MiFID II Research Unbundling: Cross-border Impact on Asset Managers*

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ABSTRACT

MiFID II requires EU-based asset managers to separate payments for research from execution costs in trading commissions. Under this unbundling rule, asset managers must either explicitly charge research costs to investors or absorb these costs internally. We model the impact of this regulation and find that it creates a "pecuniary incentive" for global asset managers to use non-EU client commissions to subsidize the cost of European research. Supporting this regulatory arbitrage hypothesis, we provide empirical evidence that the unbundling rule for mutual funds operating in Europe is associated with an increase in bundled commissions generated by their U.S. counterparts. Specifically, U.S. funds with an EU twin (an EU-based fund managed by the same team and following the same investment style) exhibit higher bundled commissions after the regulation. In turn, EU twins benefit from this cross-subsidization by achieving higher risk-adjusted returns while maintaining similar management fees and trading activity. Our findings suggest that agency costs are not mitigated but merely shifted from more regulated to less regulated markets. We conclude that effective trading commission disclosure regulation in global financial markets requires internationally coordinated actions.

JEL classification: G11, G20, G23, G24, G28

Keywords: MiFID II, soft dollars, research unbundling, mutual fund, institutional investors, equity research, brokerage commissions, cross-border regulations, global financial markets

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1 Introduction

MiFID II, the second Markets in Financial Instruments Directive, took effect across the European Union on January 3, 2018.[1] It constitutes a new regulatory framework for financial markets, agents, and transactions in the Union. One of the most prominent (and contested) rules included in the directive is the requirement for EU investment advisors to unbundle their brokerage research expenses from their trading costs. While the issue of commission bundling or "soft dollars" has been a subject of debate among regulators, practitioners, and academics for more than three decades[2], the new restrictions imposed by MiFID II constitute one of the most dramatic changes implemented in regulatory history. Specifically, if they want to continue to use investor assets to pay these research costs, they must disclose them via a Research Payment Account (RPA), or interalize them. To the surprise of many industry observers, the vast majority of investment advisors chose to interalize them rather than passing these onto investors through the use of RPAs.[3]

Regulators expected the new restrictions imposed by MiFID II to foster increased transparency in fee setting and improve accountability among asset managers. Proponents of the regulation argued that greater transparency or internalization would result in trimming unnecessary research expenses and potentially curbing agency conflicts inherent in bundling. However, we provide evidence that global asset managers engage in regulatory arbitrage by using non-EU client commissions to subsidize the cost of EU research.[4] Specifically, we show that the unbundling rule for mutual funds operating in Europe is accompanied by an increase in both total and per trade bundled commissions generated by

[1] Directive 2014/65/EU of the European Parliament and of the Council of the EU, May 15, 2014.

[2] See Bender et al. (2021) for a review of both the academic literature on soft dollars as well as the global regulatory history.

[3] Even Fidelity International (who originally defended them) gave up on using an RPA and finally decided to assume research costs internally. See "The definitive list of asset managers that will pay for research" Financial Times, February 22, 2018.

[4] Investment advisors warned regulators that commission subsidization was a likely outcome of the EU regulation. For example, in her October 16, 2018 letter to the SEC regarding their MiFID II regulatory response, Heidi Hardin, General Counsel of MFS, mentioned the "conflict of interests" it created giving global investment advisors "pecuniary incentive for money managers to pay for research using client commissions of non-EU clients or with respect to accounts no managed within the EU."

their US counterparts (i.e., a US-based version of the fund with the same management team and investment style).

In addition to documenting this regulatory arbitrage, our setting gives a unique insight into the performance impact of bundled expenses. On the surface, the initial MiFID II unbundling requirement appears as an ideal experimental design because EU funds that previously bundled research and execution costs are now required to pay for research separately from execution services and either charge clients transparently or pay for research themselves. If researchers could observe the amount of bundled research costs before and the amount of research costs expensed after, along with performance measures before and after the change, this would give important insight into the potential agency costs associated with bundling. However, this approach is not feasible because data on the breakdown of research costs for EU funds before the regulatory change are scarce, and virtually all asset managers choose to absorb these costs rather than explicitly disclose them after the regulation. Therefore, researchers have little to no insight into how these research expenditures changed due to the regulation.[5] However, using variation in access to bundled US commissions (only available to European funds with a US twin) and the estimated cost of those commissions, we are able to test, first, the impact of the regulatory ban on bundled commissions on the provision of equity research and, second, its effect of fund performance, both for investors in US and EU twin funds.

As a first step, we model the choices of investors, fund managers, and brokers regarding commission bundling building on the seminal model of Berk and Green (2004). We incorporate trading commissions optimally chosen by revenue maximizing brokers and extend the model to a two-country setting where twin funds split their research costs. The model rationalizes the choice of funds to internalize non-observable equity research expenses to minimize red-tape and compliance costs. Additionally, it generates three predictions which form the basis for

[5]In conversations with European supervisory agencies like the Spanish CNMV, it became clear that even in the reserved financial statements privately filed by management companies to the regulator, research expenses are not singled out when they are expensed. This is even more obvious in the public statements disclosed by the management companies, where any mention of research expenses we found only refers to aggregated amounts.

our empirical analysis. The first hypothesis is that EU funds with twins will shift commission bundling to their US counterparts. The second hypothesis is that European funds will decrease their total research expenditures. Consequently, despite the increase in soft dollars after MIFID II, US twin funds will underperform similar US funds without twins. The third hypothesis is that, thanks to the shift of commission bundling to the US, European twin funds will outperform similar European funds without twins.

We test these hypotheses using a sample of 2,352 unique US-domiciled funds that belong to 454 fund families from 2014 through 2019. This translates into a total of 11,927 fund-year observations. We then combine the sample of US-domiciled funds with a sample of 4,357 unique EU-domiciled funds over the same period, resulting in a total combined sample of 34,332 fund-year observations. To test the first hypothesis from the model, we compare changes in commissions for US funds with EU-based twins (treatment group) to those without (control group) around the 2018 MiFID II implementation date in a difference-in-differences (hereafter DiD) framework. Under the null hypothesis, in the absence of research cost cross-subsidy, the difference in soft dollars between both groups should not widen after 2018. Otherwise, if the null hypothesis is rejected, funds exposed to the unbundling regulation through their EU counterparts will charge higher brokerage commissions after MiFID II becomes effective in the EU.

Our tests strongly reject the null hypothesis. The average US fund an EU-twin increases total commissions (as a percentage of the fund TNA) by 3.3 basis points (bps) relative to non-twin US funds after MiFID II becomes mandatory. This increase is statistically (at the 1% level) and economically significant (47% of the sample average). In terms of trading volume, investors in US twin funds increase their commission rate by 6.5 bps per trade after MiFID II (100% of the sample average and significant at the 1% level). It is interesting to compare this figure with the estimates from the brokerage commissions data (from 2001 to 2014) in Di Maggio et al. (2022) where the average "investment manager would be willing to pay an additional 3 bps per trade to have access to sell-side research." Only 10% of their investors would be willing to pay more than 7 bps per trade for sell-side research. Even

assuming that all the sell-side equity research was bought by the European twin funds before MiFID II and that this expense was fully transferred to the US twin funds after MiFID II, our estimates suggest that either sell-side research is considerably more expensive than previously estimated or soft dollar arrangements impose potentially large agency costs on US investors. Our performance tests will help to distinguish between these two possibilities.

We confirm the robustness of these findings through several tests. The results hold when measuring commission payments as a commission rate (commissions scaled by trading volume). However, the results disappear in a placebo test when European twin funds are replaced with Canadian twin funds (not affected by MiFID II). They also hold when including fund fixed effects, accounting for the difference in TNA between the twin funds,[6] and when splitting the fund investment objectives into global and US domestic investments.[7] Consistent with the hypothesis that this increase in commissions is caused by the transfer of research cost payments to US funds, we find that the results are concentrated among US funds that use soft dollars. We do not observe an effect on commissions for funds that do not pay soft dollars prior to 2018. Additionally, we find that the increase in commissions is not accompanied by either an increase in trading volume or a decrease in fund size.

Our empirical strategy also provides a unique setting to examine the potential impact of the reform on the provision of equity research. Informed by the model's second hypothesis, we explore the implications of prohibiting the bundling of research and trading costs in Europe for the provision of equity research. Prior to the reform, many asset managers voiced their concern about the adverse effect of banning soft dollars for the incentives for equity research, particularly among small and less liquid stocks, and the presumably negative effect this would have on the value added to investors (e.g., BloombergBriefs, 2017). Although there is evidence of the effect of MiFID II on the quantity and quality of sell-side of equity research partially consistent with these predictions (e.g., Fang et al., 2020; Lang et al., 2024), there is no direct

[6]If the size of the Euro twin is small (large) relative to its US counterpart, only a small increase (a large increase) in bundled commissions would be required by the US twin in order to replace commission dollars. We capture this relationship in the results shown in Table IA.3

[7]Funds with a global mandate are likely to have higher total bundled commissions. As a result, EU funds with a global mandate would require a higher rate of commissions subsidization from their US twin. We test and find supportive evidence of this hypothesis in Table IA.5

estimate of the effect on fund performance. Our empirical strategy allows us to estimate the performance of US twin fund investors relative to similar US funds without twins after MIFID II banned soft dollar commissions for all European funds. Conversely, based on the predictions of the model's third hypothesis, we can estimate how much European twin funds profited from the equity research acquired with the extra soft dollars spent by their US twins, hence testing whether (and to what extent) bundled commissions add value to investors.

To test these hypotheses, we employ a triple DiD approach to compare, respectively, the performance of US (alternatively, European) twin funds with that of US (alternatively, European) funds without twins, following the implementation of MiFID II. To measure performance, we estimate alphas from a global 4-factor model including the three global Fama-French factors and a global momentum factor, using both net (after-fee) and gross returns. Under the null second hypothesis (i.e., no loss in equity research after MiFID II), US funds with and without twins should not differ in net performance after MiFID II. Our results clearly reject this hypothesis: US funds with twins underperform similar US funds without twins by 1.12% per year after 2018. These estimates are significant at the 1% level and quantitatively and qualitatively similar using gross returns. This suggests that US twin funds did not decrease their management fees and expenses to compensate for the increase in soft dollars, a hypothesis that we formally test and cannot reject.

Finally, under the third null hypothesis (i.e., no transfer of research costs after MiFID II across the Atlantic), European investors should not benefit from MiFID II unbundling(Fröberg and Halling, 2023). Under the alternative hypothesis, the cross-subsidy of research costs gives European funds with US twins research information paid by US funds. That should translate into higher fund performance for European twins relative to similar European funds without twins. Our results reject the null hypothesis in favor of the alternative. EU funds with twins outperform similar EU funds without twins by approximately 1% after MIFID II, both in terms of net and gross performance (all estimates significant at the 1% level). We show that these results are robust to the introduction of family and fund fixed effects and that they only arise among twin funds that used soft dollars to pay for research prior to MiFID II.

In addition to the literature on soft dollars previously discussed, we contribute to several other strands of literature. First, we add to the existing literature on the production of information in financial markets (e.g., Veldkamp, 2006a,b; Van Neieuwerburgh and Veldkamp, 2010). Several recent papers have used MiFID II to explore the impact of separating research from execution costs on the quantity and quality of research produced by analysts (e.g., Pope et al., 2019; Fang et al., 2020; Guo and Mota, 2021; Lang et al., 2024). For example, Guo and Mota (2021) show that unbundling leads to fewer research analysts covering a given firm, which supports the rationalization of research expenses. According to their evidence, the research market is undergoing a concentration process in which only the best analysts survive. This competition will likely push up the quality of research and, arguably, fund performance. In addition, Fang et al. (2020) and Lang et al. (2024) find that a reduction in sell-side coverage is accompanied by an increase in buy-side research quality and effort. In contrast to these studies, we shift the focus from analysts to asset managers and their clients. Our sample data enables us to implement a DiD methodology to identify and quantify the impact of the unbundling rule on research cost and fund performance.

We also contribute to the theoretical literature that models the compensation of financial intermediaries (like advisors or brokers) and the potential conflicts of interest between these agents and fund management companies. Common to this literature, we assume that investors (or a large fraction of them) are unsophisticated (Stoughton et al. (2011)) or naive (Inderst and Ottaviani (2012)). Investors underestimate or ignore the potential biases in the provision of services induced by the rebates or bundled commissions brokers charge to fund investors, and this results in fund underperformance. Similar to the model of Inderst and Ottaviani (2012), we predict the adverse consequences of banning soft dollars without imposing sufficient disclosure of (internalized) research expenses on fund management companies. Our model, however, focuses on cross-border subsidies and their performance implications which is readily testable in the context of MiFID II.

We also contribute to the literature on hidden fees (e.g., Barber et al., 2005; Busse et al., 2021) and the role of transparency in resolving agency conflicts in delegated investment

management (e.g., Edelen et al., 2012). These papers study fee disclosure decisions in the context of agency conflicts between asset managers and their clients. In our case, the increased disclosure is exogenously imposed through a regulatory change that affects global asset managers offering EU-domiciled funds. Our results quantify the unintended agency costs of banning bundled commissions without simultaneously imposing more thorough disclosure of the internalized research expenses, in line with the conclusions of Edelen et al. (2012) and Inderst and Ottaviani (2012).

