Taxing Internal Capital Markets and the Repatriation of Risk

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Abstract

Taxing internal capital markets can curb profit shifting, but it can also disrupt valuable risk sharing within multinational firms. We study this trade-off in the U.S. property-casualty insurance industry using the 2017 Base Erosion and Anti-Abuse Tax, which raised the cost of cross-border affiliate reinsurance. To separate the motives behind these internal transfers, we exploit the §953(d) election, which allows a foreign affiliate to be taxed as a U.S. corporation while remaining offshore, decoupling tax status from location. We estimate a policy-induced substitution ratio: for each dollar the tax drove out of the non-electing channel, about a fifth returned through a fully taxed §953(d) affiliate. This substitution was concentrated among groups with high exposure to catastrophes that most require global diversification. The contraction in internal risk pooling pushed insurance risk back onto U.S. balance sheets, raising domestic retained losses. However, the reported capital ratios remained unchanged because a decrease in the risk charge on recoverables offset the higher charge from greater risk retention. We document how this mechanical offset creates a regulatory measurement blind spot, as the credit risk charge tracks the raw volume of recoverables rather than capturing the true economic shift in repatriated risk.

JEL classification: G22, G32, F38, H26

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1. Introduction

Multinational firms rely heavily on internal capital markets to allocate resources across their global subsidiaries. A central debate in corporate finance is the extent to which these internal flows create economic value or simply shift profits to low-tax jurisdictions (Desai et al., 2004; Gopalan et al., 2007; Stein, 1997; Tørsløv et al., 2023). The two views carry opposite implications. If internal markets relax financing constraints and share risk, restricting them fragments global firms and raises financial fragility. If they mainly relocate paper profits, restricting them restores tax neutrality at little real cost. There are intercompany transactions for which the motive is clear (e.g., royalty payments). The economically interesting and more difficult cases lie in between, where a single contract transfers real economic content and taxable income at the same time. For these flows, the tax motive and the economic motive are inseparable in standard data, so the true demand for the internal link is unknown. Reinsurance inside multinational insurance groups is the leading example. One treaty can pool global risk and shift profit offshore at the same time. Because the IRS requires reinsurance to transfer real risk, the tax motive can hide behind a contract that looks operational (Seessel, 2001). This is exactly why standard tax-haven classifications cannot tell the two apart (Altuntas et al., 2018).

We overcome this identification challenge with an exogenous shock to the cost of internal transactions. The 2017 Tax Cuts and Jobs Act (TCJA) introduced the Base Erosion and Anti-Abuse Tax (BEAT). The BEAT places a minimum tax on payments from U.S. firms to their foreign affiliates (internal reinsurance). It raises the cost of the internal market while leaving the external market (external reinsurance) untouched. It therefore forces firms to reveal how much their internal links are worth. When the subsidy on an internal flow disappears, the firm's response shows whether the flow was about risk or about tax. We study this in the U.S. property-casualty insurance industry. The setting fits the question for three reasons. First, the industry is large and systemically important, insuring more than $1 trillion in premiums as of 2024. Second, internal reinsurance is the main channel through which insurance groups allocate capital internally (Powell et al., 2008). Third, reinsurance is a clean example of a bundled contract. Premiums ceded to a foreign affiliate are tax-deductible in the U.S., so they lower U.S. taxable income and raise it offshore. At the same time, pooling weakly correlated risks in one entity lowers the capital the group must hold.

The economic substance of internal reinsurance lies in diversification. Capital is typically set by the tail of the loss distribution. When uncorrelated risks sit in one entity, the joint tail is smaller than the sum of the separate tails. A U.S. hurricane and a Japanese earthquake are very unlikely to happen at the same time. An affiliate that holds both therefore needs less capital than two separate insurers each holding one. The group writes the same business with less capital, which frees resources to underwrite more. This is genuine risk sharing. But the same contract also moves profit. Before the BEAT, reinsurance cessions to foreign affiliates were tax deductible. An insurance group could therefore lower its total tax liabilities by shifting taxable income from the U.S. to an affiliate in a low-tax jurisdiction such as Bermuda.

The BEAT applies to insurance groups that meet two statutory tests: average gross receipts of at least $500 million over the prior three years, and a base erosion percentage of at least 3%. In essence, these conditions identify groups that are large (gross receipts) and rely heavily on internal capital markets (base erosion payments). We classify groups ex ante on their 2017 values, before the tax took effect. We identify 28 groups that met both conditions; these form the treatment group. The remaining 27 did not and serve as the control. We estimate difference-in-differences models on a sample from 2013 to 2022, a panel of 550 group-year observations. The sample is highly representative: treated and control groups together held 58.3% of U.S. property-casualty industry assets in 2017. Our analysis proceeds in three parts.

First, we examine the aggregate response to increased internal capital markets costs through the BEAT. We find that affected insurance groups reduced their internal reinsurance cessions by 10.7 percentage points of premiums written relative to control groups. The contraction was immediate and permanent. It appeared in full in 2018, the first year the BEAT applied, and did not deepen when the statutory rate rose the following year. Firms anticipated the tax and restructured their treaties at once. If internal and external reinsurance markets were frictionless substitutes, a firm forced out of affiliate reinsurance would simply buy the same cover from a third party. The decline in affiliate cessions would be offset one-for-one, and total risk transfer would be unchanged. We find no such offset. External reinsurance markets absorbed only a small share of this lost capacity. Cessions to foreign third parties rose by just 2.5 percentage points. Treated firms replaced less than a fourth of the internal capacity they gave up. This substitution gap suggests that these flows were more about optimizing global tax liabilities than transferring risk that would be costly to hold in the

U.S.

Second, we ask what these flows were actually for. The aggregate contraction tells us that affiliate reinsurance was sensitive to tax, but not why. A single reinsurance contract does two things at once: it transfers insurance risk, and it moves taxable income offshore. To separate them, we exploit a feature of the U.S. tax code: the §953(d) election. A foreign affiliate can elect to be taxed as a U.S. corporation while keeping its offshore domicile, capital structure, and regulatory regime. The election removes the tax advantage but leaves the operational benefits intact. It therefore splits the firm's choice in two. A firm that cedes purely for tax reasons has no reason to elect; once the BEAT removes the subsidy, the flow collapses. A firm that cedes for genuine risk-sharing reasons will elect, paying full U.S. tax to keep the operational link. The election is thus a revealed preference for risk over tax. We hand-collect the §953(d) status of every affiliate in three jurisdictions: Bermuda, the Cayman Islands, and Switzerland. We focus on these three for a specific reason: they are at once global reinsurance hubs and major tax havens, so they are exactly where the two motives overlap and need to be disentangled. Together they took 88.3% of all affiliate cessions in our sample in 2017. To our knowledge, this is the first study to track these elections systematically.

We cannot simply regress electing cessions on non-electing cessions. A group sets both at once, as part of one reinsurance program, so the two move together for reasons unrelated to the tax. We therefore use the BEAT as an instrument in a 2SLS setting. The instrument is the interaction of treatment with the post-reform period, restricted to groups that both met the statutory thresholds and held a non-electing affiliate before the reform. These are the only groups for which the BEAT actually raised the cost of an existing arrangement. The instrument is relevant: BEAT-exposed firms cut non-electing cessions by 17.5 percentage points of premiums relative to controls. It is plausibly exclusive: the only path from the tax to electing cessions runs through the rising cost of the non-electing channel, since cessions to §953(d) entities are exempt from the BEAT by law. The substitution ratio is small. For every dollar pulled out of the tax-advantaged channel, only about 22 cents moved into the tax-neutral one. The other 78 cents left the foreign reinsurance market entirely. Therefore about 80% of pre-reform offshore reinsurance was tax-motivated and vanished once the subsidy was gone and about 20% was sticky enough to survive paying full U.S. tax.

The surviving flows were not random. To see which firms kept their offshore links, we partition on catastrophe exposure. For each group, we measure the share of premiums written in catastrophe-

prone lines within catastrophe-prone states. We take the median of this share over the pre-reform period, 2013 to 2017, to capture each group's structural reliance on diversification. We then split the sample at the median, labeling groups above it as high-catastrophe and those below as low-catastrophe. The result is clear. High-catastrophe firms cut their affiliate cessions by about 13.7 percentage points less than low-catastrophe firms, and they substituted more actively toward risk-motivated channels. They paid full U.S. tax to keep pooling rather than carry tail risk home. Low-catastrophe firms, for whom the operational benefit was small, exited almost entirely. This is consistent with their pre-reform flows having been tax arbitrage.

Furthermore, treated firms did not change their underwriting business. Gross premiums written stayed flat after the reform, and their underwriting portfolio stayed the same. However, since external markets did not absorb the lost capacity, firms kept more of what they wrote on their own domestic books, and net premiums written rose. The increase was concentrated in long-tail lines, where claims take the longest to settle. The literature points to these lines as the most common channel for tax arbitrage: because payouts come years or decades later, the reserves backing them can sit in a low-tax jurisdiction and be invested at lower tax rates until the claims fall due (Seessel, 2001). Catastrophe risk is different. It requires global diversification, so firms paid the U.S. tax to keep ceding it. When the tax advantage disappeared, it was the long-tail, tax-favored risk that was repatriated, while the diversification-dependent catastrophe risk stayed pooled abroad. This cross-sectional pattern lines up with our decomposition: the flows that left were tax-motivated, and the flows that stayed were risk-motivated.

Third, we examine the real effects of this disruption. The substitution gap implies that risk previously ceded to affiliates was repatriated to U.S. balance sheets.[1] We find that the repatriation of insurance risk among treated firms increased their incurred losses: firms most exposed to the BEAT saw a 9.7 percentage point increase in their losses, scaled by premiums. Effective solvency therefore deteriorated. Reported solvency did not. For each group and year, we compute required capital (the Authorized Control Level) and the RBC ratio. Neither moved for treated firms after the BEAT. To understand why, we decompose required capital into its risk charges. Required capital is the sum of separate charges, each tied to a different exposure. Three should respond to a change in

[1] We do not claim that the premiums ceded overseas, though mostly tax-motivated, carried no real insurance risk. Rather, we argue that these contracts were set up in the first place to shift premiums for tax arbitrage from the U.S. to low-tax jurisdictions.

reinsurance: a credit-risk charge on reinsurance recoverables (R3), a reserve-risk charge (R4), and a premium-risk charge (R5). When a firm cedes less, two things happen at once. Its recoverables shrink, so R3 falls. Its retained reserves and premiums grow, so R4 and R5 rise. We show that these forces cancel. The decline in R3 offsets the increase in the other two buckets, and total required capital is unchanged.

This offset might look economically sound: if the firm has genuinely eliminated reinsurer credit risk, the released capital is justified. But the credit charge is not calibrated to do that work. When the BEAT was introduced, R3 was a flat 10% of recoverables. It did not depend on the reinsurer's rating. The released capital is therefore proportional to ceded volume, not to any real change in default risk. The rise in domestic risk-taking was thus offset by a structural feature of the formula, not by any reduction in counterparty risk. The result is that the formula treats shedding reinsurance as a reduction in risk even when the firm retains more. Disrupting internal capital markets can therefore create regulatory blind spots, pushing risk into accounting categories the existing framework is not calibrated to capture.

We contribute to three strands of literature. First, we add to the literature on internal capital markets (ICMs). One strand stresses their benefits. ICMs supply internal credit when external borrowing is too costly (Desai et al., 2004). They move capital to the divisions with the best prospects (Khanna & Tice, 2001; Stein, 1997). And they support weaker affiliates (Gopalan et al., 2007). A second strand stresses their costs. ICMs can enable profit shifting (Desai et al., 2006; Griffith et al., 2014; Grubert, 2003; Huizinga & Laeven, 2008; Santacreu, 2023; Tørsløv et al., 2023) and create agency conflicts inside conglomerates (Lamont, 1997; Rajan et al., 2000; Scharfstein & Stein, 2000).[2] Closest to our work is Ge (2022), who studies the ICM inside insurance groups. She shows that internal transfers pass financial shocks from one division to another. We differ in two ways. She looks at flows between divisions of a group; we look at flows across borders. She studies a financial shock, where losses in one division strain another; we study a tax shock, where the BEAT raises the cost of offshore reinsurance. Where she shows that ICMs spread stress within a group, we show what happens when the ICM itself is shut down. The risk is repatriated, not pooled. More

[2]Tørsløv et al. (2023) estimate that U.S. multinationals shifted more than half of their foreign profits to tax havens in 2015. Firms often shift profit through hard-to-value intangibles. Karkinsky and Riedel (2012) show that patent filings respond to cross-country tax differences, and Dischinger and Riedel (2011) find the same for the level of intangible investment.

broadly, we show that a large part of what looks like internal risk sharing is in fact tax arbitrage. We separate the two motives and measure how elastic each one is.

Second, we add to the literature on tax and reinsurance in the insurance industry. Insurers face a convex tax schedule, so reinsurance can smooth earnings and lower expected taxes (Mayers & Clifford W. Smith, 1982; Mayers & Smith, 1990). Adiel (1996) tests whether reinsurance demand rises with the marginal tax rate but finds no support. Adams et al. (2008) find that the reinsurance demand of U.K. life insurers tracks their marginal tax rate rather than any wish to reduce volatility. A related literature studies tax and regulatory arbitrage. Koijen and Yogo (2016) document shadow insurance, where life insurers cede to affiliates in lighter-regulation jurisdictions to lower required capital. Hepfer et al. (2020) estimate that U.S. life insurers saved $25.1 billion in taxes through profit shifting between 2004 and 2014. We differ from this work in two ways. First, we study the insurance group, not the single company, because tax and reinsurance strategy is set at the group level (Cummins et al., 2021; Powell & Sommer, 2007). Second, we study the property-casualty industry, where reinsurance is also driven by the need for diversification, not by tax and regulation alone. Our closest reference is Tang (2022), who studies the effect of the BEAT on reinsurance use and on insurance prices. We depart from this paper in both identification and goal. Tang (2022) splits firms at the median of pre-reform reinsurance use. We instead assign treatment from the BEAT's own statutory thresholds. Our aim is also different. We use the BEAT to split reinsurance into a tax-driven part and a risk-driven part, and then trace the effect on financial fragility.

Third, we add to the literature on the gap between economic substance and regulatory appearance in U.S. insurance. Oh et al. (2025) show that rate regulation creates cross-subsidies across states, so that prices drift away from underlying risk. Abramson et al. (2025) show that the funding structure of state guaranty funds leads healthy insurers to cut supply when peers fail. Sastry et al. (2026) show that guarantee fees and some credit ratings understate insurer insolvency risk. A common theme runs through this work. Rules meant to protect policyholders can mask risk, or even add to it. We document the same decoupling through a new channel: tax policy. The BEAT pushes real risk back onto U.S. balance sheets. Yet reported solvency does not move. The reason is that the NAIC capital formula requires a credit charge that tracks the volume of recoverables rather than their quality. Firms can therefore raise their true exposure while their reported capital position stays flat. A tax designed to curb profit shifting thus opens a blind spot in prudential regulation.

The remainder of the paper proceeds as follows. Section 2 reviews insurance internal capital markets and the BEAT in the insurance context. Section 3 constructs the sample and presents summary statistics. Section 4 presents the baseline results of the tax shock on the internal capital allocation of insurance groups. Section 5 attempts to decompose reinsurance into a tax-motivated and risk-sharing-motivated part. Section 6 examines the impact of the BEAT on the financial fragility of the U.S. Finally, Section 7 concludes.

2. Institutional Background and Identification Strategy

2.1 The BEAT as a Tax on Internal Capital Markets

Multinational insurance groups rely on internal reinsurance markets to overcome significant external frictions. Functioning as a mechanism for the internal reallocation of capital, these markets allow groups to deploy resources to subsidiaries where they are most efficiently used (Powell et al., 2008). Internal capital markets mitigate the high costs of external capital arising from information asymmetries and moral hazard (Jean-Baptiste & Santomero, 2000; Yan & Hong, 2015). By operating under a unified structure with aligned interests, groups avoid the risk premiums embedded in third-party pricing and benefit from significantly lower transaction costs (Cragg et al., 2017; Park et al., 2021). Furthermore, these internal transfers have historically offered a tax advantage: by shifting premiums to low-tax jurisdictions, firms could minimize their global tax burden (see e.g., Jean-Baptiste & Santomero, 2000; Mayers & Smith, 1990; Powell & Sommer, 2007).

The 2017 TCJA disrupted this equilibrium by introducing the BEAT. Designed to curb profit shifting through deductible payments to foreign related parties, the BEAT reclassifies cross-border affiliate reinsurance premiums as base erosion payments that must be added back to taxable income. This effectively subjects these flows to a minimum tax, which phased in at 5% in 2018, rose to 10% for 2019–2025, and has reached a rate of 10.5% for 2026 and beyond.[3] By removing the tax deductibility of offshore transfers, the policy acts as an exogenous shock to the cost of internal capital. This forces affected insurance groups to adjust their internal capital allocations and move toward a new equilibrium. Their response reveals their true demand for internal risk pooling. Do they keep these transfers because the operational benefits, such as diversification and lower capital

[3] See Section 59A(b)(1)(A).

frictions, outweigh the new tax cost? Or do they abandon them because the flows were purely tax-motivated?

2.2 The §953(d) Election: Decoupling Tax from Operation

The central empirical challenge is that observed reinsurance flows are a bundled product of genuine risk management and tax optimization. To separate these two motives, we use a special feature of the U.S. tax code: the Section 953(d) election. Under §953(d), a foreign insurance affiliate can elect to be treated as a domestic U.S. taxpayer for federal income tax purposes while maintaining its physical operations and regulatory domicile offshore (see e.g., Flum et al., 2016; Forni et al., 2025).

We focus on affiliated §953(d) entities located in Bermuda, Switzerland, and the Cayman Islands. The reason is their dual role in the global insurance business. On one hand, these jurisdictions have long served as prominent tax havens. Their statutory corporate tax rates are low or zero, which creates large tax-arbitrage opportunities for multinational groups (Seessel, 2001).[4] On the other hand, these jurisdictions are global reinsurance hubs for property-casualty insurance. They are the largest foreign destination for U.S. cessions and the central hub for global catastrophe capacity (Cragg et al., 2017). The three jurisdictions account for 88.3% of affiliated reinsurance cessions in our sample. Their prominence reflects a lighter and more flexible regulatory regime, which allows efficient capital management and risk pooling that is difficult to replicate in the U.S. domestic market (OECD, 2018). Catastrophe risk relies on global diversification, which domestic U.S. affiliates cannot easily replicate. As a result, these groups face large frictions when they try to reduce their international risk transfers.

