	0	1	0
Lebanon	0	0	0
Luxembourg	1	1	1
Malaysia	0	0	0
Mexico	1	0	0
Netherlands	1	1	1
New Zealand	1	1	0
Norway	1	1	0
Panama	0	0	0
Saudi Arabia	0	1	0
Singapore	0	1	1
South Africa	1	0	0
South Korea	0	1	0
Spain	1	1	0
Sweden	1	1	0
Switzerland	1	1	1
Taiwan, Province of China	0	1	0
United Arab Emirates	0	1	0
United Kingdom	1	1	0
Venezuela	1	0	0

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