Finally, our paper contributes to the literature on regulatory arbitrage among financial intermediaries. While this literature has typically focused on banks (e.g., Houston et al., 2012; Agarwal et al., 2014), our results confirm the existence of such regulatory arbitrage among investment advisors and highlight the importance of international coordination in mutual fund regulation as well.

The rest of the paper proceeds as follows. Section 2 discusses the institutional setting. Section 3 presents our theoretical framework and derives empirical testable implications. Section 4 describes the process of building the data and presents summary statistics for our sample. Section 5 analyzes the impact of unbundling brokerage research expenses and trading costs on commission payments. Section 6 discusses the empirical results on performance, expense ratios, and turnover. Section 7 offers the conclusions.

2 Institutional setting

Before MiFID II, most European asset managers paid for research expenses via commission bundling (e.g., McKinsey&Co., 2017). Specifically, the asset manager would pay commissions above an 'execution only' cost (also known as "soft dollars") and this excess would accumulate and be used by the asset manager to purchase research. After MiFID II, for EU funds these bundled commissions must either be replaced with Research Payment Accounts (RPA) or internalized by the asset manager. Similar to bundled payments, the funding for RPAs would be taken from fund assets by the asset manager, but different than bundling, these research

expenses would be itemized and disclosed to the underlying fund investors. The amount of "red tape" involved in this process, the complexity of allocating research to specific funds, and the commercial and marketing pressure from asset managers' clients finally prevented most asset managers from adopting this option. Instead, most brokers and dealers decided to internalize their research costs.

With this change, EU regulators aimed to foster transparency in fee setting and improve accountability among asset managers who, arguably, by either expensing research costs or turning them into an explicit research fee, would internalize and rationalize such costs, hence trimming unnecessary research expenses, and curbing potential agency conflicts embedded in the bundled arrangements.[8]

For US broker-dealers providing research to EU investment managers, receiving hard dollars in exchange for research may constitute "special compensation" which, under the Investment Advisers Act, can only be provided by registered investment advisors. Registering, however, is not an alternative for these brokers since it imposes onerous compliance and reporting requirements and, ultimately, a change in their business model. The SEC solution was a "temporary exemption relief," originally allowed for 30 months after the January 3, 2018 implementation date, and later extended to July 2023, during which the SEC's Division of Investment Management "would not recommend enforcement action to the SEC if a broker-dealer provides research services that constitute investment advice under section 202(a)(11) of the Advisers Act to a Manager that is required to pay for the research services by using Research Payments."[9] This temporary period was enabled US firms to comply with the research payment requirement without substantially altering the treatment of those activities by the SEC. At he same time, this provided the SEC with an adequate evaluation period to analyze and better understand the impact of the research payment requirement on the firms' business practices. In a recent statement, William

[8] Asset managers, however, vehemently opposed the reform, arguing that the new rules would "commoditize" equity research and, as a consequence, specialized, value-adding research (particularly into smaller and less liquid stocks) would be in short supply. This would lead to lower fund performance than US funds, which still use predominantly soft dollars, ultimately harming EU fund investors.

[9] "Response of the Chief Counsel's Office Division of Investment Management" Investment Advisers Act of 1940 - Section 202(a)(11). Securities Industry and Financial Markets Association. October 26, 2017.

Birdthistle, SEC Director of the Division of Investment Management, announced that "the Division does not intend to extend the temporary position beyond its current expiration date in July 2023. Accordingly, the Division plans for the temporary position to expire on July 3, 2023, and does not expect to issue further assurances concerning the adviser status of broker-dealers accepting compensation under MiFID II arrangements."[10] On the European side, in February 2021 the EU Parliament and the Council approved a partial reversal of the unbundling requirement for the trading of stock issued by small and medium-sized enterprises (SMEs).[11] In particular, it stipulates that "investment firms should be allowed to pay jointly for the provision of research and for the provision of execution provided... the research is provided on issuers whose market capitalization did not exceed EUR 1 billion, as expressed by the end-year quotes, for the 36 months preceding the provision of the research."

3 Theoretical Motivation

In this section, we build a theoretical framework based on the models of Berk and Green (2004) and Berk and van Binsbergen (2015) to understand the potential implications of the rule to unbundle brokerage research expenses and trading costs for asset managers and their clients. Active fund managers can generate an expected excess return (above the benchmark return) before fees and expenses equal to $R(q) = a - bq$ per dollar of total net assets (TNA) q. This assumption captures the diseconomies of scale in managers' ability to find and exploit positive net present value investment opportunities in limited supply. The parameter $a > 0$ can be interpreted as the expected excess return on the first dollar of investment and $b > 0$ as the rate of decreasing returns to scale. Thus, the dollar value active management adds before fees and expenses will be $V = q(a - bq)$.

Producing a positive excess return requires costly investment in research. We assume the

[10] Remarks at the Practicing Law Institute, July 26, 2022.
[11] Directive 2021/338 of the European Parliament and the Council of 16 February 2021.

fund charges part of this cost in the management fee f per dollar of TNA.[12] Additionally, the fund uses a full-service broker that charges a percentage commission c per dollar of TNA in exchange for equity research and other services bundled with purely trading execution costs. Trading commissions are not included in the management fees. The broker charges "soft dollars" as a percentage c of the fund TNA q:

$$S(q) = qc \tag{1}$$

Thus, the expected excess net return after research expenses will be a function of the fund's TNA:

$$r(q) = a - bq - f - c \tag{2}$$

3.1 The effect of bundled commissions

Unlike management fees, mutual funds are not obliged to disclose soft dollar amounts to investors other than a simple yes/no indicator in a relative obscure filing (N-CEN). Mutual funds may disclose information regarding brokerage commissions (bundling execution and research costs) in their annual and semi-annual reports to shareholders. These reports summarize the fund's financial activities, including the costs associated with portfolio transactions, but are less prominent than management fees (i.e., Edelen et al. (2012)), which are reported in the prospectus. In the spirit of the unsophisticated (Stoughton et al. (2011)) or naive (Inderst and Ottaviani (2012)) investors assumed in the existing literature, we model this asymmetry of information in reduced form by assuming that investors only internalize a fraction $\delta < 1$ of the soft dollars charged by the broker.

Therefore, under asymmetric information, the net return expected by investors will be

$$r_\delta(q) = a - bq - f - \delta c \tag{3}$$

[12] For simplicity, we abstract in the model from other fees like the 12b-1 fee. In the empirical tests, we will consider all relevant explicit fees as part of the Total Expense Ratio (TER).

The difference between the actual net return in equation (2) and the investor's expected net return under asymmetric information in equation (3) is crucial for our results. Of course, for (3) to be possible in equilibrium, the under-estimation parameter δ must be pervasive across funds. Otherwise, underperforming funds would be competed away and disappear.

Like in Berk and Green (2004), we assume that investors supply capital to funds with perfect elasticity until the marginal expected net return equals zero. Given (3), $r_{\delta}(q) = 0$ implies that the dollar value of fund fees is equal to

$$qf = q(a - bq - \delta c) \tag{4}$$

Managers know that investors underestimate the true cost of research in soft dollars when they decide the size of the fund that maximizes the total dollar fees. Put another way, they maximize the right-hand side of the equation (4) over q. Solving this yields the optimal fund size as a function of c:

$$q(c) = \frac{a - \delta c}{2b} \tag{5}$$

Replacing (5) in to (4), we obtain the optimal fee rate that induces investors to supply the fee-maximizing capital in equation (5):

$$f(c) = \frac{a - \delta c}{2} \tag{6}$$

Equation (6) captures the inverse relation between fees and soft dollar commissions described by Livingston and O'Neal (1998) whereby "ideally, mutual fund management fees should be reduced to offset any non-brokerage services purchased with soft dollars." The *ideal* first best scenario would correspond to $\delta = 1$ in the absence of asymmetry of information. However, for $\delta < 1$, brokers are likely to have incentives to increase commissions. We explore this next.

Replacing (5) into (1) and maximizing over c yields the broker's optimal commission percentage that maximizes the brokers' soft dollars:

$$c(\delta) = \frac{a}{2\delta} \tag{7}$$

Equation (7) illustrates the agency costs of soft dollar arrangements. Let t denote the fund's turnover (dollar trading value as a percentage of the fund's TNA)[13] and r the commission rate per dollar of trading. Then $c = r \times t$. Under asymmetry of information and imperfect monitoring ($\delta < 1$), brokers are incentivized to increase c either by inducing higher portfolio turnover t or charging higher rates r.[14] Let

$$c(1) = \frac{a}{2}$$

denote the zero-inducement commission percentage. It corresponds to the equilibrium value of commissions when retail investors are perfectly informed about these costs. Thus, we can define the (percentage) commission inducement as follows:

$$i(\delta) = \frac{c(\delta) - c(1)}{c(1)} = \frac{1}{\delta} - 1 \tag{8}$$

The overcharging above $c(1)$ is larger when the asymmetry of information about bundling is higher or monitoring by the fund manager is weaker. In other words, when δ is smaller. Replacing (7) into (5) and (6), we obtain, respectively, the optimal fund size,

$$q^* = \frac{a}{4b}$$

and management fee

$$f^* = \frac{a}{4}$$

chosen by the fund manager. Notice that both q^* and f^* are independent of δ. In other words,

[13] While we use the term turnover in both the theory and empirical portions of the paper, it is important to note that in contrast to the definition provided here in the theoretical section, in the empirical section, we use the SEC definition (i.e., minimum of fund purchases and sales divided by average fund TNA).

[14] In the model, we are agnostic about which of these two channels (or, possibly, both) brokers may use to extract rents from fund investors, leaving this to be tested empirically.

the fund manager has no incentive to monitor the broker or make soft dollar disclosure more transparent. Regardless of δ, he always obtains the same (optimal) dollar fees

$$q^* \times f^* = \frac{a^2}{16b} \tag{9}$$

and adds the same (gross) value

$$V^* = q^*(a - bq^*) = \frac{3a^2}{16b} \tag{10}$$

to investors.[15] Given the definition of soft dollars in equation (1) and the inducement free commission $c(1)$, let us define the hard dollar function

$$H(q) = q \times c(1) \tag{11}$$

as the dollars the fund must pay to the broker for research (plus other services) without any inducement. Then,

$$H^* = q^* \times c(1) = \frac{a^2}{8b}$$

is the amount of hard dollars that a fund of size q^* would have to pay to the broker to add value V^* to investors without trading inducement:

$$V^* = q^* \times f^* + H^* \tag{12}$$

The fund's gross performance before management fees (gross alpha) would be

$$R^* = \frac{V^*}{q^*} = f^* + c(1) = \frac{3a}{4} \tag{13}$$

Equation (13) shows the two sources of the fund's gross performance: the research and skill

[15] To simplify, we are ignoring the additional indirect benefits that managers may obtain from brokers in exchange for inducements such as paid trips or other perks. This would only add to the unwillingness of portfolio managers to reduce overpaying in commissions.

provided internally and appropriated by the fund through the management fee f^*; and the research acquired externally to the broker with value equal to the inducement-free commission $c(1)$. Therefore, without inducement, the expected net performance would be zero.

With bundled commissions, however, fund investors suffer the cost of suboptimal commissions by paying soft dollars ΔS above H^*. Given the trading inducement defined in equation (8) and the zero-inducement research expense H^*, we define ΔS as:

$$\Delta S = S(q) - H^* = H^* \left(\frac{1}{\delta} - 1 \right) = H^* \times i(\delta) \tag{14}$$

ΔS is a dollar transfer of value added from fund investors to the broker. The loss in value added is higher for smaller δ. That is, when the asymmetry of information regarding soft dollars is higher. Arguably, this is the motivation behind the ban on bundling equity research and execution costs in trading commissions introduced by MiFID II. Since fund managers have no incentive to internalize the costs of the broker's inducement to overtrade, this must be imposed by the regulator.

After MiFID II became effective in January 2018, fund managers in the European Union (EU) cannot buy research with soft dollars. Any research cost must be either charged to investors through explicit Research Payment Accounts (RPAs) or internalized and paid to the broker by the fund with hard dollars (i.e., independently from the fund's turnover). In the Appendix we show that, comparing both alternatives, we can derive the following results.

Proposition 1 *If equity research expenses were observable, fund managers and investors would be indifferent between (i) internalizing research costs and paying higher management fees and (ii) passing research expenses to investors in exchange for a lower management fee. In both cases, managers would obtain the same profit, add the same value to investors, and yield the same return.*

Internalized research expenses, however, are not observable. This introduces a new agency problem. The following corollary shows that if non-observable, internalized research expenses are cut, this should be reflected in the fund's value added to investors.