The §953(d) election serves as a powerful decoupling mechanism for our empirical analysis. Once a foreign affiliate elects §953(d) status, reinsurance premiums ceded to it are no longer classified as base-erosion payments and fall outside the BEAT base. However, the Bermudian affiliate must then pay the full U.S. corporate tax rate on its worldwide income, effectively neutralizing the tax-arbitrage benefit of the offshore jurisdiction.[5] Following the implementation of the BEAT, affected groups faced a structural trilemma: (1) maintain the status quo and absorb the BEAT

[4]The federal corporate tax rate in Switzerland is 8.5%. Bermuda and the Cayman Islands do not impose any corporate tax. See the OECD data set on corporate income tax statutory.

[5]Additionally, the §953(d) election eliminates exposure to the Federal Excise Tax (FET) under section 4371, which levies a 4% charge on direct insurance and 1% on reinsurance written with U.S. cedants.

penalty, (2) exit the offshore reinsurance arrangement and forfeit diversification, or (3) elect §953(d) status and maintain diversification but pay U.S. tax. This choice allows us to observe a revealed preference for risk sharing. If a group elects §953(d), it demonstrates that the operational benefits of pooling risk offshore are sufficiently high to justify voluntarily onshoring the tax liability.

The question that arises is which insurance groups held §953(d) affiliates before the BEAT. These are mainly U.S.-parented groups, that is, groups whose foreign affiliate is owned by a U.S. parent. The reason lies in U.S. tax law: under Subpart F, the net income of a controlled foreign corporation is added back to the U.S. parent. Such affiliates therefore do not generally serve as a means to shift profits overseas (see Hepfer et al., 2025).[6]

One might think that BEAT-affected groups have no incentive to keep ceding to §953(d) affiliates, since the BEAT rate sits well below the U.S. statutory rate (which dropped to 21% under the TCJA). At the same time, the BEAT rate sits well above the rates of low-tax jurisdictions like Bermuda. This intuition is wrong. The reason is that tax-deductible cessions to foreign affiliates make up a median of 26.3% of gross premiums written for affected insurers over 2013–2017. Therefore, the BEAT applies to a larger tax base. We illustrate that the typical treated insurer is better off electing than paying the BEAT using a numerical example. We built the example entirely from median figures for the treatment group over 2013–2017.

Consider a U.S. insurer that writes $1,000 in gross premiums and reinsures with its Bermudian affiliate. It cedes 26.3% to the affiliate and retains the rest on its domestic book. Before the reform, this structure carried a U.S. tax liability of $14.7. The BEAT raises that liability to $33.9, because the cession to the affiliate is added back into the tax base.[7] Electing §953(d) status removes the cession from the BEAT base but brings the affiliate's profits into the U.S. tax net. On underwriting income alone, the group's total liability under election falls to $23.1.[8] Once the affiliate's investment income is included, it rises to $28.0. Either way, electing leaves the group below the $33.9 it would

[6]Classification as a controlled foreign corporation depends on whether a U.S. corporation controls the foreign affiliate. See IRC §951(a), §953(c), §957, and Hepfer et al. (2020) for details.

[7]The example uses treatment-group medians for 2013–2017. The insurer cedes 26.3% to its foreign affiliate and 12.8% to external reinsurers, leaving $610 in net premiums written. At the median EBT-to-NPW ratio of 12.5%, pre-tax profit is $76.15. Applying the median effective tax rate of 19.3% gives a pre-BEAT liability of $14.7. The 10% mid-term BEAT applies to modified taxable income, which adds the affiliate cession back, raising the liability to $33.9.

[8]For the affiliate, we use aggregate Bermudian figures published by the Bermuda Monetary Authority (2018) for the pre-BEAT period: a combined ratio of 83.6% yields underwriting profit of $43.1 on the ceded book. We add investment income at the median ratio of 9.7% of net premiums written. Under §953(d), these profits are taxed at the U.S. effective rate, producing group liabilities of $23.1 excluding and $28.0 including the affiliate's investment result.

owe by absorbing the BEAT. The election dominates.

One caveat applies to this example. The §953(d) election subjects the affiliate's entire worldwide income to U.S. federal tax, not just the income from the U.S. risks it reinsures. Our calculation captures the election's cost accurately only when the affiliate's book consists primarily of U.S. business. For an affiliate that also reinsures substantial non-U.S. risk, electing would pull that foreign income into the U.S. tax base as well, raising the cost of election and narrowing the gap we describe.

2.3 Statute-Based Identification

Our empirical strategy relies on the two-pronged statutory test defined in Section 59A(e), which creates discrete thresholds for tax liability. To be subject to the BEAT, an insurance group must exceed two specific criteria simultaneously: (1) **The Gross Receipts Test**: The insurance group must have average annual gross receipts of at least $500 million over the three preceding tax years. (2) **The Base Erosion Percentage Test**: The group's base erosion payments (e.g., cross-border affiliate reinsurance premiums) divided by its total deductible payments must meet or exceed 3%.[9] In essence, the two tests capture two distinct dimensions: the Gross Receipts Test measures firm size, while the Base Erosion Percentage Test measures the extent of offshore reinsurance cession. In Table A1 of the Appendix, we provide illustrative calculations of gross receipts and base erosion percentages.

These statutory thresholds provide a quasi-experimental setting that improves on the median-split classifications used in Tang (2022). By using the actual legal criteria, we isolate the firms that are legally bound by the tax. We also address endogeneity concerns. Firms might have intentionally shrunk their gross receipts or shifted their reinsurance usage to fall just below the thresholds in 2018. To rule this out, we classify all groups ex ante based on their 2017 statutory filings. This fixes the treatment status before the policy took effect. As a result, our findings capture the behavioral response to the tax, not a firm's successful attempt to avoid the classification. Finally, this statute-based approach lets us exploit variation in treatment intensity by measuring how far a firm sits above the 3% threshold.

[9]For insurers that meet these thresholds, the BEAT liability is calculated on a modified taxable income base that adds back base erosion payments.

2.4 The NAIC Risk-Based Capital Framework

U.S. insurers operate under the National Association of Insurance Commissioners (NAIC) Risk-Based Capital (RBC) framework. Unlike model-based regimes such as Solvency II, the NAIC system utilizes a factor-based approach, applying fixed risk charges to specific balance sheet items to calculate the Authorized Control Level (ACL). This number represents the minimum capital that insurers are required to hold for operation (Cummins & Phillips, 2009; NAIC, 2012). The formula sorts risk into six components, R0 through R5. R0 captures the risk of affiliated insurance subsidiaries. R1 and R2 capture asset risk on invested assets, fixed income and equity respectively. R3 captures credit risk, primarily on reinsurance recoverables. R4 captures reserve risk, the risk that booked reserves prove inadequate. R5 captures premium risk, the risk that the coming year's premiums fail to cover the coming year's losses. These components are not added directly. The framework combines them through a square-root:

$$\text{ACL} = R_0 + \sqrt{R_1^2 + R_2^2 + R_3^2 + R_4^2 + R_5^2}.$$

The RBC ratio is then total adjusted capital divided by the ACL.[10]

A central feature for our analysis is how the framework treats reinsurance recoverables. At the time the BEAT took effect, the R3 credit charge applied a flat factor to recoverables, regardless of who the counterparty is. This factor was set at 10% and did not vary with the reinsurer's credit rating.[11] A cedent therefore had to hold ten cents of capital against every dollar of recoverable, whether the reinsurer was a top-rated third party or an intra-group affiliate. This means the credit charge tracked the volume of recoverables, not their quality. When a firm reduced its cessions, the charge fell mechanically, even if the counterparty risk it was nominally protecting against was negligible to begin with. This mechanical adjustment creates a blind spot: while the firm's effective economic risk may rise due to higher net retention or lower diversification, its reported regulatory solvency can remain unchanged. This decoupling suggests that tax-driven realignments can obscure genuine deteriorations in financial stability and increase systemic risks.

[10] Supervisory actions escalate as the ratio falls below prescribed thresholds (no action above 200%, regulatory control below 100%) (Grace et al., 1998; NAIC, 2012).

[11] This uniform treatment, which makes no distinction by counterparty rating, has been criticized on that ground (Odomirok et al., 2015).

3. Data and Descriptive Statistics

3.1 Sample Construction and Summary Statistics

To analyze the impact of tax frictions on internal capital mobility, we construct a comprehensive panel dataset of U.S.-domiciled property-casualty insurance groups. We focus on the insurance group as the unit of analysis rather than individual insurance companies because capital allocation strategies are typically coordinated at the consolidated level (Cummins et al., 2021).[12] Additionally, the BEAT liability is determined using consolidated group-level metrics: both gross receipts and the base erosion percentage are calculated for the aggregate affiliated group, not for individual subsidiaries.[13]

Our primary data source is NAIC statutory filings accessed through the S&P Global Market Intelligence platform. These filings contain detailed annual information on direct and gross premiums written, counterparty-specific reinsurance transactions (Schedule F), as well as information on insurance losses (Schedule P). The S&P Global Market Intelligence platform assigns subsidiaries to groups based on the most recent Schedule Y filing rather than the filing contemporaneous with each observation year. Taking these adjusted numbers would bias the results as we would not necessarily identify insurance groups that were actually subject to the BEAT in 2017.[14] We therefore reconstruct historical group composition from annual Schedule Y filings directly, ensuring that treatment assignment reflects each group's actual structure in 2017.

We supplement this standard data with a unique dataset on the tax status of affiliates in Bermuda, the Cayman Islands, and Switzerland. The three jurisdictions account for 88.3% of affiliated reinsurance cessions in our sample. Because standard databases do not track tax elections, we manually collect the §953(d) status for every affiliate located in these countries. We use three strategies to identify the §953(d) status. First, for Bermudian affiliates, we extract election status

[12] Group members are often assigned specialized roles such as writing particular lines, serving specific regions, or acting as internal reinsurers to absorb catastrophe risk (Powell & Sommer, 2007).

[13] See Section 59A(e)(3). The consolidated computation prevents corporations from splitting up activities among affiliates to fall below the thresholds (Yang & Lauricella, 2020).

[14] For example, suppose insurance group A has a subsidiary C that, in every year from 2013 to 2023, exceeds both the $500 million gross receipts threshold and the 3% base erosion percentage, making it subject to the BEAT. In 2024, group B acquires C from A. When extracting data from the platform in 2026, the platform aggregates all historical figures based on the 2025 Schedule Y, attributing C's full history to B. As a result, B appears to meet the BEAT thresholds in 2017 and is flagged as treated, while A falls below the thresholds and is assigned to the control group.

from Bermuda Monetary Authority (BMA) financial statements.[15] A §953(d) election materially affects a Bermudian affiliate's statutory filing because it subjects the entity's worldwide income to U.S. taxation. Affiliates therefore disclose their election status explicitly in their Bermudian financial statement. Second, we check the notes to the financial statements in NAIC filings, which typically list all affiliated entities with which the filing entity files a consolidated U.S. tax return. For a foreign entity to be included in a consolidated U.S. tax return, it must be treated as a domestic corporation for U.S. tax purposes, the mechanism that achieves this for foreign insurance companies is the §953(d) election. We therefore classify any foreign affiliate identified in these consolidated tax return filings as a §953(d) entity.[16] Third, we verify the CFC status of all foreign affiliates in our sample using historical Schedule Y filings. Because §953(d)(1)(A) requires the electing entity to be a controlled foreign corporation (CFC), any foreign affiliate that does not qualify as a CFC cannot have elected §953(d) status and is assigned a value of zero.

To the best of our knowledge, this is the first academic study to systematically track these elections. Each year, we identify whether a foreign affiliate falls under §953(d) and aggregate premiums ceded to affiliates with and without that status. Our data cover 97.9% of total premiums ceded by insurance groups in our sample to foreign affiliates in the three countries in 2017, providing comprehensive coverage of the relevant markets.

Starting with the universe of all NAIC-active property-casualty primary insurers and reinsurers, we exclude entities with non-positive direct premiums, negative leverage, or those that do not engage in foreign affiliate reinsurance.[17] The latter restriction ensures that our treatment effects are not driven by domestic-only firms that were mechanically unable to reduce cross-border cessions. The identification of BEAT-affected insurance groups follows the statutory thresholds defined in the TCJA. We classify a group as treated if, in the pre-reform year of 2017, it meets both criteria of having average gross receipts exceeding $500 million and a base erosion percentage greater than 3%. A central challenge is that BEAT-affected firms are inherently larger and more global than the

[15] https://www.bma.bm/public-filing-overview. Financial statements for Classes 3A, C, and D are available from 2016, and Class E from 2017. For earlier years, we rely on the NAIC consolidated tax return filings and the CFC screen described in strategies two and three, which are available for the full sample period and yield coverage of 97.9% of total premiums ceded to affiliates in the three countries in 2017.

[16] We also include affiliated reinsurance cessions to Swiss Re (Switzerland) as §953(d) cessions. In its 2019 consolidated annual report, Swiss Reinsurance Company Ltd (2020) confirms that it has restructured its internal capital market by creating a U.S. tax branch.

[17] We assume an insurance group to have foreign affiliates if it has ceded premiums to foreign affiliates in 2017.

average U.S. insurer. Therefore, we will add several control variables in our regressions. The final sample consists of 55 insurance groups (28 treated, 27 control) covering the period 2013 to 2022. We provide a list of all insurers in the treatment and control group, including their asset size, in Table A2 of the Appendix. This sample is highly representative of the aggregate U.S. insurance industry, covering 58.3% of total industry assets in 2017.

Table 1 provides the summary statistics for the final sample. Across the 550 group-year observations, insurers ceded an average of 22% of gross premiums written to foreign affiliates. Treated groups cede on average 27% of gross premiums written to foreign affiliates, compared to 17% for control groups, a difference that is significant at the 1% level and reflects the higher offshore integration that generates BEAT exposure in the first place. As expected, treated groups are larger (mean log assets of 22.68 versus 21.63) and less concentrated in their line-of-business mix (LOB Concentration of 0.25 versus 0.42), both significant at the 1% level, consistent with a broader market scope. As there are systematic differences between both groups, we control for these variables in our regressions to account for any imbalance.

3.2 Measuring Capital Flows, Risk, and Solvency

To analyze the effects of the BEAT on internal capital markets, we construct several variables that measure different dimensions among insurance groups.

Reinsurance and Capital Flows. Our primary dependent variables are the ratios of reinsurance premiums ceded to specific counterparties, including foreign affiliates, foreign non-affiliates, domestic affiliates, and domestic non-affiliates, scaled by gross premiums written (GPW). We utilize GPW as the denominator to ensure that reinsurance activity is appropriately scaled to the size of the underwriting portfolio, particularly since our sample includes both primary insurers and reinsurers.

Treatment Intensity. While the statutory threshold for the BEAT is a base erosion percentage (BEP) of 3%, the economic incentive to restructure varies with the intensity of exposure. A higher base erosion percentage implies that a larger share of total deductions consists of cross-border affiliate payments, so the BEAT penalty bears on a greater fraction of the firm's tax base. To capture this heterogeneity, we split treated insurers into two groups at the median 2017 base erosion percentage. The resulting *LowBEP* and *HighBEP* groups have substantially different pre-reform

Table 1: Summary Statistics

This table reports descriptive statistics for the main variables used in the analysis of U.S. property-casualty insurance groups. The sample consists of 55 insurance groups (28 treated and 27 control) over the period 2013–2022. This table presents summary statistics for the pre-treatment period (2013–2017). All variables are calculated at the consolidated group level. Statistics are provided for the full sample, as well as separately for groups subject to the Base Erosion and Anti-Abuse Tax (BEAT) and the matched control group. Treated groups are identified ex ante based on 2017 statutory thresholds: average annual gross receipts $\geq$ \$500 million and a base erosion percentage $\geq$ 3%. The column Diff. reports the difference in group means between treated and control groups, with statistical significance assessed using a Welch two-sample t-test. All continuous variables are winsorized at the 5th and 95th percentiles. Variable definitions are provided in Table 2.

	Total Sample (N = 55)				Treatment (N = 28)				Control (N = 27)				Diff.
	Mean	St. Dev.	Min	Max	Mean	St. Dev.	Min	Max	Mean	St. Dev.	Min	Max	(T − C)
Reinsurance Foreign Affiliates	0.22	0.21	0	0.63	0.27	0.2	0	0.63	0.17	0.22	0	0.63	0.09***
Reinsurance Domestic Affiliates	0.39	0.38	0	1.24	0.39	0.39	0	1.24	0.39	0.38	0	1.24	0
Reinsurance Foreign Non-Affiliates	0.07	0.08	0	0.27	0.08	0.07	0	0.27	0.07	0.09	0	0.27	0.01
Reinsurance Domestic Non-Affiliates	0.07	0.07	0	0.29	0.07	0.06	0	0.29	0.06	0.07	0	0.29	0.02**
Gross Premiums Written[a]	5.74	9.2	0.02	44.88	6.67	9.52	0.05	35.53	4.77	8.79	0.02	44.88	1.9*
Direct Premiums Written[a]	5.01	8.54	0.01	38.43	5.7	9.34	0.01	33.83	4.3	7.58	0.02	38.43	1.4
Net Premiums Written[a]	4.04	7.46	-1.1	46.03	4.09	6.47	-0.58	28.63	3.98	8.39	-1.1	46.03	0.1
Size	22.16	1.75	19.44	25.23	22.68	1.42	19.44	25.11	21.63	1.9	19.44	25.23	1.05***
Return on Equity	0.09	0.08	-0.06	0.26	0.08	0.07	-0.06	0.26	0.1	0.08	-0.06	0.26	-0.02*
Leverage	0.35	0.1	0.2	0.55	0.32	0.09	0.2	0.55	0.39	0.11	0.2	0.55	-0.06***
LOB Concentration	0.33	0.28	0.1	1	0.25	0.23	0.1	1	0.42	0.31	0.1	1	-0.17***
LOB Catastrophe Risk	0.36	0.27	0	0.99	0.38	0.24	0	0.99	0.34	0.31	0	0.99	0.04
ACL[a]	0.83	1.36	0	5.11	0.89	1.1	0	4.91	0.77	1.59	0	5.11	0.12
Losses Incurred	0.37	0.2	0.03	0.69	0.35	0.17	0.03	0.69	0.39	0.22	0.03	0.69	-0.03
RBC Ratio	6.84	3.76	2.93	15.93	5.66	2.79	2.93	15.93	8.06	4.22	2.93	15.93	-2.4***

Notes: [a] Amounts in USD billions.

BEAT exposure, with mean base erosion percentages of 13.5% and 60.7%, respectively. We exploit this variation to test whether the contraction in internal capital markets is more pronounced for firms facing a steeper tax penalty. Figure A1 of the Appendix illustrates the distribution of the base erosion percentage in 2017 for the treatment and the control group.

Catastrophe Risk Exposure. To measure the catastrophe risk exposure of insurance groups, we construct *CatRisk* as the share of premiums written in catastrophe-prone business lines within catastrophe-prone states.[18] Catastrophe-prone states are defined based on their exposure to four distinct perils – earthquakes, hurricanes, tornadoes, and typhoons – following the S&P Global Intelligence platform classification. By requiring both conditions to hold simultaneously, *CatRisk* captures only the subset of underwriting activity that is genuinely exposed to catastrophic loss potential.

Financial Fragility and Solvency. To capture the relationship between economic reality and regulatory reporting, we employ two distinct solvency metrics. We use *Losses Incurred* (scaled by premiums) as a proxy for effective solvency, reflecting the actual realization of risk on the balance sheet. In contrast, we measure reported solvency using the *RBC Ratio* and the *Authorized Control Level (ACL)*, which are determined by statutory accounting rules. This distinction allows us to test for a decoupling of economic reality and reported solvency.

Controls. We include a standard set of time-varying control variables consistent with the literature (see e.g., Adiel, 1996; Altuntas et al., 2018; Cole & McCullough, 2006; Cummins & Drechsler, 2008; Garven & Lamm-Tennant, 2003; Griffith & Liebenberg, 2021). These include *Size* (log assets), *Leverage*, *Return on Equity*, and *LOB Concentration* (Herfindahl-Hirschman index over business lines). Detailed definitions for all variables are provided in Table 2.

4. The Aggregate Response of Internal Capital Markets

We begin by estimating the aggregate response of multinational insurers to the tax shock. If internal and external capital markets were frictionless substitutes, meaning firms could seamlessly switch from affiliated to unaffiliated reinsurance, we would expect the decline in tax-disadvantaged internal

[18] Following the NAIC (2018), catastrophe-prone business lines include: allied lines, commercial auto physical damage, commercial multiple peril (non-liability), earthquake, farmowners multiple peril, federal flood, fire, homeowners multiple peril, inland marine, multiple peril crop, private passenger auto physical damage, private crop, and private flood.

Table 2: Variable Definitions

This table defines the dependent and independent variables used in the empirical analysis.

Variable	Definition
Reinsurance Foreign Affiliates	Foreign affiliate reinsurance cessions / GPW
Reinsurance Domestic Affiliates	Domestic affiliate reinsurance cessions / GPW
Reinsurance Foreign Non-Affiliates	Foreign non-affiliate reinsurance cessions / GPW
Reinsurance Domestic Non-Affiliates	Domestic non-affiliate reinsurance cessions / GPW
Gross Premiums Written (GPW)	Direct premiums written plus premiums assumed from non-affiliates and foreign affiliates
Direct Premiums Written (DPW)	Premiums written in the primary market
Net Premiums Written (NPW)	GPW less reinsurance ceded
Total Premiums Assumed	Premiums assumed from non-affiliates and foreign affiliates
Treated	Binary indicator: 1 if the insurance group is subject to BEAT, 0 otherwise
Post	Binary indicator: 1 for observations after 2017 (post-TCJA), 0 otherwise
Size	Natural logarithm of the group's total reported assets
Return on Equity	Net income after tax / total capital and surplus
Leverage	Total capital and surplus / total assets
CatRisk	DPW in cat-prone business lines within cat-prone states / total direct premiums written
LOB Concentration	Herfindahl index of direct premiums written across all business lines
Portfolio Distance (L1)	Sum of absolute deviations in line-of-business shares from each firm's fixed 2017 portfolio composition across all lines
Portfolio Distance (L2)	Euclidean distance between the current line-of-business share vector and the firm's fixed 2017 portfolio composition
ACL	Authorized Control Level (standard regulatory capital threshold)
Losses Incurred	Sum of net losses paid, net loss adjustment expenses paid, and net change in loss and loss adjustment expenses reserves
RBC Ratio	Total adjusted capital / Authorized Control Level (ACL)
953d	Reinsurance cessions to affiliated §953(d) entities / GPW
Non953d	Reinsurance cessions to affiliated non-§953(d) entities / GPW
Avg Bond Rating	Weighted average rating of bonds, from 1 through 6
Liquid Investments / CS	(cash and equivalents, common stock and carrying value of bonds with a 1 or 2 rating) / total capital and surplus
Mortgage Loans / Assets	Book value of mortgage loans / total assets
Net Reserves	Net Loss and Loss Adjustment Expense reserves

flows to be offset one-for-one by an increase in external cessions.

4.1 Empirical Strategy

To estimate the impact of the BEAT on reinsurance demand, we employ a difference-in-differences (DiD) specification, whereby we treat the BEAT as an exogenous shock to internal capital markets. We estimate the following baseline specification:

$$Y_{i,t} = \alpha_i + \lambda_t + \beta \left(\textit{Treated}_i \times \textit{Post}_t \right) + \gamma \mathbf{X}_{i,t} + \varepsilon_{i,t}, \tag{1}$$

where $Y_{i,t}$ represents the ratio of reinsurance premiums ceded to gross premiums written. We measure the reinsurance ratio for four different counterparties. These include foreign affiliates, foreign non-affiliates, domestic affiliates, and domestic non-affiliates. $\textit{Treated}_i$ is an indicator variable equal to one if the insurance group is subject to the BEAT (gross receipts $\geq$ \$500 million and base erosion percentage $\geq 3\%$ in 2017), and zero otherwise. $\textit{Post}_t$ is an indicator equal to one for years 2018–2022. The vector $\mathbf{X}_{i,t}$ includes time-varying control variables: *Size* (log assets), *Leverage*, *Return on Equity*, *LOB Concentration*, and *CatRisk*. α_i and λ_t represent group and year fixed effects, respectively, which absorb time-invariant heterogeneity and aggregate shocks. We cluster standard errors at the insurance group level. The coefficient of interest, β, captures the causal effect of the tax shock on reinsurance capital flows.

The validity of our difference-in-differences design rests on the parallel trends assumption: that in the absence of the tax reform, constrained and unconstrained firms would have exhibited similar capital allocation patterns. In practice, the parallel-trends assumption is evaluated by including leads of the treatment indicator in the regression and testing whether their coefficients are statistically different from zero (Cunningham, 2021). Following prior work (e.g., Cai, 2016; Carrizosa et al., 2023; Gavira-Durón et al., 2022; Samuel, 2023), we assess this assumption using an event-study specification that replaces the *Post* indicator in the baseline model with year-specific interactions from 2013 to 2022:

$$Y_{i,t} = \alpha_i + \lambda_t + \left(\sum_{t=2013}^{2016} + \sum_{t=2018}^{2022} \right) \beta_t \left(\textit{Treated}_i \times \textit{Year}_t \right) + \gamma \mathbf{X}_{i,t} + \varepsilon_{i,t}, \tag{2}$$

where $Year_t$ is an indicator variable equal to one if the observation falls in year t and zero otherwise. Following Cunningham (2021), we recenter the year of policy adoption at zero; in our setting, this corresponds to 2017, which serves as the reference period. Since treatment begins uniformly in 2018, the two-way fixed effects estimator is not subject to staggered adoption bias (see e.g., Baker et al., 2022; Borusyak et al., 2024; Sun & Abraham, 2021). The coefficients of interest, β_t, measure the annual difference in reinsurance demand between treated and control groups relative to 2017. Under the parallel trends assumption, all pre-BEAT coefficients (2013-2016) should be statistically indistinguishable from zero. We formally test this using a joint Wald test of the null that all pre-BEAT interaction terms equal zero. We also conduct a placebo test using only the pre-BEAT period (2013-2016) with a placebo treatment year of 2016. This additional check examines whether our specification would spuriously detect an effect in a period without any policy change.

4.2 Baseline Results: Internal Exit and the Substitution Gap

Before quantifying the aggregate response, we first validate our identification strategy by testing the parallel trends assumption. Figure 1 plots the coefficients with 95% confidence intervals from the dynamic difference-in-differences specification in Equation (2). We use 2017 as the base year. Estimates for the foreign affiliated market are individually small before 2017 and show noticeable shifts following the implementation of the BEAT in 2018. In each regression, a joint Wald test fails to reject the null that all pre-2017 interactions equal zero.[19] We provide the full regression results in Table A3 of the Appendix.

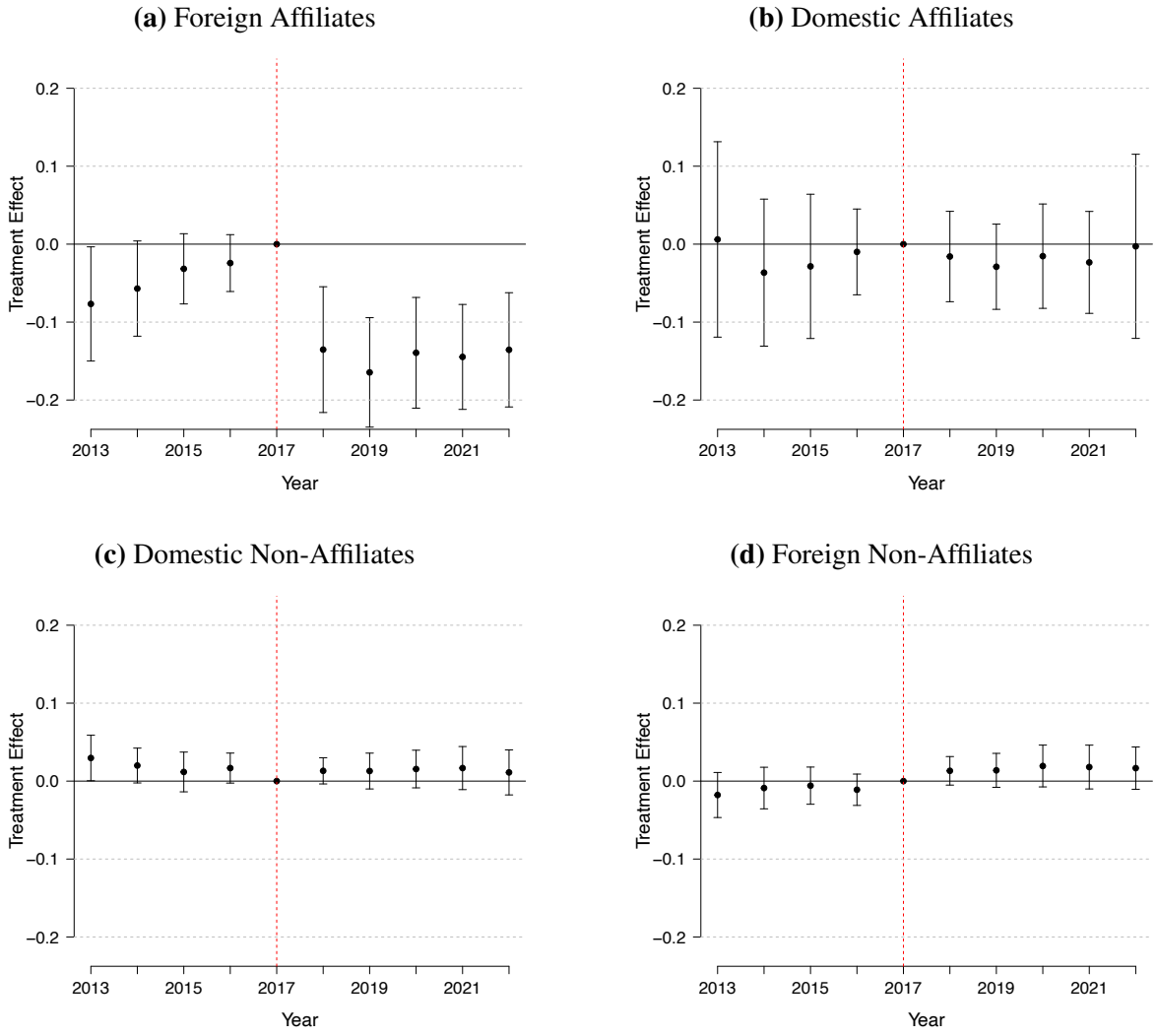
The joint Wald test does not reject the null of parallel trends. Still, the point estimates for the foreign affiliated market rise monotonically toward zero between 2013 and 2016. This pattern could reflect a differential linear trend between treated and control groups. We therefore run an additional robustness check. We estimate the differential linear trend using only pre-reform data. We then remove this trend from the outcome and re-estimate the event study. As the trend is itself estimated, we base inference on a cluster bootstrap-t procedure that re-estimates both steps in each replication. Figure A2 and Table A4 in the Appendix report the results. For the foreign affiliated market, the pre-reform coefficients are now flat and close to zero, while the post-reform effects remain large and

[19]The p-values for the joint Wald test are as follows: foreign affiliates ($p = 0.31$); domestic affiliates ($p = 0.71$); domestic non-affiliates ($p = 0.22$); foreign non-affiliates ($p = 0.13$).

statistically significant. In fact, they even become stronger since the pre-trend runs in the opposite direction to the treatment effect. Our baseline estimates are thus conservative. For the other three reinsurance markets, the estimated pre-trends are small and statistically indistinguishable from zero. The post-reform coefficients are, with a single marginal exception, statistically insignificant. The trend adjustment therefore leaves all conclusions unchanged. As an additional robustness check, we conduct a placebo test restricted to the pre-BEAT period (2013–2016), assigning a fictitious treatment in 2016. We report results in Table A5 of the Appendix. The absence of significant placebo effects further supports the parallel-trends assumption and strengthens the causal interpretation of the DiD results.

Table 3 presents the results for the impact of the tax shock on internal reinsurance streams to foreign affiliates. Columns (1) and (2) estimate the average treatment effect. Column (1) presents a parsimonious specification with only treatment and post-period indicators, while Column (2) includes the full set of insurer-level controls and fixed effects. The coefficient on the interaction term *Treated* $\times$ *Post* is negative and statistically significant at the 5% level across both specifications. In the strictest specification (Column 2), treated insurers reduced their foreign affiliate reinsurance ratio by 10.7 percentage points relative to the control group. Column (3) replaces the single post-period dummy with year-by-treatment interactions to trace the dynamics of the adjustment. The coefficients reveal a swift and persistent structural break. The magnitude of the drop in 2018 is approximately 9.8 percentage points ($t = -2.72$) and remains stable through 2022. This pattern suggests a one-off adjustment rather than a gradual phase-in. Notably, although the statutory BEAT rate increased from 5% in 2018 to 10% in 2019, we observe no further decline in cessions. This implies that insurers effectively anticipated the rate hike and adjusted their long-term reinsurance treaties immediately in 2018. Column (4) examines heterogeneity by splitting BEAT-exposed insurers into *LowBEP* and *HighBEP* based on their 2017 base erosion percentage. The *LowBEP* group shows no statistically significant response, consistent with the notion that firms with minimal exposure faced negligible costs and thus had little incentive to restructure. The *HighBEP* groups show large, significant reductions of 19.3 percentage points. One could argue that the coefficients in Column (4) are mechanical, since the two groups cede different levels of reinsurance to foreign affiliates before treatment. To rule this out, we also use simple growth rates of the dependent variable. Here too, the response to the BEAT is concentrated in groups with high exposure to foreign affiliated reinsurance.

Figure 1: Identification and the Parallel Trends Assumption



This figure shows point estimates and 95% confidence intervals from the dynamic difference-in-differences specification following Equation (2). The regression results can be found in Table A3 of the Appendix. We omit the year 2017 as reference year. *Treated* is an indicator variable equal to one if the insurance group met the statutory BEAT thresholds in 2017. These include average annual gross receipts of at least $500 million and a base erosion percentage of at least 3%. The dependent variables are the ratios of reinsurance premiums ceded to four counterparty types, scaled by gross premiums written (GPW): foreign affiliates in Panel A, domestic affiliates in Panel B, domestic non-affiliated reinsurers in Panel C, and foreign non-affiliated reinsurers in Panel D. Standard errors are clustered at the insurance group level.

They reduced their reinsurance cessions by 47% relative to the control group in 2018.[20]

If reinsurance demand is driven by fundamental risk diversification rather than tax arbitrage, the source of capital, internal versus external, should be second-order to the necessity of risk transfer. We would therefore expect the decline in affiliate capacity to be fully offset by an increase in alternative coverage. We test for substitution along two reinsurance markets: (1) domestic markets

[20]To keep Table 3 readable, we show only the 2018 interaction terms.

Table 3: Tax Sensitivity of Foreign Affiliate Reinsurance

This table reports regression results based on Equation (1), estimating the effect of the Base Erosion and Anti-Abuse Tax (BEAT) on internal capital transfers to foreign affiliates. The dependent variable is the ratio of reinsurance premiums ceded to foreign affiliates to gross premiums written (GPW). *Treated* is an indicator variable equal to one if the insurance group met the statutory BEAT thresholds in 2017. These include average annual gross receipts of at least $500 million and a base erosion percentage of at least 3%. *Post* is an indicator variable for the years 2018-2022. Column (1) reports the baseline DiD coefficient without covariates. Column (2) adds insurer-level controls. Column (3) replaces *Post* with year-specific treatment interactions to examine the dynamic adjustment process; 2017 is the omitted reference year. Column (4) interacts treatment with median-split groups of the 2017 base erosion percentage to capture treatment intensity. Column (5) uses the simple growth rate of reinsurance to foreign affiliates as the dependent variable and runs it on every interaction term between median-split group and year. Control variables are *Size*, *Leverage*, *LOB Concentration*, *CatRisk*, and *Return on Equity*. Variable definitions are provided in Table 2.