Corollary 1 *Funds that cut non-observable research expenses after internalizing them in compliance with MiFID II unbundling regulation will experience a loss in value added and underperform.*

3.2 Testable hypotheses

The model suggests that EU regulators correctly understood the agency costs associated with bundled commissions. By banning the bundling of trading and research costs, they expected to curb inducement and the associated excessive commissions. However, the EU regulator overlooked the effect of asymmetric information when regulating the choice between internalizing research costs or passing them to shareholders through RPAs. In the first-best scenario, with observable research expenses, Proposition 1 shows that funds and investors would be indifferent between both options. At the margin, funds may prefer to internalize and expense research if this saves compliance costs and red tape, for instance. This could explain why virtually all funds chose to internalize research expenses. In that case, investors would expect higher management fees when research is expensed by the fund. In either case, the added value to shareholders would be the same. Unfortunately, these predictions are not testable because, except for some anecdotal cases, EU funds decided to internalize research expenses after 2018.

On the other hand, Corollary 1 shows that funds may decide to cut non-observable research expenditures after internalizing them. We test this hypothesis using *twin funds*: funds with the same management team and the same objective commercialized both in the EU (hence subject to the MiFID II ban on soft dollars after January 2018) and the US (unaffected by the regulatory change).[16] Twin funds constitute our treatment sample. The control includes similar funds without twins.

Treatment and control funds may differ in size and research expenses. Therefore, we use the superscript T (alternatively, C) to denote treatment (alternatively, control) funds.[17] We

[16]The assumption of the same management team and the same investment objective implies that twin funds can add the same value to fund investors, provided the necessary amount of research money is spent.

[17]We drop the superscript $*$ to simplify the notation. All variables are assumed to be optimal set in

use subscript 0 (alternatively, 1) to denote before (alternatively, after) MiFID II.

Before MiFID II, we assume that (treatment) twin funds split research costs (paid to the broker through soft dollars) between the US and the EU as follows. A percentage μ_0 of research is spent by the US fund, and the remaining $1-\mu_0$ by the EU fund. According to equation (14), to acquire the equivalent to H^T in hard dollar research, US fund investors pay $\mu_0 H^T \times (1+i^T(\delta))$ while EU fund investors pay the remaining $(1-\mu_0)H^T \times (1+i^T(\delta))$ in soft dollars to their respective brokers. Control funds (without twins), both in the EU and the US, assume the entirety of their research expenses for which they pay $H^C \times (1+i^C(\delta))$ in soft-dollar commissions. Therefore, according to equation (13), the gross return of US and EU treatment (alternatively, control) funds will be $f_0^T + c(1)$ (alternatively, $f_0^C + c(1)$).[18]

After MiFID II, US twin funds buy equity research worth $\mu_1 H^T$ dollars, for which they pay $\mu_1 H^T(1+i^T(\delta))$ in soft dollars to the broker. US funds without twins are not affected by MiFID II; hence, we assume they still buy equity research worth H^C dollars after 2018 and pay $H^C \times (1+i^C(\delta))$ dollars in soft commissions. EU funds (both with and without twins) must internalize research; treatment EU funds spend (non-observable) $\tau_1 H^T$ dollars while similar control EU funds spend $\tau_1 H^C$ dollars in equity research. Thus, after MiFID II, the gross alpha of both twin US and EU fund investors is $f_1^T + (\mu_1+\tau_1) \times c(1)$, with $\mu_1 + \tau_1 \leq 1$. For investors in US control funds it is $f_1^C + c(1)$ while for EU control funds it becomes $f_1^C + \tau_1 \times c(1)$.

Under these assumptions, we can estimate the expected difference (before and after MiFID II) in the difference in commissions between treatment and control US funds:

$$\Delta C^{US} = (\mu_1 - \mu_0)(1+i^T(\delta))H^T \tag{15}$$

For our empirical tests, it is more convenient to express equations (15) as a percentage of

equilibrium. In the empirical tests, we will control for differences in management fees and other standard dimensions like turnover or fund size that may differ across treatment and control funds as well as EU versus US funds.

[18] To simplify the notation, we assume that the US and EU funds have the same management fees. In the empirical tests, gross performance is calculated adding back the actual fund's Total Expense Ratio (TER) times the fund's total net assets to the fund's net performance.

the fund TNA. Therefore, we define

$$\frac{\Delta C^{US}}{q^T} = (\mu_1 - \mu_0)(1 + i^T(\delta)) \times c(1) \tag{16}$$

as the increment (after MiFID II) in the soft dollars percentage commission (relative to the fund TNA) of US treatment versus control funds. Under the null hypothesis, there is no transfer of research expenses from EU funds to their US twins after MiFID II ($\mu_1 = \mu_0$) and there is no variation in the difference between percentage commissions ($\Delta C^{US}/q^T = 0$). Under the alternative hypothesis, there is regulatory arbitrage ($\mu_1 > \mu_0$). Then $\Delta C^{US}/q^T > 0$ measures the increment in percentage commissions transferred to US twins after MiFID II.

Next, we estimate the difference (after MiFID II) in the difference in expected gross return between treatment and control US funds:

$$\Delta\, R^{US} = f_1^T - f_1^C - (f_0^T - f_0^C) + (\mu_1 + \tau_1 - 1) \times c(1) \tag{17}$$

According to (17), the difference in gross return between US treatment and control funds after MiFID II can be broken down in two components: the change in the difference in management fees, $f_1^T - f_1^C - (f_0^T - f_0^C)$, and the change in aggregate equity research expenses $(\mu_1 + \tau_1 - 1) \times c(1)$. The gross return of US twin funds relative to US control funds increases by $\mu_1 c(1)$ dollars (due to the soft dollars spent by US funds) net of the loss in research expense after MiFID II banned soft dollars in the EU, $(1 - \tau_1) \times c(1)$. If, after MiFID II, EU treated funds (with US twins) do not cut their share in non-observable, internalized research expenses then $\mu_1 + \tau_1 = 1$ and the model predicts that there should be no variation in gross return between treatment versus control US funds. According to (17), the difference in gross returns between treatment and control US funds after MiFID II would then be change in the difference between management fees $f_1^T - f_1^C - (f_0^T - f_0^C)$. This is our null hypothesis in the second testable hypothesis. If rejected (i.e., if $1 - \tau_1 > \mu_1$), Corollary 1 predicts that treated US fund (with EU twins) should underperform (net of management fees) control US funds without EU twins after MiFID II.

Finally, we estimate the change post-MiFID II in return between treatment and control EU funds:

$$\Delta R^{EU} = f_1^T - f_1^C - (f_0^T - f_0^C) + \mu_1 \times c(1) \tag{18}$$

Equation (18), predicts that if US funds stop sharing equity research with their EU twins after MiFID II ($\mu_1 = 0$) there should be no difference in gross return net of management fees between treated and control EU funds after 2018. This is the null hypothesis in the model's third prediction. Under the alternative hypothesis, when US funds keep on sharing their equity research with their EU twins after MiFID II ($\mu_1 > 0$), these funds should outperfom (net of management fees) control EU funds without twins.

We can then test the following three (alternative) hypotheses:

Hypothesis 1 *There is cross-border regulatory arbitrage between EU and US twins funds whereby the latter increase their soft dollar percentage commissions more than similar (control) US funds without twins after MiFID II.*

Hypothesis 2 *The increase in soft dollar commissions by US twin funds does not fully replace the decrease in (non-observable) equity research internalized by their EU twins. Thus, the performance net of management fees of US treatment funds decreases relative to that of similar (control) US funds without twins after MIFID II.*

Hypothesis 3 *EU treatment funds (with twins) outperform net of management fees similar control EU funds (without twins) after MiFID II.*

Notice that Hypothesis 1 motivates our empirical test of cross-border arbitrage across twin funds post-MiFID II. Hypothesis 2 motivates our test of the post-MiFID II decrease in total research expenditures and the associated performance impact on US investors. Finally, Hypothesis 3 motivates our test of the performance impact on EU fund investors in twin funds post-MiFID II.

4 Data

This section describes our approach to constructing the database and the necessary variables for our tests.[19] The initial sample consists of US and Europe-domiciled (including the UK) open-end equity mutual funds in the Morningstar database from January 2014 through December 2019. We merge the US-domiciled sample with a database of annual fund N-SAR and N-CEN fillings from SEC.[20]

4.1 Morningstar data

From Morningstar, we obtain fund-level data on monthly net returns, monthly total net assets (TNA), annual expense ratios, and annual portfolio turnover. The returns are net of fees, expenses, and brokerage commissions. We also use Morningstar to identify the country of sale, investment style, inception date, an index fund indicator, fund managers, and fund families of each fund in our sample. We use the country of sale to identify equity funds available for sale in the US and/or Europe.[21] We use the investment style category and index fund indicator to exclude index and sector funds. We use the fund's inception date to calculate the fund age and ensure that our findings are robust to incubation and backfill biases (Evans, 2010). Our final sample consists of actively managed, diversified global and US equity funds available for sale in the US and/or Europe with at least 36 months of return data. Because our analyses are at the fund-year level, we compute the average TNA and the cumulative annual return during the twelve months preceding the fund's fiscal year-end. Other variables like portfolio turnover, expense ratio, and qualitative characteristics at the fund, family, and manager level

[19] Table A1 in the Appendix contains a detailed description of the source and calculation for each of our variables.

[20] Registered investment companies are required to file Form N-CEN starting on June 1, 2018. Before that period, these investment companies were required by the Investment Company Act of 1940 to file N-SAR reports with the Securities and Exchange Commission (SEC) for the first six months period of the fiscal year (NSAR-A) and the entire twelve months of the fiscal year (NSAR-B). Our study focuses on the annual NSAR-B fillings from 20214-2017 and N-CEN from 2018-2019.

[21] Our sample of European countries includes Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Guernsey, Hungary, Iceland, Ireland, Isle of Man, Italy, Jersey, Latvia, Liechtenstein, Lithuania, Luxembourg, Andorra, Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland, United Kingdom, Gibraltar, Malta, Monaco, and San Marino.

are reported at the fiscal year-end. We obtain the fund family names to calculate the aggregate TNA at the family level and use the monthly net returns and TNA to calculate the fund's cumulative annual net flows.

4.2 Brokerage commission data

We extract all the annual N-SAR reports filed between 2014 and 2017 and N-CEN between 2018 and 2019, available through the SEC's Electronic Data Gathering, Analysis, and Retrieval (EDGAR) system and collected by WRDS. From these fillings, we retrieve the average net assets and aggregate brokerage commissions paid by the fund during the fiscal year and whether the fund paid commissions to broker-dealers for brokerage and research services ("soft dollar payments"). Because in the N-SAR reports, brokerage commissions are aggregated and reported at the registered investment company level (series), we also aggregate fund-level brokerage commissions reported in the N-CEN reports at the series level.[22] We use a proration algorithm to allocate brokerage commissions paid at the series level down to the fund level following Edelen et al. (2012); Gokkaya et al. (2023). In particular, we first sum the net assets managed by all the commissions-paying funds in the series and then scale the series' aggregate dollar commission payments by the aggregate series' net assets.[23] We assume that brokerage commission payments per dollar of net assets are similar across funds in the series.

4.3 Merged sample

The Morningstar and N-SAR/N-CEN databases are merged by linking the Morningstar fund identifier (FundID) with the registered investment company identifier (CIK). We start by collecting the CIK associated with each FundID, as reported by Morningstar. For funds in the Morningstar database with missing CIK, we obtain the associated CIK by following two

[22] A registered investment company or series consists of one or several funds within a family, generally grouped because of a common date of inception. When a series is initially registered with the SEC, it is assigned a CIK, a unique identifier across the EDGAR system.

[23] We identify commission-paying funds as those that significantly engage in trading activity with brokers and disclose an annual trading volume (purchases + sales of securities) of at least $1m.

additional matching procedures. First, we link the crsp_fundno−cik mapping file provided by CRSP with the crsp_fundno-FundID mapping file provided by Pástor et al. (2020). Second, we link share-class Morningstar (SecID) with a unique CIK via ticker, using the NSAR and NCEN linking CIK-ticker tables provided by WRDS and the SecID-FundID-ticker mapping file provided by Morningstar. If one of the SecIDs linked to a FundID is matched with a CIK, we assign that CIK to that FundID.

To be more conservative in our matching process, we drop all the cases in which our multi-step matching procedure leads to different CIKs for a given FundID. In addition, we require non-missing data for all variables used throughout our analysis. Lastly, we apply a winsorization technique to all the continuous variables at the fund-year level, setting the winsorization limits at the 1% and 99% levels. Our final sample includes 2,352 unique US-domiciled funds belonging to 454 fund families from 2014 through 2019. This translates into a total of 11,927 fund-year observations.

4.4 Descriptive statistics

Our identification strategy involves identifying twin funds managed by the same portfolio managers, under the same investment style, and available for sale in the US and Europe (including the UK). The indicator variable *Twin* takes the value of one if the fund is a twin fund domiciled in the US in a given year. We identify 514 unique US twin funds belonging to 133 fund families. Funds are classified by investment style: first, global versus domestic, and then within US domestic funds, large-cap, mid-cap, and small-cap. Large-cap funds are further divided into blend, growth, and value. Table 1 presents the number and style classification of US funds and families (total and twins) across all years in the sample. Panel A shows that our sample of total (twins) US-domiciled funds is fairly stable across our sample period, ranging from 1,878 (345) in 2014 to 1,948 (377) in 2019. Panel B reports our sample of funds across different investment styles. About 70% of the funds focus on US equities, while the remaining 30% have a global investment approach. Among the US domestic funds,

the sample ranges from 283 large-cap value funds to 454 small-cap funds. [24]

[Insert Table 1 about here]

The fund-level sample characteristics of US funds are reported in Table 2. The average US fund in our sample (Panel A) has $1.81 billion of TNA, belongs to a family with $56 billion of TNA, has an expense ratio of 1.17%, and a portfolio turnover of 59%. These funds have a cumulative annual net return of 10.8%, an annual gross (net) alpha of 1.22% (0.09%), are about 18 years old, and receive about 6.8% in annual net flows. The average US twin fund in our sample (Panel B) is larger ($2.88 billion) but belongs to smaller families ($52 billion). The expense ratio (1.13%), turnover (53%), annual net return (10.7%), age (20 years), and fund flows (6.6%) of the average twin fund are very similar to those of the average fund in the full sample. Their performance is, on average, lower, with an annual gross (net) alpha of 0.97% (-0.18%). [25]

The annual brokerage commissions variable is defined as the average dollar brokerage commission paid during the fiscal year as a percentage of the average net assets under management during the same reporting period (*Total Commissions (% TNA)*). In addition, we also construct the *Commission Rate (% Volume)*. In this case, the total dollar commissions are scaled by the fund's trading volume (in %). Trading volume is the product of the fund's turnover ratio and the fund's monthly average net assets during the fiscal year. Lastly, we define *Soft Dollar* as an indicator variable that takes the value of one for funds that have been paying commissions to broker-dealers for brokerage and research services during the four years before the regulation took place (2014-2017), zero otherwise. The average fund in the sample pays 7 bps of TNA and 6 bps of trading volume in annual brokerage commissions, virtually as much as twin funds pay. The median values are, respectively, 5 and 2 bps.

[24] For some of our analyses, we use data on EU funds. Table IA.1 in the Internet Appendix presents the same statistics for our sample of European funds. We should note that the number of US and EU twins in a given year does not need to coincide since a US fund may have more than one twin fund domiciled in Europe and vice-versa. Figure IA.1 in the Appendix provides an example of twin funds.

[25] See Table IA.2 for similar descriptive statistics on our sample of EU twins.

Interestingly, we also observe that about 80% of the funds paid soft dollar commissions to broker-dealers during the period before MiFID II took place. Thus, other than in their size, twin funds are, on average, comparable to the rest of the funds in our sample. The larger size of twin funds was expected as one of the potential reasons to offer similar funds in other geographical areas is the higher demand for these funds.

[Insert Table 2 about here]

5 The impact of MiFID II on brokerage commissions

In this section, we test Hypothesis 1 from our model: US mutual fund management companies raised commissions of US funds after January 2018 (post-MiFID II) to cross-subsidize the research costs of their European-counterparts. To test this prediction, we follow a difference-in-differences identification strategy. The first difference is the regulatory shock: the MiFID II regulation on unbundling research and execution costs effective after January 2018 in Europe. The second difference is between *treated* funds (US twin funds) and similar *control* funds (US funds with the same style and similar characteristics but without European twins).

We proceed as follows. First, in subsection 5.1, we present the baseline results of our test of Hypothesis 1. Second, in subsection 5.2, we examine how the results vary if we focus only on the subset of US funds that used soft dollars to pay for research before MiFID II. Third, in subsection 5.3 we present the results of a placebo test in which EU twin funds are replaced with Canadian twin funds, unaffected by MiFID II. Finally, we conduct several robustness tests in subsection 5.4 and show that the baseline results remain qualitatively the same.

5.1 Baseline results

Before presenting and discussing our baseline regression results we examine the parallel trends hypothesis for the dependent variables between treatment and control funds before MiFID II. This is important since the original directive was approved in May 2014. Thus, there was

plenty of debate and discussion during this period until it became effective for all countries in the EU in January 2018.

This evidence is shown in Figure 1. The figure presents a time series analysis, plotting two lines to compare the aggregate brokerage commissions paid by the two types of funds over the sample period. The first line is a black solid line representing the treatment group of *twin funds* (US-domiciled funds with at least one EU twin during the fiscal year). The second line is a black-dashed line representing the control group of *other funds* (US-domiciled funds without any EU twin funds during the fiscal year). The x-axis of the graph represents the years of our sample. In the y-axis, we plot the aggregate brokerage commissions paid by the fund over the fiscal year scaled by either the fund's average net assets (Panel A) or trading volume (Panel B) during the same period. A vertical line at year-end 2017 allows us to visually compare the total commissions during the four years before against the two years after MiFID II became effective. It is clear that, no matter how total commissions are scaled, twin funds charged lower commissions than other funds every year before 2018 (although the difference in Panel A is quantitatively smaller than in Panel B). Both types of funds followed a very similar time series pattern before January 2018. Graphically, there is no evidence to reject the hypothesis of parallel trends. In 2018, however, twin funds exhibit an increase in commissions incurred which widens in 2019.

[Insert Figure 1 about here]

Given our failure to reject the hypothesis of parallel trends, we move to our baseline test. Specifically, to test Hypothesis 1 on commissions, we run the following regression:

$$Y_{i,t} = \alpha + \beta\, Twin_{i,t} \times Post_t + \gamma\, Twin_{i,t} + \delta\, X_{i,t-1} + \epsilon_{i,t} \tag{19}$$

where $Y_{i,t}$ is *Total Commissions* of fund i in year t either as a fraction of TNA or trading volume. *Post* is an indicator variable that takes a value of one in 2018 and 2019 (after the MiFID II directive became effective); zero otherwise. The indicator variable *Twin* takes value one if the US fund has a European twin fund with the same portfolio managers and investment

style; zero otherwise. $X_{i,t}$ is a set of control variables to ensure that we effectively compare similar funds, and δ is the corresponding vector of coefficients. The control variables include fund and family TNA, expense ratio, turnover, net return, age, and fund flows, all lagged one year. We also include *Style* and *Time* fixed effects (and, in a final specification, their product) and we cluster standard errors at the fund level.

Our object of interest in regression (19) is the coefficient β. In the model, β corresponds to the ratio $\Delta C^{US}/q^*$ in equation (16). Under the null hypothesis (i.e., no cross-subsidy between European and US funds), the model predicts that the coefficient on the interaction term, β, is not statistically different from zero. Under the alternative Hypothesis 1, it predicts that $\beta > 0$, that is, the difference in commissions between US funds with and without EU twins increased after MiFID II regulation became effective, even after controlling for fund style and a set of fund characteristics.

Table 3 presents the coefficients from regression (19) with total commissions scaled by TNA. In specification (1), we include only *Style* fixed effects. In specification (2), we add the control variables. We replace *Style* with *Time* fixed effects in the specification (3). In specification (4), we include *Time* and *Style* fixed effects, while in (5), both effects are absorbed by $Style \times Time$ fixed effects. The coefficient β on the interaction term $Post \times Twin$ is consistently 3.3 bps and significant at 1% across all specifications. Thus, the null hypothesis is rejected, and the (alternative) Hypothesis 1 is supported: total commissions as a percentage of the fund's TNA of US twin funds is 3.3 bps larger than that of similar US funds with no European twin after 2018. This difference is also economically relevant: the average total commission in the sample is 7 bps of TNA, so there is a 47% increase in total commissions.

[Insert Table 3 about here]

The results are qualitatively analogous when we consider total commissions as a percentage of trading volume in Table 4. The coefficient on the interaction term, in that case, is 6.3 bps which is slightly higher than the size of the average ratio of total commissions over volume in the entire sample, 6.0 bps Consistent with the graphs in Figure 1, commissions grow after

2018 for all funds (with a significant coefficient for the variable *Post* both in tables 3 and 4. However, this increase is much steeper for twin funds.

[Insert Table 4 about here]

Regarding the coefficients on the control variables, they are broadly consistent with those reported in previous cross-sectional analyses of commissions (e.g., Edelen et al. (2012) and Livingston and O'Neal (1998)). They are stable across specifications (2) through (5), regardless of the scale variable (TNA or trading volume). In Table 3, total commissions scaled by TNA are lower for larger families and funds with higher net return; they are higher for funds with higher expense ratios and higher turnover (all coefficients significant at the 1% level). Fund size, age, and fund flows are not statistically significant. The results in Table 4 are qualitatively similar. In general, as expected, funds that belong to larger families may profit from economies of scale by spreading out some fixed component in trade commissions, particularly if they are bundled with research expenses. They may also enjoy some discount by trading volume at the family level. It is interesting to note that these savings are not replicated at the fund level, suggesting that only scale at the family level matters when negotiating commissions. Livingston and O'Neal (1998) claim that the positive relation between expense ratio and commissions may reflect that funds charge higher management fees when they invest heavily in stocks with higher research costs (bundled with execution costs in the trading commissions), like small-cap stocks. Since we are controlling for investment style in the regression, this seem unlikely to be the full explanation. An alternative explanation is that funds that exert less cost control in curbing the total expense ratio (TER) are equally lax about reducing trading commissions. Thus, higher TER is associated with worse gross performance (Gil-Bazo and Ruiz-Verdú (2009)) and higher trading costs. Finally, as expected, funds with higher turnover (and, arguably, trading) pay higher total commissions (and to a lesser extent, higher commission rates).

While the regression analysis above captures the commission relationship before and after MiFID II, the annual coefficient estimates may be of interest as well. In Figure 2 we plot

the point estimates and the corresponding 90% confidence intervals of the difference in funds' brokerage commission payments between each year in our sample and the baseline year (2014) from a panel regression with *Style* fixed effects and lagged controls (*fund size, family size, expense ratio, fund turnover, net return, fund age, and fund flows*) for every year from 2014 through 2019. The x-axis of the graph represents the years of our sample. In contrast, the y-axis represents the difference in aggregate brokerage commissions paid by the fund over the fiscal year scaled by either the fund's average net assets (Panels A and B) or turnover (Panels C and D) during the same period. The vertical line at year-end 2017 allows us to visually compare the total scaled commissions during the four years before against the two years after the regulation was in place.

Before MiFID II, the point estimates for funds with twins decrease marginally relative to the baseline year 2014 until 2017. In 2018, after MiFID II, both total commissions as a percentage of TNA (Panel A) and commission rates as a percentage of trading volume (Panel C) increase significantly relative to 2014 values. These differences increase further in 2019. On the other hand, for funds without twins, and regardless of the scaling variable used (TNA in Panel B or trading volume in Panel D), commissions do not change relative to their values in 2014.

[Insert Figure 2 about here]

5.2 Soft dollars arrangements

US funds must disclose whether they pay commissions to broker-dealers that bundle research and execution costs ("soft dollars"). We conjecture that if, as predicted by hypothesis 1, there is a cross-subsidy from US funds towards their European twin funds after MiFID II banned soft dollars in Europe in January 2018, this should only appear among US twin funds that already engaged in "soft-dollar" practices at home before MiFID II.

Before presenting our regression test results, Panel A in Figure 3 shows that the total commissions (as a percentage of TNA) of US funds that used soft dollars to pay for research before January 2018 (represented by the red vertical line) show a different pattern in 2018

and 2019 if they have EU twins. Their total commissions increase significantly more than those of other funds without EU twins in those years. Before 2018, the total commissions charged by US funds without twins were slightly larger than those charged by funds with EU twins, although converging to the same rate by the end of 2017. On the other side, Panel B shows no significant difference in the pattern of total commissions of twins versus other funds neither before nor after 2018.

[Insert Figure 3 about here]

We reach the same conclusion when commissions are scaled by the fund's trading volume (commission rates) in Figure 4.

[Insert Figure 4 about here]

Building on the graphical results shown in these figures, we formally test the hypothesis above by including a triple interaction term in equation (20):

$$\begin{aligned} Y_{i,t} = \quad & \alpha + \beta\, Twin_{i,t} \times Post_t + \gamma\, Twin_{i,t} + \lambda\, Soft\, Dollar_{i,t} \times Twin_{i,t} \times Post_t + \\ & \phi\, Soft\, Dollar_{i,t} \times Twin_{i,t} + \theta\, Soft\, Dollar_{i,t} + \delta\, X_{i,t-1} + \epsilon_{i,t} \end{aligned} \tag{20}$$

Soft Dollar is an indicator variable that equals one if the fund paid commissions to broker-dealers for brokerage and research services in the four years before the regulation took place (period 2014-2017); zero otherwise. We add $Style \times Time$ fixed effects and adjust for serial correlation by clustering standard errors at the fund level. The results are reported in Table 5.

Our object of interest in regression (20) is the coefficient λ on the triple interaction term. As reported in specification (1) of Table 5, funds that paid research with soft dollars before 2018 charge an extra 5.5 bps in total brokerage commissions (as a % of TNA) after January 2018 relative to funds that also used soft dollars but have no EU twins. This difference is robust to the inclusion of control variables in the specification (2), and it is significant at the 1% level in both cases. Conversely, there is no statistically significant difference in commissions

after 2018 between funds with and without EU twins that did not use soft dollars to pay for research. Qualitatively, the conclusions are analogous when total commissions are scaled by trading volume in the specification (3): funds that pay soft dollars and have EU twins charge 10 bps higher commision rate. The same test finds no difference in commission rates after 2018 when funds did not use soft dollars before that year. These results are robust when we introduce the control variables in specification (4). Both in specifications (3) and (4), the coefficient on the triple interaction is significant at the 1%.[26]

[Insert Table 5 about here]

Table 5 not only shows that the commissions arbitrage is concentrated among funds that use soft dollars but also the economic magnitude is larger (5.5 bps). Given that the average size for twin funds that use soft dollars is $3,233.768 million, the increase in annual commission in dollar terms is almost about $1.8 million per fund. This magnitude is economically important, especially if we account for the fact that the average mutual fund generates about $3.2 million per year of value added (Berk and van Binsbergen (2015)).