	Reinsurance Foreign Affiliates				
	level	*level*	*level*	*level*	*simple growth*
	(1)	(2)	(3)	(4)	(5)
Treated x Post	−0.096**	−0.107***			
	(0.038)	(0.031)			
Treated x 2018			−0.098***		
			(0.036)		
Treated x 2019			−0.128***		
			(0.033)		
Treated x 2020			−0.102***		
			(0.034)		
Treated x 2021			−0.107***		
			(0.032)		
Treated x 2022			−0.098***		
			(0.036)		
LowBEP x Post				−0.020	
				(0.024)	
HighBEP x Post				−0.193***	
				(0.041)	
LowBEP x 2018					−0.150
					(0.173)
HighBEP x 2018					−0.470***
					(0.150)
Treated	0.094*				
	(0.054)				
Post	−0.055**				
	(0.026)				
Constant	0.171***				
	(0.041)				
Control variables	no	yes	yes	yes	yes
Group fixed effects	no	yes	yes	yes	yes
Time fixed effects	no	yes	yes	yes	yes
Observations	550	550	550	550	495
Adjusted R^2	0.095	0.785	0.784	0.812	0.006

Notes: All continuous variables are winsorized at the 5th and 95th percentiles. Standard errors are in parentheses and clustered at the insurer group level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

and (2) external foreign markets. Table 4 reports the estimates for reinsurance ceded to domestic affiliates (Columns 1-2) and domestic non-affiliates (Columns 3-4). Across all specifications, the coefficients are statistically indistinguishable from zero and economically negligible.

Table 4: Reinsurance Spillovers to Domestic Counterparties

This table reports regression results based on Equation (1), estimating the effect of the Base Erosion and Anti-Abuse Tax (BEAT) on potential capital reallocation within the U.S. The dependent variables are the ratios of reinsurance premiums ceded to (i) domestic affiliates and (ii) domestic non-affiliates, both scaled by gross premiums written (GPW). *Treated* is an indicator variable equal to one if the insurance group met the statutory BEAT thresholds in 2017. These include average annual gross receipts of at least $500 million and a base erosion percentage of at least 3%. *Post* is an indicator variable for the years 2018-2022. The objective of this analysis is to determine whether the contraction in foreign affiliate reinsurance (documented in Table 3) was offset by a shift toward domestic counterparties. Columns (1) and (3) report parsimonious specifications, while Columns (2) and (4) include fixed effects and the full set of insurer-level controls. Control variables are *Size*, *Leverage*, *LOB Concentration*, *CatRisk*, and *Return on Equity*. Variable definitions are provided in Table 2.

	Domestic Affiliates		**Domestic Non-Affiliates**	
	(1)	(2)	(3)	(4)
Treated x Post	−0.023	−0.004	−0.005	−0.001
	(0.059)	(0.048)	(0.013)	(0.012)
Treated	−0.005		0.017	
	(0.101)		(0.017)	
Post	0.082*		0.032***	
	(0.048)		(0.009)	
Constant	0.392***		0.057***	
	(0.073)		(0.013)	
Control variables	no	yes	no	yes
Group fixed effects	no	yes	no	yes
Time fixed effects	no	yes	no	yes
Observations	550	550	550	550
Adjusted R^2	0.003	0.883	0.037	0.818

Notes: All continuous variables are winsorized at the 5th and 95th percentiles. Standard errors are in parentheses and clustered at the insurer group level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 5 reports the estimated effects of the BEAT on reinsurance cessions to foreign non-affiliates. We find a positive coefficient of 0.025 ($t = 1.92$), which indicates that treated firms increased external cessions by 2.5 percentage points of gross premiums written. Again, the substitution is concentrated in the firms most exposed to the BEAT, with a substitution of 3.4 percentage points in Column (3). We next distinguish whether the increase occurs on the intensive margin (Columns 4–6) or the extensive margin (Columns 7–9). The intensive margin measures cessions to reinsurers

that the firm already had a relationship with before the BEAT. The extensive margin measures the number of foreign unaffiliated counterparties. We find that the increase is concentrated in existing reinsurance relationships. Affected groups did not increase their cessions to new counterparties.

While there is a substitution toward foreign unaffiliated reinsurers, its economic magnitude is modest relative to the internal contraction. Comparing this result to the 10.7 percentage point decline in internal cessions (Table 3) reveals a substantial substitution gap. Treated firms replaced less than one fourth of the lost internal capacity with external reinsurance. This gap suggests that the discontinued internal flows were mainly vehicles for profit shifting rather than genuine risk transfer. Once the tax advantage disappeared, the demand for this reinsurance evaporated, and substitution became unnecessary. If the discontinued flows had represented fundamental risk that threatened firm solvency, we would expect demand to be relatively inelastic. In that case, firms would likely pay the higher premium for external coverage rather than retain the exposure. Instead, firms let most of these flows lapse. This suggests that the underlying risk was either non-existent (pure profit shifting) or too low in quality to justify the cost of an arm's-length transfer. In Section 5, we formally test this interpretation. We decompose the internal market flows to separate the reinsurance that was abandoned from the reinsurance that was preserved.

5. Unbundling Risk Management and Tax Optimization

There are multiple motives for an insurer to purchase reinsurance. These include risk sharing and tax arbitrage. Risk sharing means that an insurance group can send risk to an affiliate whose book is weakly correlated with the risk being ceded. Pooling weakly correlated risks creates diversification benefits. These benefits lower the capital the insurer must hold and thus raise capital efficiency within the group. This motive is directly linked to regulatory arbitrage (Koijen & Yogo, 2016; Tang, 2024), where insurance groups cede premiums overseas because they must hold less capital for the same amount of risk. On the other hand, reinsurance can be used for profit shifting. Before the BEAT, reinsurance cessions reduced taxable income in the U.S. and raised taxable income in jurisdictions with a lower statutory tax rate.

The challenge in disentangling the two motives is that a single reinsurance contract transfers both insurance risk and taxable profit at once. Because of this bundling, tax-motivated profit shifting

Table 5: Substitution to Foreign Third-Party Reinsurers

This table reports regression results based on Equation (1), estimating the effect of the Base Erosion and Anti-Abuse Tax (BEAT) on reinsurance cessions to foreign unaffiliated counterparties. *Treated* is an indicator variable equal to one if the insurance group met the statutory BEAT thresholds in 2017. These include average annual gross receipts of at least $500 million and a base erosion percentage of at least 3%. *Post* is an indicator variable for the years 2018-2022. *LowBEP* and *HighBEP* are indicator variables for affected groups with a below-median and above-median base erosion percentage in 2017, respectively. The objective of this analysis is to determine whether the contraction in foreign affiliate reinsurance (documented in Table 3) was offset by external foreign capacity. Columns (1)-(3) report results for the overall ratio of reinsurance premiums ceded to foreign unaffiliated reinsurers scaled by gross premiums written (GPW). Columns (4)-(6) examine the intensive margin, defined as reinsurance ceded to foreign unaffiliated counterparties with whom the insurance group had an established relationship prior to 2018, scaled by GPW. Columns (7)-(9) examine the extensive margin, measured as $\log(1+n)$, where n is the number of distinct foreign unaffiliated reinsurance counterparties. Within each panel, the first column report the baseline treatment effect without controls or fixed effects; the second column adds insurer-level controls, group fixed effects, and time fixed effects; the third column replaces the binary treatment indicator with the median-split intensity specification. Control variables are *Size*, *Leverage*, *LOB Concentration*, *CatRisk*, and *Return on Equity*. Variable definitions are provided in Table 2.

	Overall Reinsurance Ratio			**Intensive Margin**			**Extensive Margin**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treated x Post	0.020	0.025*		0.022**	0.023**		−0.123	−0.070	
	(0.016)	(0.013)		(0.011)	(0.010)		(0.224)	(0.140)	
LowBEP x Post			0.016			0.020			−0.180
			(0.018)			(0.016)			(0.121)
HighBEP x Post			0.034**			0.026**			0.038
			(0.016)			(0.010)			(0.201)
Treated	0.010			0.010			0.978***		
	(0.021)			(0.019)			(0.353)		
Post	0.019*			−0.006			0.464***		
	(0.011)			(0.006)			(0.178)		
Constant	0.069***			0.066***			3.382***		
	(0.017)			(0.016)			(0.295)		
Control variables	no	yes	yes	no	yes	yes	no	yes	yes
Group fixed effects	no	yes	yes	no	yes	yes	no	yes	yes
Time fixed effects	no	yes	yes	no	yes	yes	no	yes	yes
Observations	550	550	550	550	550	550	550	550	550
Adjusted R^2	0.043	0.816	0.818	0.023	0.841	0.841	0.125	0.911	0.912

Notes: All continuous variables are winsorized at the 5th and 95th percentiles. Standard errors are in parentheses and clustered at the insurer group level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

and genuine risk sharing look identical in standard data.[21] A firm may cede premiums to a low-tax affiliate to hedge risk, to strip earnings out of a high-tax jurisdiction, or to do both at once.

The aggregate results in Section 4 documented a substantial contraction in internal capital markets but offered limited insight into which of these two motives was dominant. The substitution gap suggests that a significant portion of the pre-reform market may have been driven by tax incentives rather than fundamental risk transfer needs. To disentangle these bundled motives, we exploit a unique feature of the U.S. tax code: the §953(d) election.

5.1 Estimating the Elasticity of Internal Capital

The §953(d) election provides a mechanism to unbundle the tax status of an affiliate from its operational location. As detailed in Section 2, this provision allows a foreign insurance corporation to be treated as a domestic U.S. corporation for tax purposes. By making this election, a foreign affiliate voluntarily subjects its global income to U.S. taxation, thereby neutralizing any tax advantage associated with the reinsurance transaction. However, the affiliate retains its non-tax operational characteristics, such as its legal domicile, capital structure, and regulatory environment. This institutional feature allows us to decompose the aggregate decline in reinsurance into two distinct economic components based on the firm's revealed preference. We classify flows that cease entirely following the tax shock as tax-motivated capital. These transactions represent capital that was located offshore primarily to exploit the tax differential; once the tax advantage is removed by the BEAT, the economic rationale for the transaction evaporates, and the capital exits the internal market. Conversely, we classify flows that persist by switching to the tax-neutral §953(d) regime as risk-motivated capital. These transactions represent sticky capital where the operational surplus of the internal market, such as specialized risk pooling or regulatory arbitrage, exceeds the cost of U.S. taxation.

To distinguish between genuine risk-sharing and tax-optimization motives, we hand-collect data on the §953(d) status of foreign affiliates. Specifically, we focus on affiliates located in Bermuda, the Cayman Islands, and Switzerland. The reason is that these jurisdictions are the major countries that simultaneously serve as global reinsurance hubs and tax havens. In 2017, insurance groups

[21] Under §845(a), insurance groups are required to transfer genuine insurance risk to their foreign affiliates. The IRS can restate reinsurance arrangements that are aimed primarily at shifting profits.

in our sample ceded more than $40.7 billion to affiliates in these countries, which corresponds to 88.3% of their total reinsurance cessions to foreign affiliates.[22] An overview of the ten largest reinsurance countries for affiliated reinsurance can be found in Table A6 of the Appendix. At the same time, these countries are among the largest tax havens in the world (Clausing, 2020), where U.S. multinationals report most of their foreign profits.[23]

To measure the share of reinsurance driven by risk-sharing versus tax-optimization motives, we estimate σ as

$$\sigma = \frac{\Delta \text{Premiums}^{953d}}{\Delta \text{Premiums}^{\text{Non953d}}}. \tag{3}$$

Specifically, we ask: for each percentage point decline in premiums ceded to non-electing foreign affiliates, how many percentage points are offset by an increase in premiums to §953(d) affiliates? We define the substitution ratio σ as the responsiveness of reinsurance via §953(d) entities to changes in reinsurance via non-electing entities.

The substitution ratio assumes that the decline in non-electing foreign affiliate cessions reflects a genuine restructuring of the reinsurance program. However, the denominator could instead decline mechanically, which would bias our estimate. Suppose treated firms shifted their underwriting toward lines that require less global diversification. They would then cede less offshore simply because they are writing less reinsurance-intensive business, not because they are unwinding tax-driven treaties. Under this scenario, part of the observed decline in non-§953(d) cessions would be a composition effect rather than a behavioral response to the tax. This would inflate our estimate of the tax-motivated share.

We rule out this channel using the portfolio reallocation tests in Table 6. For each insurance group and year, we compute the share of direct premiums written in each line of business. We then construct four measures of portfolio adjustment. Portfolio Distance L1 is the sum of absolute deviations in line-of-business shares from each firm's fixed 2017 portfolio. It captures the total magnitude of reallocation across all lines. Portfolio Distance L2 is the Euclidean distance between the current share vector and the firm's fixed 2017 portfolio. It places greater weight on large

[22] Bermuda: $23.1 billion (50.3%), Cayman Islands: $1.2 billion (2.5%), Switzerland: $16.3 billion (35.5%).

[23] Specifically, using 2017 IRS Form 8975 data, Clausing (2020) finds that the Cayman Islands accounted for the largest share of shifted profits at $58.5 billion (9.2% of total foreign profits), followed by Switzerland at $49.4 billion (7.7%), and Bermuda at $32.5 billion (5.1%). The effective tax rates for these countries – 0.1%, 7.1%, and 2.7%, respectively – are all significantly below the 10% threshold used by Clausing (2020) to define tax haven status.

deviations in any single line. Both distance measures use 2017 as the fixed reference point and equal zero by construction in that year. The Herfindahl-Hirschman Index measures overall portfolio concentration across lines. CatRisk measures the share of direct premiums written in catastrophe-exposed lines within catastrophe-prone states. Across all four outcomes and both specifications, the coefficient on *Treated* $\times$ *Post* is statistically indistinguishable from zero. Treated firms therefore kept the same underwriting composition, the same degree of portfolio concentration, and the same exposure to catastrophe-prone lines after the BEAT. The decline in non-§953(d) cessions thus reflects a genuine restructuring of the reinsurance program, not a passive portfolio adjustment driven by changes in the underlying business mix.

Additionally, we test whether insurance groups adjusted not only the composition of their underwriting portfolio but also their overall underwriting effort. That is, whether their gross underwriting changed after the BEAT. Table 7 presents the results. The dependent variables are the simple growth rates of Gross Premiums Written (GPW) in Columns (1)–(2), Direct Premiums Written (DPW) in Columns (3)–(4), and Total Premiums Assumed in Columns (5)–(6). To separate changes in underwriting volume from mechanical price changes due to loss shocks, even-numbered columns control for the lagged growth rate of incurred losses. Across all specifications, the interaction term is statistically indistinguishable from zero. This null result is economically meaningful: it confirms that treated firms did not reduce their origination of insurance business in either primary or secondary markets. Despite the higher cost of capital, they continued to underwrite risks at the same scale as before the tax shock. The BEAT therefore did not lead to an adjustment in underwriting volume.

The naive OLS regression (without using the BEAT as identification strategy) to estimate the substitution ratio would be

$$953\text{d}_{i,t} = \gamma_i + \delta_t + \sigma \text{Non}953\text{d}_{i,t} + \varepsilon_{i,t}, \tag{4}$$

where γ_i denotes group fixed effects and δ_t year fixed effects. These OLS results would be contaminated by simultaneity. The allocation of premiums across non-electing and §953(d) entities is a joint optimization decision made at the group level. A firm does not first choose the amount ceded to non-§953(d) entities and then adjust its §953(d) volume. Both are chosen at the same time

Table 6: Portfolio Reallocation

This table reports difference-in-differences (DiD) estimates of the effect of the Base Erosion and Anti-Abuse Tax (BEAT) on the underwriting portfolio composition of U.S. property-casualty insurers. For each firm-year, we compute the share of direct premiums written allocated to each line of business. The outcome variables capture four distinct dimensions of portfolio adjustment. Portfolio Distance (L1), in Columns (1) and (2), is the sum of absolute deviations in line-of-business shares from each firm's 2017 portfolio across all lines. It captures the total magnitude of portfolio reallocation relative to the pre-BEAT structure. Portfolio Distance (L2), in Columns (3) and (4), is the Euclidean distance between the current share vector and the firm's 2017 portfolio. It places greater weight on large deviations in any single line. The Herfindahl-Hirschman Index (HHI), in Columns (5) and (6), measures the overall concentration of the portfolio across all business lines. The catastrophe risk share, in Columns (7) and (8), is the share of direct premiums written in catastrophe-exposed lines within catastrophe-prone states. It captures whether treated firms reduced their exposure to lines that require global diversification. *Treated* is an indicator variable equal to one if the insurance group met the statutory BEAT thresholds in 2017. These include average annual gross receipts of at least $500 million and a base erosion percentage of at least 3%. *Post* is an indicator variable for the years 2018–2022. Odd-numbered columns report parsimonious specifications without controls; even-numbered columns add the full set of firm-level controls including *Size*, *Leverage*, *Return on Equity*, *CatRisk*, and *LOB Concentration*. All specifications include group and year fixed effects. Variable definitions are provided in Table 2.

	Portfolio Distance (L1)		**Portfolio Distance (L2)**		**LOB Concentration (HHI)**		**CatRisk**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treated x Post	0.015	0.031	0.001	0.008	−0.021	−0.017	0.002	0.001
	(0.036)	(0.031)	(0.016)	(0.014)	(0.013)	(0.011)	(0.002)	(0.001)
CatRisk		−4.185		−2.076		−2.091		
		(5.091)		(2.285)		(1.540)		
LOB Concentration		0.234		0.083				−0.012*
		(0.212)		(0.101)				(0.006)
Control variables	no	yes	no	yes	no	yes	no	yes
Group fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Time fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Observations	550	550	550	550	550	550	550	550
Adjusted R^2	0.638	0.659	0.620	0.639	0.964	0.966	0.938	0.946

Notes: All continuous variables are winsorized at the 5th and 95th percentiles. Standard errors are in parentheses and clustered at the insurer group level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 7: The Impact of the BEAT on Underwriting Volume

This table investigates whether insurance groups adjusted their underwriting activity in response to the increased cost of internal capital. The dependent variables are the simple growth rates of: (i) Gross Premiums Written (GPW), (ii) Direct Premiums Written (DPW), and (iii) Total Premiums Assumed. *Treated* is an indicator variable equal to one if the insurance group met the statutory BEAT thresholds in 2017. These include average annual gross receipts of at least $500 million and a base erosion percentage of at least 3%. Even-numbered columns include the lagged growth rate of losses incurred, Δ *Losses Incurred*, to isolate underwriting changes from mechanical price adjustments following loss events. Control variables are *Size*, *Leverage*, *LOB Concentration*, *CatRisk*, and *Return on Equity*. Variable definitions are provided in Table 2.