In Figure 5 we plot the point estimates and the corresponding 90% confidence intervals of the difference in funds' brokerage commission payments scaled by TNAs between each year in our sample and the baseline year (2014) from a panel regression with *Style* fixed effects and lagged controls (*fund size, family size, expense ratio, fund turnover, net return, fund age, and fund flows*) for every year from 2014 through 2019. In Panels A and C, we only include funds that paid soft dollars prior to 2018. In Panels B and D we only include funds without soft dollars before 2018, represented graphically by the solid vertical line. We observe that only twin funds that paid soft dollars before 2018 in Panel A show commission increase significantly after MiFID II. For the rest, commissions do not change or (in the case of Panel D) even decrease after 2018.

[Insert Figure 5 about here]

[26]These results are also robust to measuring twin funds by the aggregate TNA of European twin funds associated with the fund. Table IA.3 in the Internet Appendix presents the results.

The conclusions are analogous when we measure commissions scaled by trading volume in Figure 6.

[Insert Figure 6 about here]

5.3 Placebo test with Canadian twin funds

To test the robustness of our results, we replace the indicator variable *Twin* in regression (19) with the variable *CA Twin* that takes value one when a US funds in our sample has a Canadian twin fund (same management team and investment style); zero otherwise. The variable *Post* is defined as before: it takes value one after the directive MiFID II became effective in January 2018; zero otherwise. In this "placebo test," there is no reason to expect that the coefficient β on the interaction term *Post* $\times$ *CA Twin* will differ from zero. The results are reported in Table 6. As expected, we cannot reject the null hypothesis of a zero effect of MiFID II on the commissions charged by US funds with Canadian twins after MiFID II became effective in January 2018. When the commissions are scaled by the fund's TNA, the coefficient is indistinguishable from zero in specifications (1) and (2) after introducing the control variables. The coefficients on the controls are the same as those reported in Table 3. When total commissions are scaled by trading volume in the specification (3), the coefficient β becomes negative and significant. However, this result is not robust to the inclusion of control variables in specification (4), after which it becomes statistically insignificant. Compared to Table 4, the coefficients on the control variables are the same. Therefore, MiFID II does not appear to mechanically impact the commissions of "any" US Twin fund. Only those whose research costs must unbundle from execution costs after the new regulation (that is, US fund with European twins).

[Insert Table 6 about here]

5.4 Robustness checks

Despite the controls introduced in regression (19), it may be argued that funds vary along other unobserved dimensions. Our difference in differences empirical strategy alleviates part of this concern. To further check the robustness of our findings, we introduce fund fixed effects together with $Style \times Time$ fixed effects and the same controls from equation (19). The results are reported in Table 7. In column (1), total commissions are reported in USD millions, in column (2) they are scaled by the fund's TNA, while in column (3) they are a percentage of the fund's trading volume. In all cases, the coefficients are significant at least at the 5% level. For the scale commissions, the coefficients are significant at the 1% level and slightly higher than those reported in the specification (5) of, respectively, Table 3 and Table 4, without fund fixed effects. In addition, we also analyze whether the boost in total commissions as a percentage of either TNA or volume is prompted by a decrease in either of these two variables, even if the dollar value of commissions did not change much. We show in columns (4) and (5), respectively, that the fund's (log) TNA and (log) trading volume did not change significantly more for twin funds after January 2018 relative to other funds without twins.

[Insert Table 7 about here]

Finally, we conduct three additional analyses to study the impact of the size difference between US and EU twin funds, the role of being part of a family with at least one twin fund, and whether having a more complex investment mandate (i.e., global funds) increases the probability of shifting commissions from EU to US-domiciled funds. The results are reported in the Internet Appendix. In addition to showing the results are robust in these analyses, we document three additional pieces of evidence regarding the economics underlying commission shifting. First, consistent with shifting, the larger the EU fund size relative to its US twin, the greater commission shifting we observe. This is consistent with the proportional allocation of research expenses to both funds before MiFID II, as assumed in the model. Accordingly, Table IA.3 shows that the larger the EU fund size, the more commission shifting is required after

bundling is prohibited in EU, in order to make up (at least partially) the research differential. Second, while being a twin fund has the strongest impact on the increase in US commissions, Table IA.4 documents spillover effects, meaning that even US funds without twins increase their commission payments after MiFID II if they are part of a fund family with at least one twin fund. This suggests that even though our twin setting is well identified, commission shifting may occur more broadly than just within twin funds. Finally, we show in Table IA.5 that the commission payments of US funds with a more global investment mandate are more affected by the unbundling rule, consistent with the idea that twin funds with global investments relied more on research covered by their foreign twins.

6 Fund performance and management fees

In the previous section, we showed that consistent with Hypothesis 1 from the model, there is evidence of regulatory arbitrage between twin funds: commissions have increased significantly in US funds with European twins after the MiFID II directive became effective in January 2018. This increase is concentrated in funds that employ soft dollar arrangements with their brokers and dealers. In this section, we test whether the underprovision of equity research by EU twin funds after bundling research and execution fees was banned by MiFID II since 2018 has resulted in, according to Hypothesis 2, the underperformance of US twin funds while, as predicted by Hypothesis 3, EU twin funds outperform thanks to the soft dollars levied on their US twins.

6.1 Fund performance

We estimate fund risk-adjusted alpha as a first step. We follow the standard procedure in the literature and estimate the four-factor risk-adjusted alphas per fund augmented by an aggregated developed markets return factor. We start with the Fama and French (1992) three-factor (FF3) model that includes the market, *small-minus-big (SMB)*, and *high-minus-low (HML)* risk factors. We add the momentum risk factor of Carhart (1997) into the FF4

model. Finally, the FF4 model is augmented with a Global risk factor in FF4 + Global. For every fund i and month t, we estimate alpha as follows:

$$\alpha_{i,t} = r_{i,t} - r_{f,t} - \sum_{f} \hat{\beta}_{i,t}^{f} Factor_{t}^{f} \tag{21}$$

where $r_{i,t}$ is the after-fees return of fund i in month t; r_f is the monthly yield on the one-year Treasury bill; $\hat{\beta}_{i,t}^{f}$ is the beta estimated with respect to the corresponding risk factor $Factor^{f}$, with f ranging from 1 to 5 (the FF4+Global alpha). Gross performance is calculated by adding back expenses (estimated as the product of the fund's TER $\times$ TNA). Betas are estimated using the last 60 monthly observations (with a minimum of 36 observations). Monthly alphas are annualized during the fund's fiscal year.

To test the model's predictions, we pursue a difference-in-differences strategy similar to the one we used to test Hypothesis 1. Specifically, we run the following regression:

$$\begin{aligned} Y_{i,t} = \quad & \alpha + \beta\, Post_t \times Twin_{i,t} \times USFund_i + \gamma\, Post_t \times Twin_{i,t} + \\ & \lambda\, Post_t \times USFund_i + \phi\, Twin_{i,t} \times USFund_i + \theta\, Twin_{i,t} + \delta\, X_{i,t-1} + \epsilon_{i,t} \end{aligned} \tag{22}$$

where $Y_{i,t}$ is, alternatively, the gross and net of fees alpha of fund i in year t.[27] $Twin_{i,t}$ is an indicator variable that takes the value of one if fund i in year t has a twin, zero otherwise. $Post_t$ is an indicator variable that takes a value of one in 2018 and 2019 (after the MiFID II directive became effective); zero otherwise. The $USFund_i$ variable equals one for funds domiciled in the US and zero for funds domiciled in the EU. $X_{i,t}$ is the same set of control variables (*fund and family TNA, expense ratio, turnover, net return, age, and fund flows*, lagged one year) included in previous regressions and δ is the corresponding vector of coefficients. We also include *Time* and *Time* $\times$ *Style* fixed effects to control for time-varying risk exposures, ensuring that the estimation of fund value added is not biased by differential risk factors across investment styles. Standard errors are clustered at the fund level.

The results are shown in Table 8. Specifications (1) and (2) present the results using gross

[27] To mitigate the large influence of outliers, we winsorize the performance variables at the top and bottom 3% of the distribution.

(before-fee) returns, while specifications (3) and (4) show the results using after-fee returns. Specifications (2) and (4) confirm that the results are robust after introducing the control variables.

The coefficients of interest are β and γ from regression (22). Under the null hypothesis, equation (17) predicts no change in aggregate equity research after MiFID II (i.e., $\mu_1+\tau_1 = 1$) and, therefore, no change in the difference of net performance between treatment and control US funds. Thus, under the null hypothesis, we expect the coefficient on the triple interaction term in regression (22) to be $\beta = 0$. The results clearly reject the null hypothesis and support the (alternative) Hypothesis 2. In specification (3), US funds with twins underperform (net of fees) relative to similar US funds without twins by 1.12% per year, significant at the 1% level. The estimates are robust after introducing the controls in specification (4). They are also economically significant since the average US twin fund has a net performance of -0.18% per year.

Looking now at the performance of EU funds, equation (18) predicts that if, under the null hypothesis, there is no cross-subsidy in equity research between US and EU twin funds ($\mu_1 = 0$) then the coefficient $\gamma = 0$ in regression (22). The alternative hypothesize is that the increase in commissions for US funds is, at least partially, a transfer of the research costs that used to be borne by the "European soft dollars" and became part of the "American soft dollars" after MiFID II. Under this hypothesis, the gross performance of the European twins should be higher than that of similar European funds without US twins since they would profit from the extra information bought with the "American soft dollars." The test clearly rejects the null in favor of the alternative Hypothesis 2. In specification (3), EU funds with US twins outperform EU funds without twins by 0.921% per year after MiFID 2. The outperformance increases to 0.987% after introducing the controls in specification (4). Economically, these estimates are relevant since, on average, EU funds with twins have an annual net performance of -1.57%.

When we add fees and expenses to the net returns to estimate gross performance, the coefficients reported in specifications (1) and (2) are, both quantitatively and qualitatively,

very similar, confirming that fund fees did not change significantly after MiFID II (we explicitly test this in Table 10).

[Insert Table 8 about here]

In summary, the estimation of regression (19) on commissions (reported in Tables 3 and 4) and regression (22) on performance (reported in Table 8) strongly supports our three Hypotheses. After MiFID II, there has been a considerable increase in commissions for US funds with EU twins (relative to those without twins): on average, a 50% increase as a proportion of the fund's TNA and double the size in terms of trading volume. However, this cross-subsidization in commissions only partially compensated the loss in equity research after EU funds internalized these costs following the implementation of MiFID II. Finally, every incremental dollar in bundled commissions let EU funds with twins outperform other EU peer funds without twins.

To test for the robustness of our findings reported in Table 8 we conduct one final test. To control for unobservable fund and family features we introduce additional fixed effects in regression (22). The results are reported in Table 9. Specifications (1) and (3) introduce *Style* $\times$ *Family* while in specifications (2) and (4) we add *Fund* fixed effects. We kep the same controls and cluster standard errors at the fund level. For both gross (specifications (1) and (2)) and net (specifications (3) and (4)) performance, all the relevant coefficients remain statistically significant at the 1% level. Economically, the estimates of β in equation (22) are even larger while the estimates of γ remain virtually identical to those reported in as in Table 8.

[Insert Table 9 about here]

6.2 Management fees and fund expenses

The commissions paid to brokers or dealers are not included in the fund's expense ratio. Therefore, US twin funds may compensate, at least partially, the increase in commissions by decreasing other expenses included in the TER. Additionally, Proposition 1 shows that

after MiFID II, EU funds could raise additional funds for research by raising management fees (explicitly included in the TER). We test for these possibilities by running the following regression:

$$\begin{aligned} TER_{i,t} = \quad & \alpha + \beta\, Post_t \times Twin_{i,t} \times USFund_i + \gamma\, Post_t \times Twin_{i,t} + \\ & \lambda\, Post_t \times USFund_i + \phi\, Twin_{i,t} \times USFund_i + \theta\, Twin_{i,t} + \delta\, X_{i,t-1} + \epsilon_{i,t} \end{aligned} \tag{23}$$

where $TER_{i,t}$ is the total annual expenses and fees divided by the year-end TNA. The independent variables are the same as in regression (22). We also introduce *Time* × *Style* and adjust for serial correlation by clustering standard errors at the fund level.

The results are reported in Table 10. We find no evidence of a change in TER for US or EU twin funds after MiFID II. This is consistent with the results reported for both gross and net performance in Table (8). Contrary to the first-best predictions of Proposition 1, there is no evidence that US funds partially compensated investors for the increase in soft dollars by decreasing fees or expenses. There is also no evidence that EU funds transferred research costs to their investors through higher TER. Our evidence suggests that total equity research spending was reduced after MiFID II and that, as predicted by Corollary 1, this resulted in a decrease of gross and net performance for US investors while EU investor profited from the US soft dollars without experiencing an increase in fees.

[Insert Table 10 about here]

7 Conclusion

While MiFID II contained multiple new regulations for EU financial markets, the unbundling of research and execution fees was one of the most controversial of these provisions. With security regulators and market participants in other countries, including the US, closely following the EU's commission experiment, the success or failure of this new regulation is of great importance for financial markets. From the outset, the two options granted to EU funds for paying for commissions, expensing them internally or passing them

on to investors, suggested the possibility of a compelling natural experiment examining the impact of different choices across investment advisors. However, with almost no investment advisors choosing to pass these expenses onto investors, this possible comparison never materialized.

To overcome this issue, we focus on an alternative channel for bundling research payments available to some, but not all, EU funds: their US twins. We find evidence that for EU funds with twins, their US counterparts increase their total commission spending (as a percentage of TNA) and their commission rate (as a percentage of trading volume). Without direct transfers from their EU counterparts to compensate them for such bundling, this incremental increase in commission spending constitutes an effective cross-border subsidization.[28] Our evidence in this well identified setting raises an additional question of how research costs are allocated across the many retail and institutional investor clients of global investment advisory firms, and whether they are all paying their fair share.

While this observed cross-subsidization raises issues of legality and fairness, it also provides us with a unique opportunity to measure the impact of bundled research payments on performance. Using the same regulatory shock, we find first that, supporting the concern voiced by many analysts and managers before the implementation of MiFID II, the unbundling of commissions resulted in a reduction of (internalized) equity research and, consequently, fund performance. Second, only part of this loss is compensated by the additional value generated by the extra soft dollars charged to US twin investors. As a result, our evidence does not suggest that the original level of bundled research payment was spurious.

Our analysis offers an important perspective on the regulation and pricing of equity research. As predicted by the the model and supported by the empirical tests, part of the loss in total equity research after banning soft dollars could be due to the option given to EU management companies to internalize research expenses without any disclosure

[28]These transfers would violate article 29 of the Commission Directive 2010/43/EU, which states that member should make sure that management companies only charge to their investors "regulatory levies or legal fees, which, by their nature, cannot give rise to conflicts with the management company's duties to act honestly, fairly and professionally in accordance with the best interests of the UCITS".

obligation. This unanticipated agency cost produced significant losses for investors, triggered a regulatory arbitrage in commissions, and resulted in asymmetric consequences for the performance of EU and US funds. We believe these conclusions will be helpful in (re)designing any future commissions unbundling regulation.[29]

[29]Consistently with the agency costs predicted by our model and supported in the empirical tests, the EU Commissions has recently open a consultation on the amendments to the research provisions in the MiFID II that would reintroduce the possibility of bundling research and execution costs as long as funds establish "a methodology for remuneration, including how the total cost of research is generally taken into account when establishing the total charges for investment services." ESMA Consultation Paper 35-335435667-5979 of October 28, 2024.

Appendix

Proof of Proposition 1

With bundled commissions, the fund's gross performance is given in equation (13). The net performance is defined as:

$$r^* = R^* - f^* - c(\delta) = -\frac{\Delta S}{q^*} = -\,c(1) \times i(\delta) < 0 \tag{A1}$$

We can interpret r^* in equation (A1) as the fund's underperformance due to the adverse incentives for trading inducement embedded in soft dollars. Notice that, as long as the asymmetry of information remains, investors will not learn about the hidden cost of inducement and the fund's underperformance. This can be shown replacing $c(\delta)$ in (3) which yields $r_\delta(q^*) = 0$. It could be argued that in a dynamic model, investors will eventually learn about this inefficiency and flee away from underperforming funds that would eventually disappear. As mentioned before, this inefficiency can remain in equilibrium if enough funds engage in soft dollar practices.

Let us consider now the first option in the proposition: passing research costs on to fund investors. In that case, investors pay (zero-inducement) hard dollars H^* to the broker through the fund.[30] The fund will collect fees $q^* \times f^*$ in equation (9). The fees charged by the fund plus the hard dollars collected from investors and passed to brokers sums up to the total value added V^* in equation (12). Since there is no inducement, $\Delta S = i(1) = 0$ in equation (A1). The fund's expected performance net of fees and hard dollars spent in external research will then be $r^* = 0$.

Let us now study the second option: the fund internalizes the research costs and pays for them. It is important to emphasize that, in this case, investors cannot monitor the money paid by the fund to the broker (or any other provider) for research. Let us assume that equity research costs were observable. This would correspond to a first-best scenario.

[30] In fact, the research expenses would be less than H^* if the latter also includes execution costs and charges for other services. These costs would be reduced from V^* without affecting the generality of our results and predictions.

The investor's net return after fees equals $r(q) = a - bq - f$. In equilibrium, money flows into the fund until $r(q) = 0$, implying that the management fee should equal $f = a - bq$. The fund, therefore, solves for the optimal size that maximizes dollar fees net of the hard dollars $H(q) = q \times c(1)$ it must pay for research. Let $\bar{q}$ denote the solution to this problem:

$$\max_q q(a - bq) - H(q)$$

It is immediate to see that the fund chooses a size

$$\bar{q} = \frac{a - c(1)}{2b} = \frac{a}{4b} = q^* \tag{A2}$$

and a management fee

$$\bar{f} = \frac{a + c(1)}{2} = \frac{3a}{4} > f^*$$

That is, when the fund internalizes research expenses, which are observable, the optimal fund size is the same as when the fund passes research costs to investors, but it charges them a higher management fee. Moreover, since $\bar{q} = q^*$, it follows from (11) that

$$\bar{H} = \bar{q} \times c(1) = H^*$$

The dollar fees collected by the fund net of the dollars paid for research are

$$\bar{q} \times \bar{f} - \bar{H} = \frac{a^2}{16b} = q^* \times f^* \tag{A3}$$

In other words, the fund's net profit would be the same if it passed research costs to investors. Finally, let $\bar{V} = \bar{q} \times \bar{f}$ denote the value added to investors when funds internalize research and pay for it. Since $\bar{H} = H^*$, it follows that, given (12):

$$\bar{V} = \bar{q} \times \bar{f} = q^* \times f^* + H^* = V^* \tag{A4}$$

That is, both alternatives add the same value to investors. Finally, given (A2), the fund's gross performance will be $\bar{R} = a - b\bar{q} = \frac{3a}{4} = R^*$ according to equation (13). Since there is no inducement, net performance is zero in both cases: $\bar{r} = \bar{R} - \bar{f} = r^* = 0$. *Q.E.D.*

Proof of Corollary 1

Let us assume first that the fund internalizes equity research (instead of passing it to shareholders) but decides to spend nothing on research. Let $\hat{a}$ be the maximum gross alpha the fund can produce *in-house* (i.e., without buying any *external* research) for the first dollar invested. In that case, given equation (5) and zero research commissions $c = 0$, the fund will choose an optimal fund size

$$\hat{q} = \frac{\hat{a}}{2b}$$

that will be obtained by charging, according to equation (6), a management fee rate

$$\hat{f} = \frac{\hat{a}}{2}$$

to investors. Assume first that $\hat{a} > a - c(1)$. Then, the fund would raise dollar fees equal to $\hat{q} \times \hat{f} > q^* \times f^*$. This would be inconsistent with any external research bought before MiFID II. In other words, the fund would have been better off producing all research in-house and hiring only a discount broker to execute trading orders. Therefore,

$$\hat{a} \leq a - c(1) \tag{A5}$$

This implies that $\hat{q} \leq q^*$ and $\hat{f} \leq f^*$ and, therefore:

$$\hat{q} \times \hat{f} \leq q^* \times f^*$$

In other words, without equity research, the maximum fees a fund could collect would be the same as those collected after passing research costs to investors. Moreover, the maximum

value added would be $\hat{V} = \hat{q}(\hat{a} - b\hat{q}) = \frac{\hat{a}^2}{4b}$. Comparing $\hat{V}$ with V^* in (10) and given (A5) it follows that

$$\hat{V} - V^* \leq -H^* \tag{A6}$$

Therefore, if funds stop paying for research after MiFID II, the minimum loss in value would be, precisely, the value of equity research H^*.

Funds may also cut research expenditures only partially after internalizing them. Equation (A4) shows that if the fund spends $\bar{H} < H^*$ in research, then it can still raise the same fees $q^* \times f^*$ it collected before unbundling research and execution costs but it will add less value ($\bar{V} < V^*$) to shareholders and the fund's performance will decrease. *Q.E.D.*

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Table 1: US Funds sample over time and across styles

This table reports the total number of funds and fund families as well as fund and fund families with European twins in our data set. Twin funds are defined as those managed by the same team, under the same investment style, and available for sale in the US and Europe (including the UK). US twins are funds domiciled in the US. Our sample of European countries includes Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Guernsey, Hungary, Iceland, Ireland, Isle of Man, Italy, Jersey, Latvia, Liechtenstein, Lithuania, Luxembourg, Andorra, Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland, United Kingdom, Gibraltar, Malta, Monaco, and San Marino. US Twin Families are fund families offering at least one twin fund in the US and Europe. The number of funds and fund families is reported over our sample period (Panel A) and across the different investment styles included in our sample (Panel B). The sample includes annual data from 2014 to 2019, focusing on actively managed, diversified global and US equity funds that are open-end and domiciled in the US. US equity funds are further sorted into large-cap blend, large-cap growth, large-cap value, mid-cap, and small-cap as classified by Morningstar.

Panel A: Sample over time

	2014	2015	2016	2017	2018	2019
Total US Funds	1878	1984	2016	2043	2058	1948
Total US Families	455	481	488	504	504	485
US Twin Funds	345	359	380	394	390	377
US Twin Families	108	107	106	112	114	112

Panel B: Sample across styles

	Global	US Large-cap			US Mid-cap	US Small-cap
		Blend	Growth	Value		
Total US Funds	716	331	392	283	356	454
Total US Families	287	202	211	166	208	222
US Twin Funds	180	72	104	66	39	53
US Twin Families	94	40	54	42	33	31

Table 2: Fund-level sample characteristics

This table presents fund-level descriptive statistics. The sample includes annual data from 2014 to 2019, focusing on actively managed, diversified global and US equity funds that are open-end and domiciled in the US. Panel A reports the statistics for the full sample, and Panel B is restricted to US Twins (funds managed by the same team under the same investment style and available for sale in both the US and Europe). All the variables are measured annually and include brokerage commissions paid by the fund over the fiscal year (scaled by average net assets during the reporting period and scaled by trading volume), whether the fund pays commissions to broker-dealers for brokerage and research services, fund TNA ($millions), family TNA ($billions), annual expense ratio, annual fund turnover, annual net return, the years since fund's inception date, annual fund flows and annualized net and gross alphas are calculated by estimating the global Fama-French 3-factor model, augmented with the global momentum factor, using monthly after-fee and before-fee returns, respectively. The global factors are from developed markets, as reported on Kenneth French's website. A complete list of definitions for these variables is provided in Table A1 in the Appendix.

Panel A: Full Sample

	mean	sd	p25	p50	p75	N
Fund TNA ($MM)	1805.44	4019.91	92.83	377.05	1428.70	11927
Family TNA ($BB)	56.08	115.90	1.68	14.03	40.57	11927
Expense Ratio (% Annual)	1.17	0.41	0.95	1.18	1.40	11927
Fund Turnover (% Annual)	0.59	0.53	0.26	0.46	0.77	11927
Net Return (% Annual)	10.75	13.18	0.63	10.71	20.11	11927
Fund Age (Years)	18.39	12.50	9.67	16.67	23.17	11927
Fund Flows (% Annual)	6.79	46.75	-15.50	-2.58	14.09	11927
Total Commissions (% TNA)	0.07	0.14	0.03	0.05	0.08	11927
Commission Rate (% Trade volume)	0.06	0.23	0.01	0.02	0.05	11927
Soft Dollar Payments (0/1)	0.78	0.41	1.00	1.00	1.00	11927
Net Alpha (% Annual)	0.09	6.43	-3.59	0.37	4.03	11927
Gross Alpha (% Annual)	1.22	6.62	-2.44	1.47	5.18	11927

Panel B: Twin Funds

	mean	sd	p25	p50	p75	N
Fund TNA ($MM)	2882.07	5136.79	231.02	779.45	2757.83	2245
Family TNA ($BB)	52.09	96.27	7.36	21.94	43.88	2245
Expense Ratio (% Annual)	1.13	0.38	0.92	1.14	1.37	2245
Fund Turnover (% Annual)	0.53	0.42	0.27	0.44	0.69	2245
Net Return (% Annual)	10.68	13.44	0.25	10.95	20.23	2245
Fund Age (Years)	20.14	13.91	11.33	17.92	24.50	2245
Fund Flows (% Annual)	6.59	46.83	-16.68	-3.01	14.29	2245
Total Commissions (% TNA)	0.08	0.18	0.03	0.05	0.07	2245
Commission Rate (% Trade volume)	0.06	0.30	0.01	0.02	0.04	2245
Soft Dollar Payments (0/1)	0.80	0.40	1.00	1.00	1.00	2245
Net Alpha (% Annual)	-0.18	6.48	-4.03	0.23	3.95	2245
Gross Alpha (% Annual)	0.97	6.61	-2.91	1.34	5.10	2245

Table 3: The Impact of MiFID II on Total Brokerage Commissions

This table presents results on the impact of MiFID II research unbundling on funds' brokerage commission payments from difference-in-differences models. The sample includes annual data from 2014 to 2019, focusing on actively managed, diversified global and US equity funds that are open-end and domiciled in the US. The dependent variable is the aggregate brokerage commissions paid by the fund over the fiscal year scaled by the average net assets during the same period. The treatment group (*Twin*) includes US-domiciled funds with at least one EU twin at fiscal year-end. The control group includes US-domiciled funds with the same investment style but without any EU twin funds during the fiscal year. The *Post* variable equals one in 2018 and 2019 and zero for 2014-2017. Control variables (*fund size, family size, expense ratio, fund turnover, net return, fund age, and fund flows*) are lagged one year. Table A1 in the Appendix provides a complete list of definitions for these variables. We adjust for serial correlation by clustering standard errors at the fund level. t-statistics are reported in parentheses. * denotes significance at the 10% level, ** denotes significance at the 5% level and *** denotes significance at the 1% level.