	Gross Premiums Written *simple growth*		**Direct Premiums Written** *simple growth*		**Total Premiums Assumed** *simple growth*	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated x 2018	0.029	0.026	−0.006	−0.004	0.151	0.151
	(0.041)	(0.041)	(0.035)	(0.035)	(0.147)	(0.139)
Treated x 2019	−0.001	0.008	−0.014	−0.002	0.072	0.106
	(0.033)	(0.033)	(0.028)	(0.028)	(0.137)	(0.134)
Treated x 2020	0.027	0.027	0.020	0.026	0.002	0.011
	(0.037)	(0.038)	(0.036)	(0.035)	(0.127)	(0.127)
Treated x 2021	0.036	0.034	0.040	0.043	0.140	0.145
	(0.032)	(0.035)	(0.035)	(0.036)	(0.141)	(0.156)
Treated x 2022	0.047	0.046	0.049	0.052	−0.118	−0.108
	(0.030)	(0.033)	(0.031)	(0.033)	(0.141)	(0.134)
Δ Losses Incurred		−0.042		−0.034		−0.127
		(0.030)		(0.022)		(0.124)
Control variables	yes	yes	yes	yes	yes	yes
Group fixed effects	yes	yes	yes	yes	yes	yes
Time fixed effects	yes	yes	yes	yes	yes	yes
Observations	495	440	495	440	495	440
Adjusted R^2	0.111	0.101	0.129	0.125	0.006	0.015

Notes: All continuous variables are winsorized at the 5th and 95th percentiles. Standard errors are in parentheses and clustered at the insurer group level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

within the group's reinsurance program. In other words, causality runs in both directions.

To estimate σ, we employ a Two-Stage Least Squares (2SLS) approach, where we use the implementation of the BEAT as an exogenous shock to internal capital market transfers to non-§953 affiliates. We instrument for the endogenous decline in non-electing cessions using the interaction *Post*×*Treated*. *Post* is an indicator variable equal to one for years 2018–2022. *Treated* is an indicator variable equal to one if the insurance group (i) was subject to BEAT in 2017 and (ii) maintained at least one non-electing foreign affiliate in Bermuda, Cayman Islands, or Switzerland in the pre-reform period. The second condition is critical and where we depart from the previous definition of *Treated*: it restricts the identifying variation to groups that were both legally subject to the BEAT and had an existing non-electing affiliate relationship whose cost the BEAT raised. Insurance groups that meet the statutory thresholds but had no non-electing affiliates pre-reform faced no marginal increase in the cost of their foreign arrangements. We verify that the baseline DiD results in Table 3 are unchanged when estimated with the adjusted treatment indicator. The respective regression results in Table A7 in the Appendix confirm that the IV subsample is representative of the broader treatment group. Formally, we test:

$$\begin{aligned} \text{First Stage:} \quad & \text{Non953d}_{i,t} = \alpha_i + \lambda_t + \pi \left(\text{Post}_t \times \text{Treated}_i\right) + \beta \mathbf{X}_{i,t} + \eta_{i,t} \\ \text{Second Stage:} \quad & 953\text{d}_{i,t} = \gamma_i + \delta_t + \sigma \widehat{\text{Non953d}}_{i,t} + \mu \mathbf{X}_{i,t} + \varepsilon_{i,t}, \end{aligned} \tag{5}$$

where α_i and γ_i represent insurer fixed effects that absorb time-invariant heterogeneity in reinsurance usage. We include time-fixed effects (λ_t and δ_t) to absorb common time trends that affect all insurers uniformly. We also include the standard set of controls in $\mathbf{X}_{i,t}$ to account for structural differences in our treatment and control group. The coefficient of interest is σ. A value of $\sigma = -1$ indicates perfect substitution (full offset): every dollar reduction in premiums ceded to non-electing affiliates is fully offset by an equivalent increase in cessions to §953(d) affiliates. A value of $\sigma = 0$ implies the opposite extreme: the decline in tax-motivated reinsurance resulted purely in a reduction of total coverage (exit), with no offsetting increase in §953(d) flows.

The instrument satisfies the relevance restriction if BEAT-affected insurance groups significantly reduced their non-§953d cession ratios following the 2018 implementation of the BEAT. This condition is empirically testable and evaluated in the first stage of our 2SLS estimation. The

exclusion restriction requires that the BEAT implementation affects §953(d) cession ratios only through its effect on non-electing cession ratios, and not through any independent channel orthogonal to the controls in the model. We argue this condition is plausible on three grounds. First, the BEAT is a federal tax regulation that affects all qualifying insurance groups simultaneously and discontinuously in 2018. It is not a firm-level choice variable. Unlike instruments based on firm operational decisions, which may reflect strategic preferences that correlate with reinsurance structure, the timing and design of the BEAT were determined by the legislative process of the TCJA, rendering it plausibly exogenous to firms' reinsurance decisions. Second, the BEAT did not directly regulate §953(d) entities by construction as those are exempt from the tax. The only channel through which the BEAT reaches §953(d) cessions is through its effect on the cost of the non-electing channel, which is precisely the first stage. Third, an omitted variable violating the exclusion restriction would need to simultaneously explain a decrease in Non-§953(d) cessions and an increase in §953(d) cessions. No plausible confound such as catastrophe loss cycles or COVID-related disruptions could generate this exact pattern.

The BEAT was implemented together with a reduction in the U.S. corporate tax rate from 35% to 21%. One might argue that it is the reduction in the U.S. tax rate that drives groups' decision to substitute from non-§953(d) entities to §953(d) entities. A lower domestic rate narrows the tax arbitrage spread and could independently make §953(d) arrangements relatively more attractive. We reject this channel for two reasons. First, the corporate rate reduction applies equally to all firms in the treatment and control group, regardless of their BEAT exposure. Using fixed effects, we control for legislation changes that affect our entire sample. The absence of any response in the control group is inconsistent with this channel. Second, the impact of the U.S. corporate tax rate reduction is too small to explain the substitution we observe. Consider the following calculation. The BEAT penalty was 10% in the medium term on premiums ceded, which is a gross flow measure. The rate-cut saving, by contrast, accrues on net income. The median combined ratio for a Bermudian reinsurer was 83.6% between 2013 and 2017,[24] implying a net profit margin on premiums of roughly 16.4%. The rate-cut saving on a dollar of premiums ceded is therefore approximately $(35\% - 21\%) \times 16.4\% \approx 2.30\%$ of premiums, compared to a BEAT cost of 10% – a ratio of roughly

[24]The numbers refer to Class 4 and Class 3B reinsurers, which represent the largest Bermudian reinsurers. See Bermuda Monetary Authority (2018).

4.3 to 1. Furthermore, 2.30% is an upper bound: premiums ceded to the Cayman Islands represent a small fraction of those ceded to Bermuda, and Switzerland faces a substantially higher corporate tax rate, making tax arbitrage smaller there.[25] Mapping this back to our estimates, the rate-cut channel would need to generate the 3.8 percentage point increase in §953(d) cessions documented in our reduced form (Table 8, Column 2) from a saving of at most 2.30 cents per dollar of premiums. The BEAT therefore dominates the rate-cut effect both in magnitude and in its ability to account for the documented substitution pattern.

Another potential concern is that the exclusion criterion is violated by firms seeking to eliminate exposure to the Federal Excise Tax (FET) under §4371.[26] This tax levies a 1% charge on reinsurance received from U.S. cedants. The concern is that FET avoidance, rather than the contraction in non-electing flows induced by the BEAT, drives our results. We find this channel unpersuasive for two reasons. First, the FET rate was not modified by the TCJA. For FET avoidance to explain our results, firms' incentives to eliminate this charge would need to have changed discontinuously in 2018, which is not the case. Second, and more fundamentally, both treated and control firms face FET exposure by maintaining foreign affiliates. If FET avoidance were independently driving §953(d) elections, we would expect to observe elevated elections among control firms as well. The reduced form estimate in Table 8 shows precisely the opposite. The increase in §953(d) cessions is concentrated entirely among BEAT-exposed firms. There is no discernible response in the control group. This differential is difficult to reconcile with a potential FET story. We therefore treat the FET channel as at most a secondary benefit. Firms received this benefit while restructuring for BEAT-related reasons. It was not an independent driver of the §953(d) elections we document. Finally, similar to the rate-cut channel, the FET is too small in magnitude (1% on premiums versus 10% BEAT) to explain the magnitude of our estimates.

Table 8 presents the results. Column (1) reports the OLS estimate of the relationship between

[25]The federal corporate tax rate in Switzerland is 8.5%. See the OECD data set on corporate income tax statutory.

[26]We also rule out that the concurrent introduction of the Global Intangible Low-Taxed Income (GILTI) provision violates the exclusion restriction. GILTI imposes a minimum tax on the income of Controlled Foreign Corporations (CFCs), defined under §951A(a). A potential concern is that GILTI independently incentivized §953(d) elections among BEAT-affected firms. This concern is, however, logically inconsistent with the structure of the tax arbitrage we study. Had the non-electing foreign affiliates been CFCs, Subpart F would have already rendered the offshore structure tax-inefficient by accounting for their insurance income in their US parent's taxable income under §953(a) (Hepfer et al., 2025). The non-electing affiliates in our sample are non-CFCs. Since GILTI requires CFC status under §951A(a), it simply does not apply to them, and its introduction creates no independent incentive to elect §953(d) status.

non-§953(d) and §953(d) cessions as stated in Equation (4). The coefficient of -0.123 ($t = -1.67$) indicates that firms with higher non-§953(d) cessions tend to have lower §953(d) cessions, consistent with the two channels being substitutes rather than complements. Column (2) presents the reduced form, regressing §953(d) cessions directly on the instrument. The coefficient of 0.038 is positive and significant at the 5% level. This means that BEAT-exposed firms with a pre-existing non-§953(d) affiliate increased their §953(d) cessions by 3.8 percentage points of gross premiums written after 2017 relative to the control group. This estimate requires only the exogeneity of the instrument and is therefore interpretable regardless of any concerns about the exclusion restriction. Columns (3) and (4) report the first stage of Equation (5), regressing non-§953(d) cessions on the instrument without and with control variables, respectively. The instrument is highly significant in both specifications. In economic terms, BEAT-exposed firms reduced their non-§953(d) cessions by 17.5 percentage points of gross premiums written relative to control firms after 2017. The first-stage F-statistics indicate strong instruments and show that the relevance criterion for our 2SLS approach is fulfilled. We report the Kleibergen and Paap (2006) F-statistic rather than the conventional first-stage F-statistic, as the latter is only valid under homoskedastic errors. Since our setting includes group and time fixed effects with standard errors clustered at the insurance group level, the Kleibergen-Paap statistic is the appropriate measure of instrument strength as it is robust to heteroskedasticity and clustering. The Kleibergen-Paap F-statistics of 21.64 and 23.71 in columns (3) and (4) substantially exceed the Stock and Yogo (2005) critical value of 16.38, which corresponds to a maximum test size distortion of 10 percent at the 5 percent significance level. Columns (5) and (6) present the second stage estimates, which identify the substitution ratio σ. To account for the uncertainty arising from the estimation of the first stage, we base inference in the second stage on a cluster bootstrap-t procedure (Cameron & Miller, 2015). [27] We report adjusted p-values in brackets.

The coefficient on the instrumented variable, $\widehat{\text{Non953d}}$, is -0.222 without controls and -0.216 with controls. Under the cluster bootstrap-t, both estimates are significant at the 10% level, with the specification including controls significant at the 5% level. Taken together with the first stage magnitude of 17.5 percentage points, the implied aggregate substitution is approximately 3.8 percentage points of gross premiums written, consistent with the reduced form estimate in

[27] In each of 1,000 replications, we resample insurance groups with replacement, re-estimate the full two-stage model, and compute the studentized statistic for the coefficient of interest. We then obtain p-values by comparing the original t-statistic with the bootstrap distribution of these studentized statistics.

Column (2). The close agreement between OLS and IV, -0.123 versus -0.216, indicates that OLS understates the true substitution elasticity, consistent with attenuation bias from endogenous co-movement between the two cession streams that the instrument corrects. Additionally, the Wu-Hausman test rejects the exogeneity of non-electing cessions at the 1% level across all specifications, confirming that instrumental variable estimation is required.

In economic terms, the second-stage estimates provide strong evidence of partial substitution: for every one percentage point decline in non-§953(d) cessions induced by the BEAT, §953(d) cessions rise by 22 percentage points. In other words, as the BEAT forced a contraction in the traditional tax-advantaged channel, treated groups reallocated part of those flows to fully taxed §953(d) entities. However, the size of the coefficient ($\sigma = -0.22$) shows that this substitution was far from complete. Our estimates suggest that only 22% of the decline in tax-motivated flows was offset by an increase in risk-motivated (tax-neutral) flows. The remaining 78% appears to represent a net exit from the foreign reinsurance market. This result implies a stark decomposition of the pre-BEAT internal capital market. About 78% of the flows were driven primarily by tax arbitrage and evaporated once the subsidy was repealed. Only 22% were sticky enough to justify paying U.S. taxes to keep the operational link. Firms did not substitute to external markets, because most of the demand for reinsurance was driven by tax arbitrage. The tax advantage created the transaction; without it, there was no underlying economic risk to insure, so the flows simply vanished. We classify these flows as tax-motivated not because they lacked economic substance, but because the viability of the transfer depended on the tax arbitrage. Once the BEAT neutralized the tax benefit, the net present value of these transactions turned negative, and firms discontinued them.

The §953(d) substitution ratio in Panel A isolates the risk that firms chose to keep inside the group, paying full U.S. tax to preserve the operational benefits of internal pooling. But this understates total risk-motivated substitution, because it treats a third category of flow as "exited": risk that firms continued to transfer, but moved outside the group. For some affiliates, the internal route was economical only while the tax differential subsidized it. Electing §953(d) pulls the affiliate's entire worldwide income into the U.S. tax net, which is prohibitive when the affiliate also reinsures substantial non-U.S. business. Once the BEAT removed the subsidy, these firms found it cheaper to cede the same risk to an unaffiliated foreign reinsurer at an arm's-length price than to keep it internally. The risk transfer survives; only its venue changes. To capture this margin,

Table 8: The Substitution Ratio of Internal Capital

Panel A: Baseline Substitution Estimates

This table examines whether U.S. property-casualty insurers substitute toward §953(d)-electing foreign affiliates in response to declining cessions to BEAT-exposed foreign affiliates. Panel A reports baseline estimates where the dependent variable in the OLS, reduced form, and second-stage specifications is the §953(d) cession ratio, defined as the share of premiums ceded to Bermuda, Switzerland, and Cayman Islands affiliates operating under §953(d) elections. Panel B extends the dependent variable to include premiums ceded to foreign unaffiliated reinsurers (FNA), capturing total risk-motivated substitution. The first-stage regressions are identical across panels and reported only in Panel A. In Panel A, Column (1) reports OLS estimates of the effect of the non-§953(d) cession ratio on the §953(d) cession ratio. Column (2) reports the reduced-form estimate, directly regressing the §953(d) cession ratio on the instrument. Columns (3) and (4) report the first-stage regressions, where the dependent variable is the non-§953(d) cession ratio. Columns (5) and (6) report the two-stage least squares estimates, in which the non-§953(d) cession ratio is instrumented by its predicted value from the corresponding first stage. The instrument, *Post* × *Treated*, is the interaction of an indicator for the post-BEAT period (2018 onward) with an indicator for BEAT-affected insurance groups holding non-§953(d) affiliates before 2018. Control variables are *Size*, *Leverage*, *LOB Concentration*, *CatRisk*, and *Return on Equity*. Variable definitions are provided in Table 2. All specifications include group and year fixed effects. Standard errors are clustered at the group level. For the second-stage IV estimates in columns (5) and (6), we additionally report cluster bootstrap-t p-values in brackets and base significance stars on them. The bootstrap-t procedure uses 1,000 replications: in each replication we resample insurance groups with replacement, re-estimate the full two-stage model, and compute the studentized statistic for the coefficient of interest; p-values compare the original t-statistic with the bootstrap distribution of these statistics. For the first-stage regressions, we report the Kleibergen-Paap rk Wald F-statistic.

	OLS	**Reduced Form**	**IV: 1st stage**		**IV: 2nd stage**	
	Dep. var: 953d	*Dep. var: 953d*	*Dep. var: Non953d*		*Dep. var: 953d*	
	(1)	(2)	(3)	(4)	(5)	(6)
Non953d	−0.123					
	(0.074)					
$\widehat{\text{Non953d}}$					−0.222*	−0.216**
					(0.098)	(0.094)
					[0.053]	[0.048]
Post × Treated		0.038**	−0.172***	−0.175***		
		(0.017)	(0.037)	(0.036)		
Control variables	Yes	Yes	No	Yes	No	Yes
Group fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Kleibergen-Paap F-stat	—	—	21.64	23.71	—	—
Observations	550	550	550	550	550	550
Adjusted R^2	0.799	0.799	0.776	0.783	0.795	0.799

Notes: All continuous variables are winsorized at the 5th and 95th percentiles. Standard errors are in parentheses and bootstrap-t p-values are in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 8: The Substitution Ratio of Internal Capital – Continued

Panel B: Extended Substitution Estimates Including External Foreign Reinsurance

This panel extends the baseline estimates from Panel A by augmenting the dependent variable to include premiums ceded to foreign unaffiliated reinsurers (FNA), defined as the sum of the §953(d) reinsurance and the foreign non-affiliate reinsurance, scaled by gross premiums written. This dependent variable captures total risk-motivated substitution: flows that survived the tax shock either by electing §953(d) status or by migrating to arm's-length foreign counterparties. The first-stage estimates are identical to those in columns (3) and (4) of Panel A and are omitted for brevity. See Panel A for full variable definitions and estimation details.