	Total Commissions (% TNA)				
	(1)	(2)	(3)	(4)	(5)
Post × Twin	0.033***	0.033***	0.033***	0.033***	0.032***
	(3.06)	(3.01)	(3.03)	(3.02)	(3.04)
Twin	-0.004	0.001	0.001	0.002	0.002
	(-1.16)	(0.45)	(0.26)	(0.45)	(0.54)
Post	0.002	0.007**			
	(0.71)	(2.08)			
Fund Size		-0.000	-0.001	-0.000	-0.000
		(-0.29)	(-0.51)	(-0.29)	(-0.29)
Family Size		-0.005***	-0.005***	-0.005***	-0.005***
		(-4.69)	(-4.16)	(-4.65)	(-4.64)
Expense Ratio		0.030***	0.033***	0.030***	0.030***
		(5.85)	(6.52)	(5.71)	(5.73)
Fund Turnover		0.034***	0.033***	0.034***	0.034***
		(5.03)	(4.90)	(5.03)	(5.01)
Net Return		-0.000***	-0.001***	-0.001***	-0.000***
		(-3.16)	(-3.77)	(-3.17)	(-2.75)
Fund Age		0.004	0.002	0.004	0.004
		(1.27)	(0.76)	(1.26)	(1.25)
Fund Flows		-0.000	-0.000	-0.000	-0.000
		(-0.60)	(-0.58)	(-0.71)	(-0.90)
Style Fixed Effects	Yes	Yes	No	Yes	Absorbed
Time Fixed Effects	No	No	Yes	Yes	Absorbed
Style x Time Fixed Effects	No	No	No	No	Yes
Observations	11927	11927	11927	11927	11927
Adjusted R^2	0.007	0.044	0.042	0.044	0.044

Table 4: The Impact of MiFID II on Brokerage Commission Rate

This table presents results on the impact of MiFID II research unbundling on funds' brokerage commission payments from difference-in-differences models. The sample includes annual data from 2014 to 2019, focusing on actively managed, diversified global and US equity funds that are open-end and domiciled in the US. The dependent variable is the aggregate brokerage commissions paid by the fund over the fiscal year scaled by the fund's trading volume during the same period. The treatment group (*Twin*) includes US-domiciled funds with at least one EU twin at fiscal year-end. The control group includes US-domiciled funds with the same investment style but without any EU twin funds during the fiscal year. The *Post* variable equals one in 2018 and 2019 and zero for 2014-2017. Control variables (*fund size, family size, expense ratio, fund turnover, net return, fund age, and fund flows*) are lagged one year. Table A1 in the Appendix provides a complete list of definitions for these variables. We adjust for serial correlation by clustering standard errors at the fund level. t-statistics are reported in parentheses. * denotes significance at the 10% level, ** denotes significance at the 5% level and *** denotes significance at the 1% level.

	Commission Rate (% Volume)				
	(1)	(2)	(3)	(4)	(5)
Post × Twin	0.065***	0.063***	0.063***	0.063***	0.061***
	(3.51)	(3.40)	(3.39)	(3.39)	(3.39)
Twin	-0.016***	-0.006*	-0.006*	-0.006*	-0.005
	(-3.64)	(-1.72)	(-1.80)	(-1.66)	(-1.52)
Post	0.007	0.015***			
	(1.31)	(3.02)			
Fund Size		0.003	0.003	0.003	0.003
		(1.09)	(0.95)	(1.09)	(1.09)
Family Size		-0.008***	-0.008***	-0.008***	-0.008***
		(-4.03)	(-3.68)	(-4.04)	(-4.03)
Expense Ratio		0.016*	0.019**	0.016*	0.017*
		(1.92)	(2.43)	(1.90)	(1.94)
Fund Turnover		0.135***	0.134***	0.135***	0.135***
		(7.22)	(7.13)	(7.22)	(7.20)
Net Return		-0.001***	-0.001***	-0.001**	-0.000*
		(-3.25)	(-2.69)	(-2.19)	(-1.76)
Fund Age		0.010**	0.007	0.009**	0.009**
		(2.18)	(1.61)	(2.06)	(2.03)
Fund Flows		0.000	0.000	0.000	0.000
		(0.79)	(0.50)	(0.44)	(0.25)
Style Fixed Effects	Yes	Yes	No	Yes	Absorbed
Time Fixed Effects	No	No	Yes	Yes	Absorbed
Style x Time Fixed Effects	No	No	No	No	Yes
Observations	11927	11927	11927	11927	11927
Adjusted R^2	0.006	0.105	0.105	0.106	0.106

Table 5: The Impact of MiFID II on Brokerage Commissions: Soft Dollar Funds

This table presents results on the impact of MiFID II research unbundling on funds' brokerage commission payments based on whether the fund pays soft dollars. The sample includes annual data from 2014 to 2019, focusing on actively managed, diversified global and US equity funds that are open-end and domiciled in the US. The dependent variable is the aggregate brokerage commissions paid by the fund over the fiscal year scaled by either the fund's average net assets or trading volume during the same period. The treatment group (*Twin*) includes US-domiciled funds with at least one EU twin at fiscal year-end. The control group includes US-domiciled funds with the same investment style but without any EU twin funds during the fiscal year. The *Post* variable equals one in 2018 and 2019 and zero for 2014-2017. *Soft Dollar* is an indicator variable that equals one if the fund paid commissions to broker-dealers for brokerage and research services in the four years before the regulation took place (period 2014-2017) and zero otherwise. Control variables (*fund size, family size, expense ratio, fund turnover, net return, fund age, and fund flows*) are lagged one year. Table A1 in the Appendix provides a complete list of definitions for these variables. We adjust for serial correlation by clustering standard errors at the fund level. t-statistics are reported in parentheses. * denotes significance at the 10% level, ** denotes significance at the 5% level and *** denotes significance at the 1% level.

	Total Commissions (% TNA)		Commission Rate (% Volume)	
	(1)	(2)	(3)	(4)
Soft Dollar=0 × Post × Twin	-0.012	-0.014	-0.008	-0.014
	(-1.30)	(-1.49)	(-0.58)	(-1.05)
Soft Dollar=1 × Post × Twin	0.055***	0.055***	0.100***	0.098***
	(3.75)	(3.70)	(3.88)	(3.82)
Soft Dollar=0 × Twin	0.004	0.007	-0.013**	-0.004
	(0.58)	(1.12)	(-2.19)	(-0.68)
Soft Dollar=1 × Twin	-0.008*	-0.001	-0.017***	-0.006
	(-1.92)	(-0.23)	(-2.94)	(-1.29)
Soft Dollar	-0.005	0.000	-0.003	0.005
	(-1.12)	(0.08)	(-0.48)	(0.89)
Controls	No	Yes	No	Yes
Style x Time Fixed Effects	Yes	Yes	Yes	Yes
Observations	11927	11927	11927	11927
Adjusted R^2	0.009	0.046	0.009	0.109

Table 6: The Impact of MiFID II on Brokerage Commissions: Placebo Test

This table presents results on the impact of MiFID II research unbundling on funds' brokerage commission payments from difference-in-differences models. The sample includes annual data from 2014 to 2019, focusing on actively managed, diversified global and US equity funds that are open-end and domiciled in the US. The dependent variable is the aggregate brokerage commissions paid by the fund over the fiscal year scaled by either the fund's average net assets or trading volume during the same period. The treatment group (*CA Twin*) includes US-domiciled funds with at least one Canadian twin at fiscal year-end. The control group includes US-domiciled funds with the same investment style but without Canadian twin funds during the fiscal year. The *Post* variable equals one in 2018 and 2019 and zero for 2014-2017. Control variables (*fund size, family size, expense ratio, fund turnover, net return, fund age, and fund flows*) are lagged one year. Table A1 in the Appendix provides a complete list of definitions for these variables. We adjust for serial correlation by clustering standard errors at the fund level. t-statistics are reported in parentheses. * denotes significance at the 10% level, ** denotes significance at the 5% level and *** denotes significance at the 1% level.

	Total Commissions (% TNA)		Commission Rate (% Volume)	
	(1)	(2)	(3)	(4)
Post × CA Twin	0.014	0.015	0.048	0.049
	(0.67)	(0.74)	(1.26)	(1.33)
CA Twin	-0.010	-0.000	-0.026***	-0.002
	(-1.63)	(-0.05)	(-3.90)	(-0.36)
Fund Size		0.000		0.003
		(0.04)		(1.30)
Family Size		-0.005***		-0.009***
		(-4.70)		(-4.12)
Expense Ratio		0.030***		0.017**
		(5.80)		(1.99)
Fund Turnover		0.034***		0.135***
		(5.03)		(7.22)
Net Return		-0.000***		-0.000*
		(-2.68)		(-1.71)
Fund Age		0.004		0.009**
		(1.27)		(2.07)
Fund Flows		-0.000		0.000
		(-0.90)		(0.24)
Style x Time Fixed Effects	Yes	Yes	Yes	Yes
Observations	11927	11927	11927	11927
Adjusted R^2	0.005	0.041	0.004	0.103

Table 7: The Impact of MiFID II on Commissions, TNA, and Volume: Fund FE

This table presents results on the impact of MiFID II research unbundling on brokerage commissions, portfolio size, and trading volume from difference-in-differences models. The sample includes annual data from 2014 to 2019, focusing on actively managed, diversified global and US equity funds that are open-end and domiciled in the US. The dependent variable in columns (1), (2), and (3) is the aggregate brokerage commissions paid by the fund over the fiscal year in $mm, scaled by the fund's average net assets, and trading volume, respectively. The dependent variable in columns (4) and (5) is the logarithm of the average net assets and trading volume, respectively. The treatment group (*Twin*) includes US-domiciled funds with at least one EU twin at fiscal year-end. The control group includes US-domiciled funds with the same investment style but without any EU twin funds during the fiscal year. The *Post* variable equals one in 2018 and 2019 and zero for 2014-2017. Control variables (*fund size, family size, expense ratio, fund turnover, net return, fund age, and fund flows*) are lagged one year. Table A1 in the Appendix provides a complete list of definitions for these variables. In these DiD specifications, we add fund fixed effects to control for any fund's time-invariant characteristics. We adjust for serial correlation by clustering standard errors at the fund level. t-statistics are reported in parentheses. * denotes significance at the 10% level, ** denotes significance at the 5% level and *** denotes significance at the 1% level.