	OLS	**Reduced Form**	**IV: 2nd stage**	
	Dep. var: 953d+FNA	*Dep. var: 953d+FNA*	*Dep. var: 953d+FNA*	
	(1)	(2)	(3)	(4)
Non953d	-0.219^{**}			
	(0.105)			
$\widehat{\text{Non953d}}$			-0.340^{**}	-0.333^{**}
			(0.150)	(0.144)
			[0.022]	[0.033]
Post × Treated		0.058^{**}		
		(0.028)		
Control variables	Yes	Yes	No	Yes
Group fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Kleibergen-Paap F-stat	—	—	—	—
Observations	550	550	550	550
Adjusted R^2	0.787	0.783	0.770	0.783

Notes: All continuous variables are winsorized at the 5th and 95th percentiles. Standard errors are in parentheses and bootstrap-t p-values are in brackets. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel B re-estimates the 2SLS specification with a broader dependent variable that adds cessions to foreign unaffiliated reinsurers to §953(d) cessions. The numerator then reflects every channel through which genuine coverage demand could persist after the reform. The substitution ratio rises to $\sigma = -0.33$ (Table 8, Panel B). The interpretation is sharp: of every dollar pulled out of the tax-advantaged internal channel, roughly 33 cents was redirected to a surviving risk-transfer channel, either a §953(d) affiliate or an arm's-length foreign reinsurer, while the remaining 67 cents left the foreign reinsurance market entirely. The gap between the two panels, from $\sigma = -0.22$ to $\sigma = -0.33$, is exactly the share of flows that represented real risk transfer but for which the internal structure was no longer worth its tax cost. This is coverage the firm still wanted, but bought externally rather than keeping it within the group. Even on the most generous definition of risk-motivated substitution, most of the pre-reform internal market did not relocate or survive in any form. It simply disappeared. This is consistent only with these flows having been tax arbitrage that lacked an underlying risk-transfer rationale once the subsidy was withdrawn.

5.2 Limits to Internal Capital Market Adjustments

The aggregate substitution ratio of $\sigma \approx -0.22$ indicates that a small but critical fraction of internal capital flows persisted despite removed tax benefits. If the sticky capital is indeed driven by operational needs, high-risk firms should exhibit a smaller contraction in internal cessions and a higher substitution towards affiliated §953(d) entities and foreign non-affiliated entities. To proxy for insurance groups that genuinely require global diversification, we consider their exposure to catastrophe risk.

Specifically, we construct the dummy variable *HighCatRisk*, which is equal to one if the insurance group's median catastrophe risk share over the pre-reform period 2013–2017 equals or exceeds the sample median, and zero otherwise. By fixing the classification at the pre-reform median rather than using annual values, we ensure that *HighCatRisk* captures each firm's structural reliance on catastrophe diversification rather than year-to-year fluctuations in its business mix. We

estimate the following model:

$$
\begin{aligned}
Y_{i,t} = \alpha_i + \lambda_t + \beta_1 \left(\textit{Treated}_i \times \textit{Post}_t\right) + \beta_2 \left(\textit{Treated}_i \times \textit{HighCatRisk}_{i,t}\right) \\
+ \beta_3 \left(\textit{Post}_t \times \textit{HighCatRisk}_{i,t}\right) + \beta_4 \left(\textit{Treated}_i \times \textit{Post}_t \times \textit{HighCatRisk}_{i,t}\right) \\
+ \gamma \mathbf{X}_{i,t} + \varepsilon_{i,t}, \qquad (6)
\end{aligned}
$$

where α_i and λ_t represent group and year fixed effects, respectively. $\textit{Treated}_i$ is an indicator equal to one if the insurance group met the statutory BEAT thresholds in 2017. $\textit{Post}_t$ is an indicator equal to one for the years 2018–2022. $\mathbf{X}_{i,t}$ is the standard vector of time-varying controls. The coefficient of interest is β_4, which captures the response to the BEAT for firms with above-median catastrophe exposure.

The regression results for Equation (6) appear in Table 9. We focus on two outcomes that are central to our decomposition: foreign affiliate cessions, which capture the stickiness of the internal capital market, and the combined §953(d) and foreign non-affiliated cessions, which capture total risk-motivated substitution as defined in Panel B of Table 8. Columns (1) and (2) show that the triple interaction *Treated* × *Post* × *HighCatRisk* is positive and statistically significant at the 5% level in the strictest specification ($\beta_4 = 0.137$). This indicates that treated firms with above-median structural catastrophe exposure reduced their foreign affiliate reinsurance cessions by approximately 13.7 percentage points less than their low-catastrophe counterparts following the BEAT. In economic terms, relative to the baseline contraction of 16.9 percentage points in the table, high-catastrophe firms effectively preserved a substantial share of their internal reinsurance capacity, while low-catastrophe firms drove the aggregate decline. Columns (7) and (8) extend this finding to total risk-motivated substitution. The triple interaction remains positive and significant at the 10% level ($\beta_4 = 0.093$). This indicates that high-catastrophe treated firms not only reduced their internal cessions by less but also substituted more actively toward risk-motivated channels, either by electing §953(d) status on their foreign affiliates or by migrating to external foreign markets. This result supports the mechanism underlying our IV decomposition. Table 9 reveals that the substitution toward risk-motivated channels is concentrated among those with the highest structural reliance on catastrophe diversification. Low-catastrophe firms, for whom the operational benefits of the internal market were modest relative to the BEAT penalty, exited almost entirely, which is consistent

with the tax-arbitrage interpretation of their pre-reform flows. High-catastrophe firms, by contrast, actively restructured their arrangements to preserve the operational link, incurring the full U.S. tax cost rather than retaining existential tail risk on their domestic balance sheets. Columns (3) through (6) confirm that the adjustment is concentrated in the foreign reinsurance channel. Neither domestic affiliate nor domestic non-affiliate cessions exhibit a significant triple interaction, indicating that high-catastrophe firms did not simply rotate toward domestic counterparties.

6. Risk Repatriation and the Regulatory Solvency Blind Spot

6.1 Risk Repatriation

Reinsurance contracts transfer both insurance risk and taxable profit at once. The substitution gap documented in Section 4 implies that when the BEAT reduced the tax advantage, firms cancelled these internal contracts and did not replace the capacity externally. The risk that was previously pooled offshore was therefore repatriated to the domestic balance sheet. We begin testing this channel by regressing net premiums written on our interaction term *Treated* $\times$ *Post*. We also study heterogeneity across business lines, asking which insurance risk was repatriated to domestic balance sheets. We distinguish between catastrophe-exposed lines and long-tail lines.[28] Catastrophe risk requires global diversification, and catastrophe-exposed insurers show a smaller substitution gap. We would therefore expect the change in repatriated premiums to be concentrated in long-tail lines rather than catastrophe lines.

Net premiums written equal premiums written from policyholders less reinsurance ceded. They therefore reflect the amount of premiums that stays on the U.S. balance sheet. As shown in Section 5, underwriting volume did not change after the BEAT. Table 10 presents the results. We scale net premiums written by gross premiums written, so the interpretation is: when an insurance group writes \$1, how much of it stays on its domestic balance sheet?

The overall treatment effect in Column (1) is positive and significant ($\beta = 0.088$, $t = 2.39$). BEAT-affected groups thus retained substantially more net premiums after the reform, which is in line with the substitution gap found earlier. Again, the effect is driven entirely by the most exposed

[28] Catastrophe-exposed lines: allied lines, auto physical damage, commercial multiple peril, earthquake, farmowners multiple peril, fire, homeowners multiple peril, inland marine. Long-tail lines: commercial auto liability, medical professional liability, other liabilities, product liability, workers compensation, private passenger auto liability.

Table 9: Catastrophe Exposure and the Elasticity of Internal Capital

This table investigates whether catastrophe risk limits the ability of firms to adjust their internal capital flows following the Base Erosion and Anti-Abuse Tax (BEAT). We estimate a triple-interaction model (Equation 6) to test whether the contraction in foreign affiliated reinsurance is limited by a firm's reliance on global risk diversification. The dependent variable is the ratio of premiums ceded to four counterparty types: foreign affiliates (Columns 1–2), domestic affiliates (3–4), domestic non-affiliates (5–6), and the sum of §953(d) cessions and foreign non-affiliated reinsurance (7–8). We scale reinsurance cessions by gross premiums written (GPW). *Treated* is an indicator variable equal to one if the insurance group met the statutory BEAT thresholds in 2017. These include average annual gross receipts of at least $500 million and a base erosion percentage of at least 3%. *Post* is an indicator variable for the years 2018-2022. *HighCatRisk* is a time-invariant binary indicator equal to one if the insurance group's median catastrophe risk share over the pre-reform period 2013–2017 equals or exceeds the sample median in this subperiod, and zero otherwise. Odd-numbered columns report specifications without additional controls beyond the interactions and *CatRisk*; even-numbered columns add the full set of firm-level controls including *Size*, *Leverage*, *Return on Equity*, and *LOB Concentration*. All specifications include group and year fixed effects. Variable definitions are provided in Table 2.

	Foreign Affiliates		**Domestic Affiliates**		**Domestic Non-Affiliates**		**953d + FNA**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treated x Post x HighCatRisk	0.132*	0.137*	−0.102	−0.063	−0.029	−0.021	0.081*	0.093**
	(0.072)	(0.069)	(0.100)	(0.092)	(0.024)	(0.023)	(0.045)	(0.046)
Post x HighCatRisk	−0.057	−0.061	0.129*	0.085	0.023	0.013	−0.027	−0.039*
	(0.042)	(0.044)	(0.076)	(0.065)	(0.016)	(0.015)	(0.020)	(0.020)
Treated x Post	−0.169***	−0.174***	0.041	0.025	0.012	0.009	−0.011	−0.016
	(0.054)	(0.052)	(0.045)	(0.053)	(0.013)	(0.014)	(0.024)	(0.023)
CatRisk	3.880	1.354	−7.979	−6.034	−1.169	−0.921	−2.871	−2.325
	(3.367)	(2.021)	(5.848)	(3.836)	(0.971)	(0.805)	(2.583)	(2.051)
Control variables	no	yes	no	yes	no	yes	no	yes
Group fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Time fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Observations	550	550	550	550	550	550	550	550
Adjusted R^2	0.763	0.792	0.871	0.884	0.804	0.818	0.772	0.782

Notes: All continuous variables are winsorized at the 5th and 95th percentiles. Standard errors are in parentheses and clustered at the insurer group level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 10: Risk Repatriation: Net Retention by Line of Business

This table investigates in which business lines insurance risk was repatriated following the Base Erosion and Anti-Abuse Tax (BEAT). The dependent variables are net premiums written (NPW) scaled by gross premiums written (GPW), decomposed into three categories. *NPW: All Lines* captures total net retention across the full underwriting portfolio. *NPW: CAT Lines* captures net retention exclusively in catastrophe-exposed business lines as classified by the NAIC. *NPW: Long-Tail Lines* captures net retention in lines characterized by extended claims development periods, including liabilities and compensation lines. *Treated* is an indicator variable equal to one if the insurance group met the statutory BEAT thresholds in 2017, comprising average annual gross receipts of at least $500 million and a base erosion percentage of at least 3%. *Post* is an indicator variable for the years 2018–2022. Odd-numbered columns report the average treatment effect using the binary *Treated* indicator. Even-numbered columns replace the binary indicator with *LowBEP* $\times$ *Post* and *HighBEP* $\times$ *Post*, where *LowBEP* and *HighBEP* denote indicators for treated groups below and above the median 2017 base erosion percentage, respectively. All specifications include the full set of firm-level controls — *Size*, *Leverage*, *CatRisk*, *LOB Concentration*, and *Return on Equity* — as well as group and year fixed effects. Variable definitions are provided in Table 2.

	NPW: All Lines		**NPW: CAT Lines**		**NPW: Long-Tail Lines**	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated x Post	0.088**		0.017		0.041*	
	(0.037)		(0.015)		(0.021)	
LowBEP x Post		0.017		0.004		−0.010
		(0.037)		(0.018)		(0.017)
HighBEP x Post		0.157***		0.030		0.091***
		(0.049)		(0.020)		(0.031)
Control variables	yes	yes	yes	yes	yes	yes
Group fixed effects	yes	yes	yes	yes	yes	yes
Time fixed effects	yes	yes	yes	yes	yes	yes
Observations	550	550	550	550	550	550
Adjusted R^2	0.829	0.841	0.929	0.930	0.904	0.912

Notes: All continuous variables are winsorized at the 5th and 95th percentiles. Standard errors are in parentheses and clustered at the insurer group level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

groups ($\beta = 0.157$, $t = 3.21$). In economic terms, for every \$1 they write, they keep \$0.16 more on their balance sheet. The line-of-business split reveals differences across lines. Net retention in catastrophe lines is unchanged across all specifications (Columns 3–4), meaning that affected firms did not repatriate catastrophe risk. Instead, more than half of the increased net retention comes from long-tail lines ($\beta = 0.091$, $t = 2.93$). These are lines in which claims are reported and fully settled often several years, or even decades, after the insured event occurs.

These findings again support the view that the terminated reinsurance contracts were the ones driven mainly by tax considerations. Catastrophe risks require global diversification, and they were not cancelled even when tax costs rose. Long-tail lines do not require global diversification, since their occurrence is independent within the U.S. Yet long-tail lines bind the most capital under the NAIC RBC framework. Ceding these risks to jurisdictions with more favorable regulation, such as Bermuda, therefore frees up capital within the global insurance group. In addition, as Seessel (2001) notes, long-tail premiums ceded to low-tax jurisdictions can be invested over a longer horizon, which maximizes investment returns that are taxed at lower rates than in the U.S. This combination makes it attractive for global insurance groups to cede long-tail risk to foreign subsidiaries.

In Table 11 we perform the same analysis, this time using actual insurance losses instead of net retention as the dependent variable. We take Losses Incurred, scaled by Gross Premiums Written.[29] This lets us see whether higher risk retention ultimately leads to higher insurance losses. The results draw the same picture: insurance losses rise for the groups with the highest exposure to the BEAT. For every \$1 written, the self-borne loss increases by \$0.10. As before, losses in catastrophe-prone lines remain unchanged, and most of the increase comes from long-tail lines. We therefore conclude that the BEAT reduced the economic solvency of affected insurance groups in the U.S.

6.2 Decoupling of Economic and Reported Solvency

A deterioration in underwriting performance of this magnitude should, in theory, trigger a regulatory response. U.S. insurers are subject to Risk-Based Capital (RBC) requirements, where the capital charge is a function of retained risk. If the regulatory framework is efficient, the increase in net

[29]The dependent variable, *Losses Incurred*, captures the total claims burden, defined as losses and loss adjustment expenses, less reinsurance recoverables, plus net changes in reserves. We do not use the combined ratio, since it also includes underwriting expenses, which are not the focus of our analysis.

Table 11: Loss Performance by Line of Business

This table tests whether the contraction in internal capital markets following the Base Erosion and Anti-Abuse Tax (BEAT) materially increased the economic risk borne by U.S. property-casualty insurance groups. The dependent variable is Losses Incurred scaled by gross premiums written (GPW), which captures the net economic risk retained on the domestic balance sheet after accounting for reinsurance recoverables. To identify which risks were repatriated, we decompose the incurred loss ratio into catastrophe-exposed lines and long-tail lines. Columns (1)–(2) report estimates for all lines combined; Columns (3)–(4) isolate catastrophe lines; and Columns (5)–(6) isolate long-tail lines. Odd-numbered columns report the baseline difference-in-differences estimate using a binary treatment indicator, and even-numbered columns replace it with *LowBEP* and *HighBEP* indicators based on a median split of the 2017 base erosion percentage in the treatment group. *Treated* equals one if the group met both statutory BEAT thresholds in 2017: average annual gross receipts of at least $500 million and a base erosion percentage of at least 3%. *Post* equals one for 2018–2022. Control variables are *Size*, *Leverage*, *LOB Concentration*, *CatRisk*, and *Return on Equity*. Variable definitions are provided in Table 2.

	Losses: All Lines		**Losses: CAT Lines**		**Losses: Long-Tail Lines**	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated x Post	0.041		0.006		0.031*	
	(0.032)		(0.011)		(0.018)	
LowBEP x Post		−0.015		0.001		0.007
		(0.038)		(0.014)		(0.019)
HighBEP x Post		0.097**		0.011		0.056**
		(0.039)		(0.016)		(0.024)
Control variables	yes	yes	yes	yes	yes	yes
Group fixed effects	yes	yes	yes	yes	yes	yes
Time fixed effects	yes	yes	yes	yes	yes	yes
Observations	550	550	550	550	550	550
Adjusted R^2	0.770	0.782	0.891	0.891	0.864	0.867

Notes: All continuous variables are winsorized at the 5th and 95th percentiles. Standard errors are in parentheses and clustered at the insurer group level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

retention should be matched by an increase in required capital. We estimate the impact of the BEAT on two regulatory metrics: Authorized Control Level (ACL), which is the minimum capital required and the RBC Ratio, which is the ratio of Total Adjusted Capital to ACL. Following Cummins and Phillips (2009) and Cheng and Weiss (2012), we include measures of underwriting, asset, and liquidity risk as covariates. Underwriting risk is proxied by the Herfindahl–Hirschman index of line-of-business concentration, which reflects the degree of diversification in insurers' underwriting portfolios. To capture asset and liquidity risk, we add three variables: *Liquid Investments / CS* is cash and equivalents, common stock and carrying value of bonds with a 1 or 2 rating as a percent of capital and surplus. *Mortgage Loans / Assets* is the book value of mortgage loans divided by total assets. *Avg Bond Rating* is a weighted average rating of bonds held by the insurance group from 1 to 6, with 1 being the safest rating.

The NAIC RBC formula sorts risk into six buckets, R0 through R5. A change in reinsurance coverage does not affect all of them. It should, all else equal, affect only R3, R4, and R5. We therefore focus on these three buckets. R3 captures credit risk arising from reinsurance to account for the risk that a reinsurer fails to pay its recoverables. R4 measures the risk that the reserves booked for claims that have already occurred will develop adversely. R5 captures premium risk, which measures whether net premiums written for the upcoming year will prove inadequate to cover the losses that occur on those prospective policies. R5 scales with net premiums written. When an insurer cedes less, it retains more net premiums, and R5 rises. The BEAT pushed insurers to cede less to foreign affiliates. Lower cessions reduce recoverables, which lowers R3. At the same time, higher retention raises net reserves and net premiums, which raises R4 and R5. For each year in our sample, we calculate the relevant risk buckets using only the information available in that year's statutory filing, and we apply the risk factors and industry-aggregated inputs that the regulator published for that same year.[30]

Table 12 presents the results. Columns (1)–(2) use the growth of ACL as the dependent variable,

[30]We thank S&P Global Intelligence for providing us with historical templates to gather the historical bucket calculations. In 2018, the NAIC changed how it calculates the credit risk charge. To ensure our results reflect the response to the BEAT rather than this regulatory change, we compute R3 for all post-BEAT years using the pre-period method. Specifically, we take each insurer's recoverables from unaffiliated and foreign affiliated reinsurers and apply a 10% charge. Recoverables from domestic affiliates are not charged under the RBC framework, so we exclude them. The factor is flat at 10% and does not vary with the counterparty's identity or rating. This follows Odomirok et al. (2015). We assign half of the resulting charge to R3 and half to R4. We split it this way because the reserve charge in R4 typically exceeds the combined charge for recoverables and non-invested assets (Odomirok et al., 2015).

and Columns (3)–(4) use the growth of the RBC ratio. Columns (5)–(9) then decompose the response into the individual risk buckets and their underlying drivers. We report R3 in Column (5), R4 in Column (7), and R5 in Column (9). Additionally, we report net reserves in Column (6), which affects R4, and net premiums written in Column (8), which affects R5. We find no evidence that the introduction of the BEAT forced affected insurers to hold additional regulatory capital or resulted in lower RBC ratios. Across all specifications, even after controlling for asset and liquidity risk, the coefficients on *Treated* $\times$ *2018* are statistically indistinguishable from zero. This null result for the ACL and the RBC ratio documents a significant divergence between economic reality and regulatory reporting. While firms are retaining more risk and suffering higher losses, their reported solvency positions appear unchanged.

The bucket decomposition shows why. The three buckets that should respond to a change in reinsurance, R3 through R5, move in offsetting directions. R3 is the credit risk charge. It is levied on reinsurance recoverables and protects the cedent against reinsurer default. R3 falls sharply for treated firms, with a 2018 effect of -14.6% ($t = -2.46$). The reason is mechanical: as firms ceded less to foreign affiliates, their recoverables shrank, and the capital held against those recoverables shrank with them. The retention-driven buckets move the other way. When a firm cedes less, it keeps more reserves and more premiums on its own books. Net reserves rise by 11.9% ($t = 1.84$) and net premiums written by 19.3% ($t = 2.84$). These quantities feed R4, the reserve risk charge, and R5, the premium risk charge. Both buckets therefore push required capital up just as R3 pushes it down.

The NAIC formula does not assign the entire recoverables charge to R3. It splits the charge in two: half goes to R3, the credit risk bucket, and half goes to R4, the reserve risk bucket. This split matters for reading the table. Column (6) reports the growth of net reserves on their own. Column (7) reports R4, which adds half of the recoverables charge on top of those net reserves. Once we fold in the share of the recoverables charge that the NAIC books to R4, the coefficient turns insignificant (Column 7). The reason is that the recoverables charge moves in the opposite direction: as treated firms ceded less, their recoverables fell, and the half of that charge sitting in R4 fell with them. This decline partly cancels the increase from higher net reserves. The same offsetting pattern holds across the buckets as a whole. The fall in R3 cancels the rise in R5. Because the buckets move against one another, reported solvency does not change for affected groups, even

Table 12: Reported Regulatory Solvency

This table analyzes the impact of the BEAT on reported regulatory capital metrics and on the individual risk components that determine them. The dependent variables are simple growth rates. Columns (1)–(2) use the Authorized Control Level (ACL), which represents the minimum capital insurance groups are required to hold. Columns (3)–(4) use the Risk-Based Capital (RBC) Ratio, defined as Total Adjusted Capital divided by the ACL. Columns (5)–(9) decompose the response into the three risk buckets that should react to a change in reinsurance, together with their underlying drivers: R3 (credit risk) in Column (5), net reserves in Column (6), R4 (reserve risk) in Column (7), net premiums written (NPW) in Column (8), and R5 (premium risk) in Column (9). The NAIC formula charges 10% on reinsurance recoverables from unaffiliated and foreign affiliated reinsurers and assigns half of this charge to R_3 and half to R_4; Columns (6) and (7) therefore differ by the share of the recoverables charge booked to R_4. For each year we compute the buckets using only that year's filing and the risk factors and industry-aggregated inputs in force that year. Odd-numbered columns for ACL and RBC report the baseline difference-in-differences estimate; even-numbered columns add controls for liquidity and asset risk. *Treated* equals one if the group met both statutory BEAT thresholds in 2017: average annual gross receipts of at least $500 million and a base erosion percentage of at least 3%. *Post* equals one for 2018–2022. Control variables are *Size*, *Leverage*, *LOB Concentration*, *CatRisk*, and *Return on Equity*. Variable definitions are provided in Table 2.

	ACL		**RBC Ratio**		**R3**	**Net Reserves**	**R4**	**NPW**	**R5**
	simple growth		*simple growth*		*simple growth*	*simple growth*	*simple growth*	*simple growth*	*simple growth*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treated x 2018	−0.017	−0.014	0.029	0.032	−0.146**	0.119*	0.021	0.193***	0.145
	(0.043)	(0.043)	(0.042)	(0.042)	(0.060)	(0.065)	(0.044)	(0.068)	(0.106)
Treated x 2019	−0.001	0.001	0.016	0.022	−0.083	0.063	0.023	0.065	−0.080
	(0.040)	(0.041)	(0.035)	(0.035)	(0.063)	(0.053)	(0.037)	(0.056)	(0.093)
Treated x 2020	−0.025	−0.024	0.057	0.060	−0.067	0.037	0.022	0.001	−0.011
	(0.040)	(0.041)	(0.036)	(0.037)	(0.050)	(0.058)	(0.039)	(0.049)	(0.093)
Treated x 2021	−0.040	−0.040	0.063*	0.065*	−0.046	0.062	0.035	0.081	0.046
	(0.046)	(0.046)	(0.037)	(0.038)	(0.062)	(0.051)	(0.036)	(0.050)	(0.094)
Treated x 2022	0.046	0.049	0.002	0.008	−0.090	0.008	0.008	0.034	0.067
	(0.033)	(0.034)	(0.031)	(0.032)	(0.077)	(0.075)	(0.051)	(0.039)	(0.104)
Liquid Investments / CS		0.0003		0.0003					
		(0.0005)		(0.0003)					
Mortgage Loans / Assets		−1.501		−0.331					
		(1.295)		(0.618)					
Avg Bond Rating		0.074		−0.026					
		(0.089)		(0.064)					
Control variables	yes	yes	yes	yes	yes	yes	yes	yes	yes
Group fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	495	495	473	473	495	495	495	495	495
Adjusted R^2	0.152	0.152	0.080	0.078	0.074	0.181	0.184	0.159	0.012

Notes: All continuous variables are winsorized at the 5th and 95th percentiles. Standard errors are in parentheses and clustered at the insurer group level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

though the risk they retain has gone up.

If R3 measured genuine reinsurer credit risk, then a firm that cedes less would have truly retired that risk, and the formula would be correct to release the corresponding capital. However, the credit charge is not calibrated to the risk it nominally captures. When the BEAT was introduced, R3 applied a flat 10% to recoverables from unaffiliated and foreign affiliated reinsurers alike. The charge did not vary with the reinsurer's rating. The capital it releases is therefore mechanically proportional to the volume of recoverables shed, not to any change in the probability that a reinsurer fails to pay. As a result, the released credit charge and the retained underwriting charge are not economically interchangeable. The RBC formula rewards a firm for shedding reinsurance even when that firm retains more risk overall. Insurers were thus able to increase their net economic exposure without triggering a regulatory capital violation. This created a regulatory blind spot, where systemic risk could accumulate undetected. By repatriating risk that was previously pooled globally, U.S. insurers became structurally more fragile, yet their reported solvency remained unchanged.

6.3 Ruling Out ILS Substitution

A potential concern is that BEAT-affected groups responded to the tax by replacing traditional affiliated reinsurance with cessions to insurance-linked securities (ILS) vehicles. We assess this channel and find it unlikely to explain our results. The ILS market, though growing, remains small relative to the broader reinsurance market. Total outstanding ILS volume in our sample grew from $1.6 billion in 2016 to $12.8 billion in 2022.[31] By comparison, total premiums ceded in the U.S. reinsurance market reached about $578 billion in 2022. ILS therefore represents a small fraction of overall risk transfer. Moreover, ILS usage is highly concentrated: only 12 insurance groups in our sample report any ILS cessions over the sample period.

To formally rule out this channel, we re-estimate our main specifications excluding all 12 groups with any ILS activity. Table 13 reports the results. The estimates remain unchanged, which confirms that ILS substitution cannot explain the reinsurance response we document.

[31] The S&P Global Market Intelligence Platform began collecting ILS data in 2016, which is why our ILS sample starts then.

Table 13: Robustness: Excluding Insurance Groups with ILS Activity

This table re-estimates the treatment effects based on Equation (1). We exclude insurance groups reporting any cessions to insurance-linked securities (ILS) vehicles over the period from 2016–2022. The dependent variable is the ratio of premiums ceded to gross premiums written (GPW). Columns partition cessions by counterparty type: (1) foreign affiliates, (2) domestic affiliates, (3) domestic non-affiliates, and (4) foreign non-affiliates. *Treated* is an indicator variable equal to one if the insurance group met the statutory BEAT thresholds in 2017. These include average annual gross receipts of at least $500 million and a base erosion percentage of at least 3%. *Post* is an indicator variable for the years 2018-2022. All specifications include group and time fixed effects. We include the full set of control variables including *Size*, *Leverage*, *CatRisk*, *LOB Concentration*, and *Return on Equity*. Variable definitions are provided in Table 2.

	Foreign Affiliates	**Domestic Affiliates**	**Domestic Non-Affiliates**	**Foreign Non-Affiliates**
	(1)	(2)	(3)	(4)
Treated x Post	-0.075^{**}	-0.009	-0.006	0.033^{*}
	(0.031)	(0.055)	(0.012)	(0.017)
Control variables	yes	yes	yes	yes
Group fixed effects	yes	yes	yes	yes
Time fixed effects	yes	yes	yes	yes
Observations	430	430	430	430
Adjusted R^2	0.810	0.861	0.832	0.816

Notes: All continuous variables are winsorized at the 5th and 95th percentiles. Standard errors are in parentheses and clustered at the insurer group level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

7. Conclusion

Internal capital markets let firms move resources to where they are most valuable. In multinational insurance groups, these markets run through internal reinsurance. But a cross-border reinsurance contract does two things at once: it pools risk, and it shifts profit to low-tax jurisdictions. The two motives are bundled in the same transaction, so they are difficult to tell apart. In this paper, we use the 2017 Base Erosion and Anti-Abuse Tax (BEAT) to separate them. The BEAT raised the tax cost of ceding reinsurance to foreign affiliates. It therefore acts as an exogenous shock to the cost of internal capital. To isolate the firms legally bound by the tax, we classify groups using the statutory thresholds as they stood in 2017. We then exploit the Section 953(d) election, which lets a foreign affiliate keep its offshore operations but pay full U.S. tax. This election separates the tax motive from the operational motive, and it lets us measure how much of the internal market each one drove.

We find that treated groups sharply cut reinsurance to their foreign affiliates after the reform. The drop was about 10.7 percentage points of gross premiums written. It happened at once in 2018 and did not reverse. The cut was largest for the firms with the most BEAT exposure, that is, those most dependent on foreign affiliate reinsurance markets. However, affected firms replaced only part of the lost capacity. They raised cessions to foreign unaffiliated reinsurers by 2.5 percentage points of gross premiums written, which left a substantial substitution gap of more than 8 percentage points. This gap is a first sign that much of the pre-reform market was driven by tax, not by genuine risk sharing.

The Section 953(d) election lets us put a number on this. Using a 2SLS framework, we estimate the share of premiums ceded offshore that was rerouted to affiliates with a §953(d) election, versus the share that left foreign affiliated markets entirely. We read a move to §953(d) affiliates as genuine risk sharing, and an exit from the market as tax arbitrage: once the tax differential shrinks, there is no longer any incentive to buy reinsurance from foreign affiliates. We find that for every dollar pulled out of the tax-advantaged internal channel, only about 20 cents stayed inside the group through a fully taxed §953(d) affiliate. The rest disappeared. We therefore estimate that 80% of the pre-reform flow was tax-motivated and evaporated, while 20% was genuine risk sharing. The capital that stayed was concentrated in firms with high catastrophe exposure. These firms need global diversification, so they paid the U.S. tax to keep the operational link. This is the genuine,

sticky part of the internal market.

The flows that disappeared did not take their risk with them. Because firms kept writing the same business, the risk they no longer ceded stayed on their domestic balance sheets. We show that net retention rose for treated firms, and that this rise came almost entirely from long-tail lines rather than catastrophe lines. Self-borne losses rose with it, and the effective insolvency risk of these firms increased. Yet their reported solvency did not move: required capital and the RBC ratio were unchanged. The reason is built into the regulatory formula. As firms ceded less, their reinsurance recoverables fell, and the credit-risk charge fell with them. This decline offset the higher charges from greater retention. But the credit charge is a flat factor on the volume of recoverables. It is not tied to the likelihood that a reinsurer fails to pay. So the formula released capital that is actually not linked to credit risk, and masked the underwriting risk the domestic firm took on.

Our findings have three main implications, most of which extend beyond the insurance industry. First, they speak to the nature of internal capital markets. A large share of what looked like internal risk sharing was in fact tax arbitrage. Tax-motivated flows are highly elastic: they collapse when the subsidy is removed. Risk-motivated flows are sticky, and firms pay to keep them. This distinction matters for any work that treats internal flows as a single object. Second, they speak to tax policy. The BEAT did what it was designed to do. It curbed cross-border profit shifting, and the affected flows did not migrate elsewhere. But the policy also worked outside the tax system. By making offshore risk pooling more expensive, it pushed genuine insurance risk back onto U.S. balance sheets. A tax aimed at base erosion thus changed how risk is held in the financial system. Third, they speak to financial regulation. The risk-based capital framework did not register the extra risk that firms retained. A firm could raise its true exposure and still report an unchanged solvency position. This blind spot arises because the credit charge tracks volume, not quality. It lets systemic risk build without a regulatory signal. The result points to a gap between tax policy and prudential regulation that neither side fully accounts for.

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Table A1: Identification of BEAT Treatment Status

This table illustrates the step-by-step determination of treatment assignment based on the 2017 statutory thresholds defined in the Tax Cuts and Jobs Act (TCJA). Using the Zurich insurance group (NAIC group 212) as a representative case, the table quantifies the two requirements for treatment: (i) average annual gross receipts of at least $500 million for the three-tax-year period ending with the preceding tax year, and (ii) a base erosion percentage of at least 3%. Panel A calculates the gross receipts for a single fiscal year (2016). Panel B computes the rolling three-year average of gross receipts as of 2017. Panel C derives the base erosion percentage, defined as the ratio of base erosion tax benefits (reinsurance cessions to foreign affiliates) to total allowable deductions. In this example, Zurich's average gross receipts exceed $500 million and its base erosion percentage of 24.4% exceeds the 3% threshold; the group is thus classified as treated. All numbers are in USD thousand and negative numbers are placed in parentheses.

Panel A: Annual Gross Receipts Calculation (2016)

Investment income		
(1) Earned investment income [a]		$ 1,291,431
(2) Total realized capital gains [b]		$ 247,866
Gross investment income	(1) + max [(2),0]	$ 1,539,298
Premiums written [c]		
(3) Direct premiums written		$ 32,538,791
(4) Premiums assumed from non-affiliates		$ 246,372
(5) Premiums assumed from foreign affiliates		$ 316,256
Total premiums written	(3)+(4)+(5)	$ 33,101,419
Other gross income		$ (28,804)
Gross receipts	(1)+max[(2),0]+(3)+(4)+(5)+max[(6),0]	$ 34,640,717

Panel B: Average Gross Receipts and Statutory Threshold (2017)

Gross receipts		
(1) 2014		$ 32,585,475
(2) 2015		$ 33,350,976
(3) 2016		$ 34,640,717
Average gross receipts in 2017	[(1)+(2)+(3)] / 3	$ 33,525,722

Panel C: Base Erosion Percentage Calculation (2017)

Base erosion payments		
(1) Base erosion payments / Reinsurance ceded to foreign affiliates		$ 6,409,299
(2) Underwriting deductions		$ 19,474,903
(3) Investment income deductions		$ 300,927
(4) Capital gains tax		$ 78,909
(5) Capital loss deductions		$ 0
Base erosion percentage	(1) / [(1)+(2)+(3)+(4)+(5)]	24.4%

Notes:

[a] Investment income (e.g., dividends) before taxes; excludes capital gains.

[b] Pre-tax realized capital gains and losses, including permanent write-downs but excluding temporary ones.

[c] Direct premiums written plus premiums assumed from non-domestic affiliates.

Table A2: Composition of Treatment and Control Group

This table lists all insurance groups included in the treatment set (Panel A) and the control set (Panel B). Treatment groups are identified as insurance groups subject to the BEAT statutory thresholds in 2017. All figures are reported for the 2017 fiscal year and represent the consolidated values of each group's U.S. property-casualty subsidiaries. *Total Asset Size* denotes the book value of the group's total assets (in USD billions). *Relative Asset Size (Sample)* represents the group's share of total assets within its respective treatment or control cohort. Groups are ordered alphabetically.

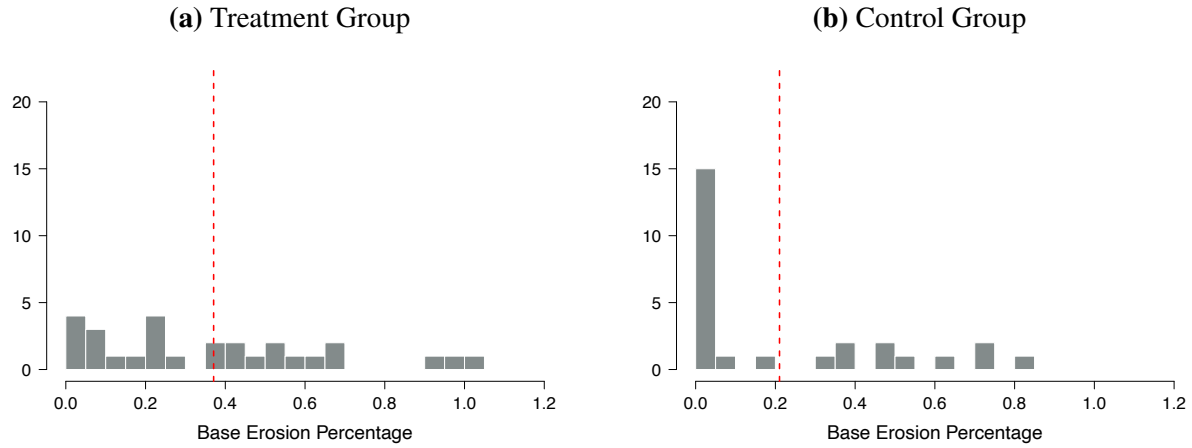
Panel A: Treatment Group

Insurance Group	NAIC group number	Total assets (USD billion)	Relative size (%)
AXIS	3416	5.01	1.01
Allianz	761	13.15	2.64
AmTrust Financial	2538	14.53	2.92
Arch Capital	1279	10.65	2.14
Argo	457	3.51	0.71
Assured Guaranty	194	9.58	1.93
Chubb	626	66.07	13.28
Enstar Group	4725	2.07	0.42
Everest Re	1120	10.41	2.09
FM Global	65	21.03	4.23
Fairfax Financial	158	21.79	4.38
Farmers Insurance	69	64.22	12.91
Great American Insurance	84	12.16	2.44
HDI	517	0.42	0.08
IAT Insurance	225	1.83	0.37
Liberty Mutual	111	80.19	16.12
MAPFRE	411	4.06	0.82
MS&AD Insurance Group	4715	1.41	0.28
Markel Corporation	785	10.48	2.11
Motors Insurance Corporation	79	2.15	0.43
Munich Re	361	22.97	4.62
PartnerRe	3483	5.18	1.04
ProAssurance	2698	3.39	0.68
STARR	4670	0.27	0.05
Swiss Re	181	20.43	4.11
Tokio Marine	3098	25.72	5.17
Tower Hill	3484	0.58	0.12
Zurich	212	64.22	12.91

Panel B: Control Group

Insurance Group	NAIC group number	Total assets (USD billion)	Relative size (%)
AXA	968	1.15	0.16
American Business & Mercantile Insurance Mutual	150	12.10	1.64
American International Group	12	80.90	10.98
Amerisure	124	3.09	0.42
Assurant	19	8.44	1.15
Auto Club Enterprises Insurance Group	1318	17.01	2.31
Auto Club Insurance Association	55	17.01	2.31
Berkshire Hathaway	31	345.85	46.92
CNA	218	45.26	6.14
Caterpillar Insurance	3569	0.79	0.11
Coaction	256	2.28	0.31
Essent	4694	1.86	0.25
GeoVera Holdings	3829	0.29	0.04
Global Indemnity	920	0.86	0.12
HCI Group	4792	0.45	0.06
ICW	922	2.88	0.39
Indiana University Health	4637	0.01	0.00
James River Group	3494	1.15	0.16
Medical Mutual	184	0.62	0.08
New Mexico Mutual Group	1112	0.45	0.06
Plateau Casualty Insurance	629	0.05	0.01
Protective P&C Insurance	458	0.39	0.05
Sompo	3219	6.31	0.86
The Hanover Insurance Group	88	8.83	1.20
Travelers	3548	158.86	21.55
UPMC Health Plan	1324	0.27	0.04
W. R. Berkley Corporation	98	19.95	2.71

Figure A1: Distribution Base Erosion Percentage



This figure shows the distribution of the base erosion percentage in 2017. Panel A shows the treatment group, and Panel B shows the control group. The vertical dashed line marks the mean within each group.

Table A3: Parallel Trends Test

This table presents event-study estimates of the impact of the Base Erosion and Anti-Abuse Tax (BEAT) on reinsurance cession ratios. The specification follows the difference-in-differences framework in Equation (2), where coefficients are estimated for each year relative to the 2017 baseline. We omit the year 2017 as reference year. *Treated* is an indicator variable equal to one if the insurance group met the statutory BEAT thresholds in 2017. These include average annual gross receipts of at least $500 million and a base erosion percentage of at least 3%. The dependent variable in all columns is the ratio of premiums ceded to gross premiums written (GPW). The columns partition cessions by counterparty type: (1) foreign affiliates, (2) domestic affiliates, (3) domestic non-affiliates, and (4) foreign non-affiliates. Control variables are *Size*, *Leverage*, *LOB Concentration*, *CatRisk*, and *Return on Equity*. Variable definitions are provided in Table 2.

	Foreign Affiliates	**Domestic Affiliates**	**Domestic Non-Affiliates**	**Foreign Non-Affiliates**
	(1)	(2)	(3)	(4)
Treated x 2013	-0.077^{**}	0.006	0.030^{*}	-0.018
	(0.037)	(0.064)	(0.015)	(0.015)
Treated x 2014	-0.057^{*}	-0.037	0.020^{*}	-0.009
	(0.031)	(0.048)	(0.011)	(0.014)
Treated x 2015	-0.032	-0.028	0.012	-0.006
	(0.023)	(0.047)	(0.013)	(0.012)
Treated x 2016	-0.024	-0.010	0.017^{*}	-0.011
	(0.019)	(0.028)	(0.010)	(0.010)
Treated x 2018	-0.135^{***}	-0.016	0.013	0.013
	(0.041)	(0.030)	(0.009)	(0.009)
Treated x 2019	-0.165^{***}	-0.029	0.013	0.014
	(0.036)	(0.028)	(0.012)	(0.011)
Treated x 2020	-0.139^{***}	-0.015	0.015	0.019
	(0.036)	(0.034)	(0.012)	(0.014)
Treated x 2021	-0.145^{***}	-0.023	0.017	0.018
	(0.034)	(0.033)	(0.014)	(0.014)
Treated x 2022	-0.136^{***}	-0.003	0.011	0.017
	(0.037)	(0.060)	(0.015)	(0.014)
Control variables	yes	yes	yes	yes
Group fixed effects	yes	yes	yes	yes
Time fixed effects	yes	yes	yes	yes
Observations	550	550	550	550
Adjusted R^2	0.784	0.881	0.817	0.814

Notes: All continuous variables are winsorized at the 5th and 95th percentiles. Standard errors are in parentheses and clustered at the insurer group level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

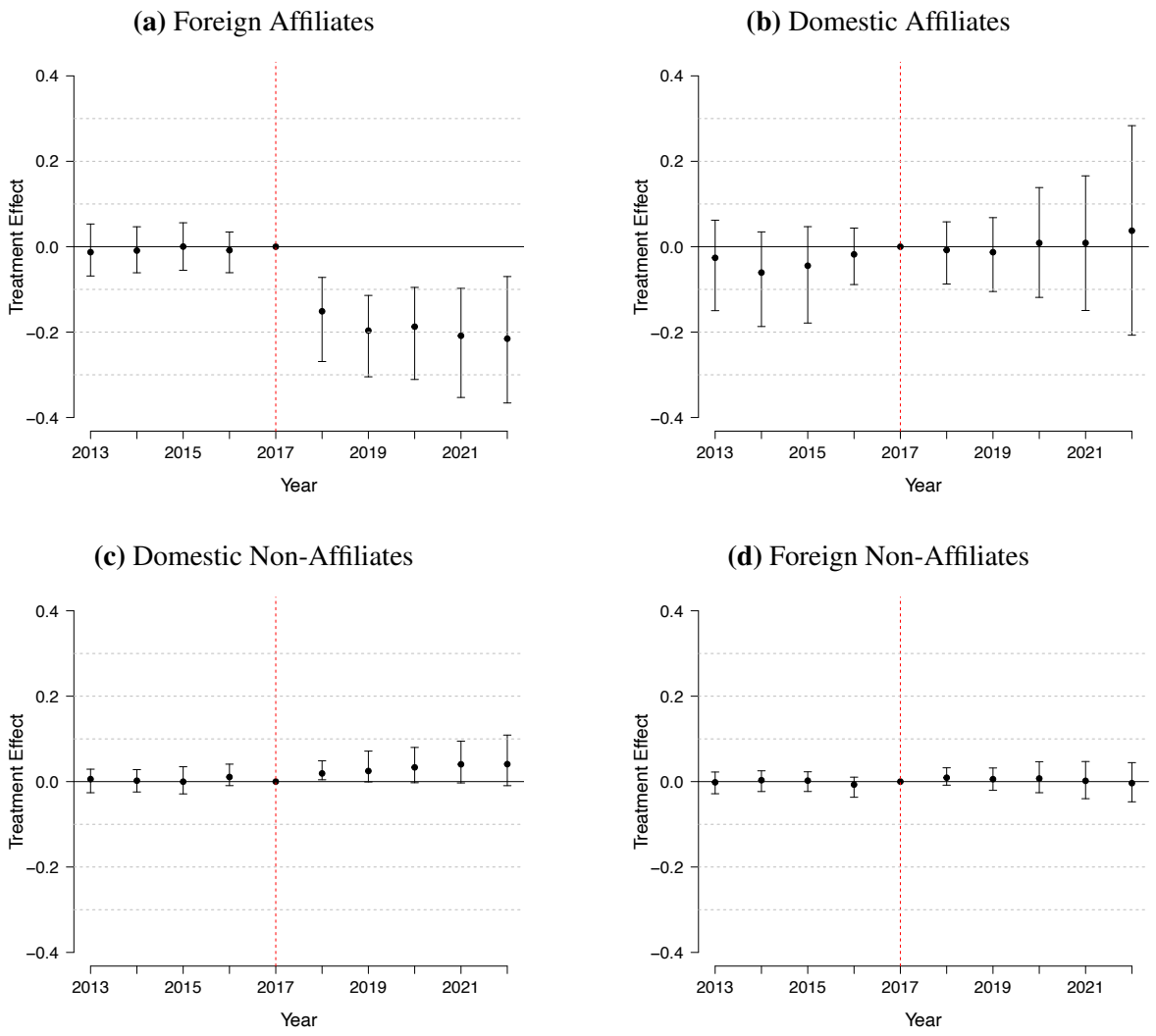
Table A4: Parallel Trends Test After Removing Differential Pre-Trend

This table presents event-study estimates following the difference-in-differences framework in Equation (2), where coefficients are estimated for each year relative to the 2017 baseline. We adjust reinsurance cession ratios by their linear pre-trend. We construct the adjusted outcomes in two steps. First, we estimate the differential linear trend between treated and control groups using only pre-reform data (2013–2016). Second, we subtract this trend, extrapolated over the full sample period, from the outcome of treated groups. We omit the year 2017 as reference year. We base statistical inference on a two-step cluster bootstrap-t procedure with 1,000 replications. In each replication, we resample insurance groups with replacement and re-estimate both steps: the pre-reform trend and the event study on the adjusted outcome. We then compute the studentized statistic for each treatment interaction. The reported p-values compare the original t-statistic with the bootstrap distribution of these studentized statistics. Control variables are *Size*, *Leverage*, *LOB Concentration*, *CatRisk*, and *Return on Equity*. Variable definitions are provided in Table 2.

	Foreign Affiliates	**Domestic Affiliates**	**Domestic Non-Affiliates**	**Foreign Non-Affiliates**
	(1)	(2)	(3)	(4)
Treated x 2013	−0.013	−0.026	0.006	−0.002
	(0.037)	(0.064)	(0.015)	(0.015)
	[0.660]	[0.595]	[0.673]	[0.918]
Treated x 2014	−0.009	−0.061	0.002	0.003
	(0.031)	(0.048)	(0.011)	(0.014)
	[0.721]	[0.224]	[0.863]	[0.792]
Treated x 2015	0.0003	−0.045	−0.0002	0.002
	(0.023)	(0.047)	(0.013)	(0.012)
	[0.992]	[0.402]	[0.988]	[0.860]
Treated x 2016	−0.008	−0.018	0.011	−0.007
	(0.019)	(0.028)	(0.010)	(0.010)
	[0.740]	[0.585]	[0.383]	[0.559]
Treated x 2018	−0.151***	−0.008	0.019*	0.009
	(0.041)	(0.030)	(0.009)	(0.009)
	[0.009]	[0.802]	[0.097]	[0.338]
Treated x 2019	−0.196***	−0.013	0.025	0.006
	(0.036)	(0.028)	(0.012)	(0.011)
	[0.000]	[0.725]	[0.128]	[0.651]
Treated x 2020	−0.187***	0.009	0.033	0.007
	(0.036)	(0.034)	(0.012)	(0.014)
	[0.004]	[0.873]	[0.115]	[0.695]
Treated x 2021	−0.209***	0.009	0.041	0.002
	(0.034)	(0.033)	(0.014)	(0.014)
	[0.005]	[0.904]	[0.108]	[0.914]
Treated x 2022	−0.215**	0.037	0.041	−0.004
	(0.037)	(0.060)	(0.015)	(0.014)
	[0.012]	[0.774]	[0.172]	[0.881]
Control variables	yes	yes	yes	yes
Group fixed effects	yes	yes	yes	yes
Time fixed effects	yes	yes	yes	yes
Observations	550	550	550	550
Adjusted R^2	0.804	0.882	0.828	0.809

Notes: All continuous variables are winsorized at the 5th and 95th percentiles. Standard errors are in parentheses and bootstrap-t p-values are in brackets. *, **, and *** are based on the bootstrap-t p-values and indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Figure A2: Parallel Trends After Removing Differential Pre-Trend



This figure shows point estimates and 95% confidence intervals from the dynamic difference-in-differences specification following Equation (2), estimated on trend-adjusted outcomes. The regression results can be found in Table A4 of the Appendix. We construct the adjusted outcomes in two steps. First, we estimate the differential linear trend between treated and control groups using only pre-reform data (2013—2016). Second, we subtract this trend, extrapolated over the full sample period, from the outcome of treated groups. We omit the year 2017 as reference year. Treated is an indicator variable equal to one if the insurance group met the statutory BEAT thresholds in 2017. These include average annual gross receipts of at least $500 million and a base erosion percentage of at least 3%. The dependent variables are the trend-adjusted ratios of reinsurance premiums ceded to four counterparty types, scaled by gross premiums written (GPW): foreign affiliates in Panel A, domestic affiliates in Panel B, domestic non-affiliated reinsurers in Panel C, and foreign non-affiliated reinsurers in Panel D. Because the differential trend is itself estimated, confidence intervals are constructed from a two-step cluster bootstrap-t procedure with 1,000 replications. In each replication, we resample insurance groups with replacement, re-estimate both steps, and compute studentized statistics for each coefficient. Note that the pre-reform coefficients lie close to zero partly by construction, since the trend is fitted to these years.

Table A5: Placebo Test

This table presents a placebo test by artificially shifting the treatment timing to a pre-reform period. The sample is restricted to the years 2013 through 2016, with 2016 assigned as a placebo treatment year. The year 2015 serves as the omitted baseline for all specifications. We re-estimate the event-study specification in Equation (1), where the dependent variable is the ratio of premiums ceded to gross premiums written (GPW). Columns partition cessions by counterparty type: (1) foreign affiliates, (2) domestic affiliates, (3) domestic non-affiliates, and (4) foreign non-affiliates. *Treated* is an indicator variable equal to one if the insurance group met the statutory BEAT thresholds in 2017. These include average annual gross receipts of at least $500 million and a base erosion percentage of at least 3%. The absence of systematic significance across all counterparty types in this table increase the validity of our primary results. Control variables are *Size*, *Leverage*, *LOB Concentration*, *CatRisk*, and *Return on Equity*. Variable definitions are provided in Table 2.

	Foreign Affiliates	**Domestic Affiliates**	**Domestic Non-Affiliates**	**Foreign Non-Affiliates**
	(1)	(2)	(3)	(4)
Treated x 2016	0.033	0.004	−0.006	0.001
	(0.023)	(0.032)	(0.010)	(0.008)
Control variables	yes	yes	yes	yes
Group fixed effects	yes	yes	yes	yes
Time fixed effects	yes	yes	yes	yes
Observations	220	220	220	220
Adjusted R^2	0.907	0.932	0.816	0.951

Notes: All continuous variables are winsorized at the 5th and 95th percentiles. Standard errors are in parentheses and clustered at the insurer group level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table A6: Geography of Affiliated Reinsurance

This table reports the ten largest destination countries for affiliated reinsurance cessions by U.S. property-casualty insurance groups in our sample in 2017 and 2018. Premiums are aggregated in USD thousands across all sample groups ceding to affiliates domiciled in each country and expressed as a share of total affiliated reinsurance cessions in that year.

2017			2018		
Country	**Premiums (USD)**	**Share (%)**	**Country**	**Premiums (USD)**	**Share (%)**
Bermuda	23,146,456	50.28	Bermuda	12,895,621	73.72
Switzerland	16,337,964	35.49	Germany	1,598,805	9.14
Germany	2,513,977	5.46	Switzerland	577,440	3.30
Cayman	1,167,207	2.54	Cayman	570,104	3.26
France	744,738	1.62	Japan	435,360	2.49
Japan	444,216	0.96	Turks & Caicos	362,612	2.07
Ireland	379,251	0.82	France	294,872	1.69
Turks & Caicos	364,318	0.79	United Kingdom	206,330	1.18
Malta	265,465	0.58	Spain	170,493	0.97
United Kingdom	221,312	0.48	Canada	131,516	0.75

Table A7: Tax Sensitivity of Foreign Affiliate Reinsurance: Alternative Treatment Variable

This table replicates the baseline difference-in-differences estimates of Table 3 using the adjusted definition of the treatment variable used in the 2SLS decomposition of Table 8. The dependent variable is the ratio of reinsurance premiums ceded to foreign affiliates to gross premiums written (GPW). The treatment indicator *Treated* equals one if the insurance group (i) met the statutory BEAT thresholds in 2017, comprising average annual gross receipts of at least $500 million and a base erosion percentage of at least 3%, and (ii) maintained at least one non-electing foreign affiliate in Bermuda, the Cayman Islands, or Switzerland in the pre-reform period. *Post* is an indicator variable for the years 2018–2022. Column (1) reports the baseline DiD coefficient without covariates. Column (2) includes the full set of insurer-level controls and group and year fixed effects. Column (3) replaces *Post* with year-specific treatment interactions to examine the dynamic adjustment process. Control variables are *Size*, *Leverage*, *LOB Concentration*, *CatRisk*, and *Return on Equity*. Variable definitions are provided in Table 2.

	Reinsurance Foreign Affiliates		
	(1)	(2)	(3)
Treated x Post	−0.104**	−0.108***	
	(0.042)	(0.038)	
Treated x 2018			−0.148***
			(0.045)
Treated x 2019			−0.100**
			(0.041)
Treated x 2020			−0.095**
			(0.042)
Treated x 2021			−0.105**
			(0.040)
Treated x 2022			−0.094**
			(0.041)
Treated	0.090*		
	(0.053)		
Post	−0.068***		
	(0.022)		
Constant	0.188***		
	(0.036)		
Control variables	no	yes	yes
Group fixed effects	no	yes	yes
Time fixed effects	no	yes	yes
Observations	550	550	550
Adjusted R^2	0.091	0.783	0.783

Notes: All continuous variables are winsorized at the 5th and 95th percentiles. Standard errors are in parentheses and clustered at the insurer group level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.