	Commissions ($ MM)	Total Commissions (% TNA)	Commission Rate (% Volume)	TNA (log)	Volume (log)
	(1)	(2)	(3)	(4)	(5)
Post × Twin	1.842**	0.039***	0.071***	-0.024	0.000
	(2.42)	(3.46)	(3.78)	(-0.52)	(0.00)
Twin	-0.415	-0.018**	-0.033***	0.051	-0.019
	(-0.59)	(-2.38)	(-2.92)	(1.05)	(-0.31)
Fund Size	-0.113	-0.000	-0.002	0.089***	0.058**
	(-0.46)	(-0.05)	(-0.36)	(4.19)	(2.49)
Family Size	5.630***	0.014**	0.014	0.485***	0.559***
	(9.44)	(2.35)	(1.55)	(12.86)	(12.87)
Expense Ratio	-0.992	0.008	0.023	-0.204***	-0.152*
	(-1.13)	(0.57)	(0.68)	(-3.08)	(-1.89)
Fund Turnover	0.483	0.021***	0.085***	-0.057**	0.348***
	(1.41)	(3.30)	(5.27)	(-2.52)	(10.50)
Net Return	0.009	-0.000*	-0.000	0.003***	0.002***
	(1.01)	(-1.78)	(-1.30)	(6.40)	(3.33)
Fund Age	1.575	0.044***	0.060**	-0.152	-0.166
	(1.31)	(2.66)	(2.21)	(-1.64)	(-1.56)
Fund Flows	-0.000	0.000	0.000	0.000**	0.000
	(-0.06)	(0.20)	(0.77)	(2.46)	(1.35)
Style x Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
Fund Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	11927	11927	11927	11927	11927
Adjusted R^2	0.675	0.208	0.272	0.934	0.915

Table 8: The Impact of MiFID II on Fund Performance

This table presents results on the impact of MiFID II research unbundling on fund performance from difference-in-differences models. The sample includes annual data from 2014 to 2019, focusing on actively managed, diversified global and US equity funds that are open-end and domiciled in the US, Europe, or both. The dependent variable is the annualized fund performance measured by the alpha from a global 4-factor model, calculated by estimating the global Fama-French 3-factor model, augmented with the global momentum factor. The global factors are from developed markets, as reported on Kenneth French's website. In columns 1 and 2, fund alphas are calculated using monthly before-fee returns (Gross Performance), and in columns 3 and 4, fund alphas are calculated using monthly after-fee returns (Net Performance). *Twins* variable equals one for US-domiciled funds with at least one EU twin and EU-domiciled funds with at least one US twin at the current period. The *US Fund* variable equals one for funds domiciled in the US and zero for funds domiciled in the EU. The *Post* variable equals one in 2018 and 2019 and zero for 2014-2017. Control variables (*fund size, family size, expense ratio, fund turnover, net return, fund age, and fund flows*) are lagged one year and are included but omitted for brevity. Table A1 in the Appendix provides a complete list of definitions for these variables. We adjust for serial correlation by clustering standard errors at the fund level. t-statistics are reported in parentheses. * denotes significance at the 10% level, ** denotes significance at the 5% level and *** denotes significance at the 1% level.

	Gross Performance		Net Performance	
	(1)	(2)	(3)	(4)
US Fund × Post × Twins	-1.156***	-1.153***	-1.120***	-1.122***
	(-2.97)	(-2.92)	(-2.91)	(-2.89)
Post × Twins	0.996***	1.050***	0.921***	0.987***
	(3.25)	(3.42)	(3.01)	(3.24)
US Fund × Twins	0.282	0.446	0.106	0.365
	(1.06)	(1.64)	(0.40)	(1.36)
US Fund × Post	0.927***	1.151***	0.937***	1.167***
	(4.95)	(6.03)	(5.09)	(6.25)
Twins	-0.208	-0.383*	-0.041	-0.355*
	(-0.99)	(-1.79)	(-0.20)	(-1.67)
US Fund	0.042	-0.187	0.523***	-0.130
	(0.35)	(-1.40)	(4.32)	(-1.00)
Controls	No	Yes	No	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes
Style x Time Fixed Effects	Yes	Yes	Yes	Yes
Observations	34332	34332	34332	34332
Adjusted R^2	0.235	0.242	0.248	0.263

Table 9: The Impact of MiFID II on Fund Performance: Family and Fund Fixed Effects

This table presents results on the impact of MiFID II research unbundling on fund performance from difference-in-differences models. The sample includes annual data from 2014 to 2019, focusing on actively managed, diversified global and US equity funds that are open-end and domiciled in the US, Europe, or both. The dependent variable is the annualized fund performance measured by the alpha from a global 4-factor model, calculated by estimating the global Fama-French 3-factor model, augmented with the global momentum factor. The global factors are from developed markets, as reported on Kenneth French's website. In columns 1 and 2, fund alphas are calculated using monthly before-fee returns (Gross Performance), and in columns 3 and 4, fund alphas are calculated using monthly after-fee returns (Net Performance). *Twins* variable equals one for US-domiciled funds with at least one EU twin and EU-domiciled funds with at least one US twin at the current period. The *US Fund* variable equals one for funds domiciled in the US and zero for funds domiciled in the EU. The *Post* variable equals one in 2018 and 2019 and zero for 2014-2017. Control variables (*fund size, family size, expense ratio, fund turnover, net return, fund age, and fund flows*) are lagged one year and are included but omitted for brevity. Table A1 in the Appendix provides a complete list of definitions for these variables. We adjust for serial correlation by clustering standard errors at the fund level. t-statistics are reported in parentheses. * denotes significance at the 10% level, ** denotes significance at the 5% level and *** denotes significance at the 1% level.

	Gross Performance		Net Performance	
	(1)	(2)	(3)	(4)
US Fund × Post × Twins	-1.386***	-1.235***	-1.298***	-1.169***
	(-3.41)	(-2.82)	(-3.24)	(-2.71)
Post × Twins	0.972***	0.922***	0.932***	0.904***
	(3.01)	(2.70)	(2.91)	(2.67)
US Fund × Twins	0.055	0.196	0.014	0.021
	(0.16)	(0.31)	(0.04)	(0.03)
US Fund × Post	1.334***	1.723***	1.364***	1.782***
	(6.76)	(8.52)	(7.00)	(8.89)
Twins	-0.390	0.122	-0.377	0.148
	(-1.39)	(0.24)	(-1.34)	(0.29)
US Fund	0.533		1.336	
	(0.38)		(1.02)	
Controls	Yes	Yes	Yes	Yes
Style x Time Fixed Effects	Yes	Yes	Yes	Yes
Style x Family Fixed Effects	Yes	Yes	Yes	Yes
Fund Fixed Effects	No	Yes	No	Yes
Observations	34332	34332	34332	34332
Adjusted R^2	0.268	0.235	0.286	0.254

Table 10: The Impact of MiFID II on Expense Ratio

This table presents results on the impact of MiFID II research unbundling on fund's expense ratio from difference-in-differences models. The sample includes annual data from 2014 to 2019, focusing on actively managed, diversified global and US equity funds that are open-end and domiciled in the US, Europe, or both. The dependent variable is the total annual expenses and fees divided by year-end TNA. *Twins* variable equals one for US-domiciled funds with at least one EU twin and EU-domiciled funds with at least one US twin at the current period. The *US Fund* variable equals one for funds domiciled in the US and zero for funds domiciled in the EU. The *Post* variable equals one in 2018 and 2019 and zero for 2014-2017. Control variables (*fund size, family size, expense ratio, fund turnover, net return, fund age, and fund flows*) are lagged one year and are included but omitted for brevity. Table A1 in the Appendix provides a complete list of definitions for these variables. We adjust for serial correlation by clustering standard errors at the fund level. t-statistics are reported in parentheses. * denotes significance at the 10% level, ** denotes significance at the 5% level and *** denotes significance at the 1% level.

	Expense Ratio			
	(1)	(2)	(3)	(4)
US Fund × Post × Twins	-0.026	-0.010	-0.012	-0.004
	(-0.85)	(-0.71)	(-0.39)	(-0.31)
Post × Twins	0.039	0.021	0.030	0.017
	(1.43)	(1.59)	(1.08)	(1.28)
US Fund × Twins	0.128***	0.012*	0.103***	0.013**
	(3.37)	(1.83)	(2.70)	(1.97)
US Fund × Post	0.005	-0.017***	-0.020	-0.025***
	(0.55)	(-3.82)	(-1.63)	(-4.38)
Twins	-0.180***	-0.006	-0.142***	-0.005
	(-5.58)	(-0.98)	(-4.34)	(-0.95)
US Fund	-0.492***	-0.012***	-0.446***	-0.013***
	(-30.54)	(-4.74)	(-21.59)	(-4.23)
Controls	No	Yes	No	Yes
Time Fixed Effects	Yes	Yes	Absorbed	Absorbed
Style x Time Fixed Effects	No	No	Yes	Yes
Observations	34332	34332	34332	34332
Adjusted R^2	0.112	0.899	0.118	0.899

Figure 1: Brokerage Commissions over Time

The figure presents a time series analysis, with two distinct lines plotted to compare the aggregate brokerage commissions paid by two different types of funds over our sample period. The sample includes annual data from 2014 to 2019, focusing on actively managed, diversified global and US equity funds that are open-end and domiciled in the US. The first line is a solid black line representing our treatment group *Twin Funds* (US-domiciled funds with at least one EU twin during the fiscal year). The second line is a black-dashed line representing our control group *Other Funds* (US-domiciled funds without any EU twin funds during the fiscal year). The x-axis of the graph represents the years of our sample. At the same time, the y-axis denotes the aggregate brokerage commissions paid by the fund over the fiscal year scaled by either the fund's average net assets (Panel A: Total Commissions) or trading volume (Panel B: Commission Rate) during the same period. A vertical line at year-end 2017 allows us to visually compare the total commissions during the four years before the regulation took place against the two years since the regulation was in place.

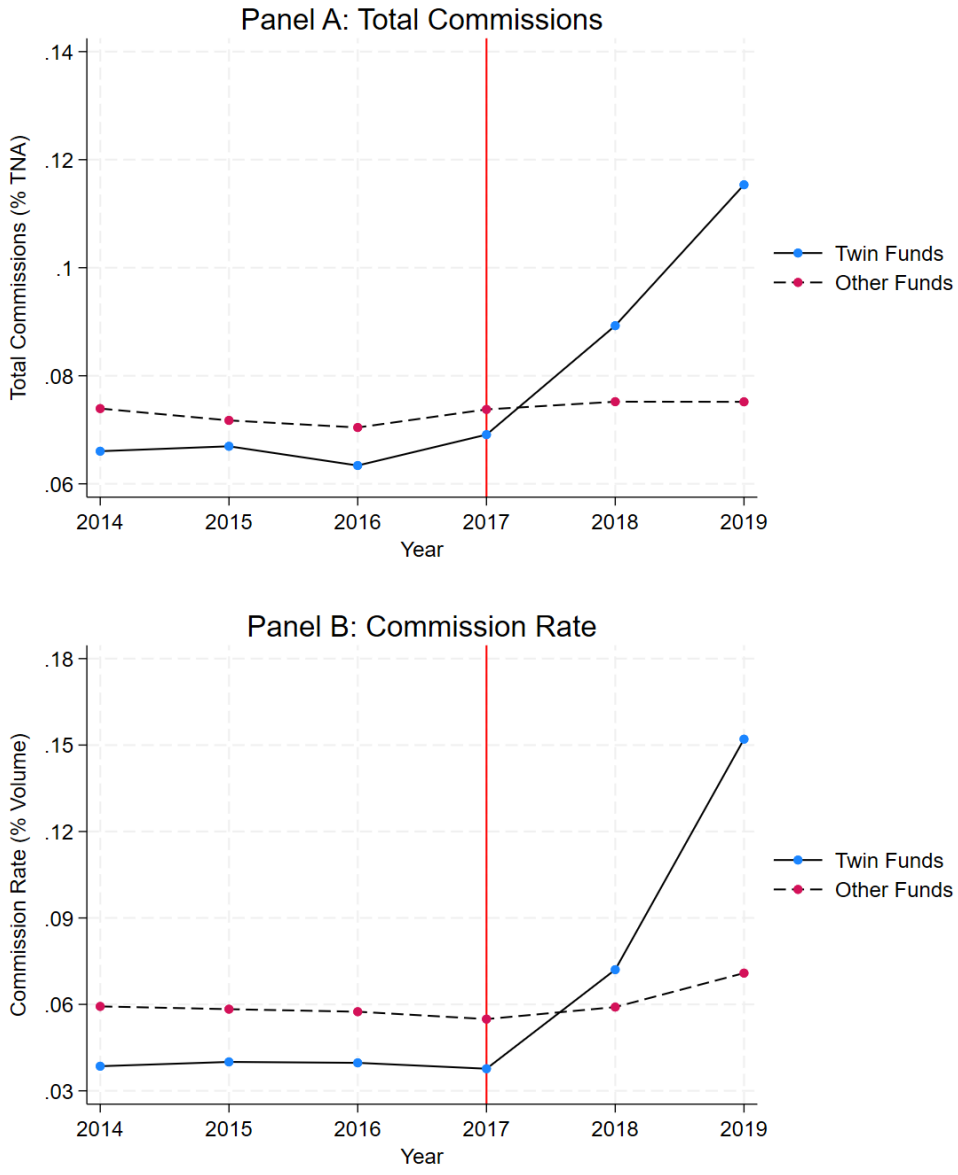


Figure 2: The Impact of MiFID II on Brokerage Commissions

This figure plots point estimates and 90% confident intervals of the differences in funds' brokerage commission payments between each year in our sample period and the baseline year (2014) from a panel regression, with style fixed effects, and lagged controls (*fund size, family size, expense ratio, fund turnover, net return, fund age, and fund flows*). The sample includes annual data from 2014 to 2019, focusing on actively managed, diversified global and US equity funds that are open-end and domiciled in the US. Panels A and C are restricted to *Twin* funds (US-domiciled funds with at least one EU twin at fiscal year-end). Panels B and D include US-domiciled funds with the same investment style but without any EU twin funds during the fiscal year. The x-axis of the graph represents the years of our sample. At the same time, the y-axis denotes the aggregate brokerage commissions paid by the fund over the fiscal year scaled by either the fund's average net assets (Panels A and B: Total Commissions) or trading volume (Panels C and D: Commission Rate) during the same period. A vertical line at year-end 2017 allows us to visually compare the total commissions during the four years before the regulation took place against the two years since the regulation was in place. We adjust for serial correlation by clustering standard errors at the fund level.

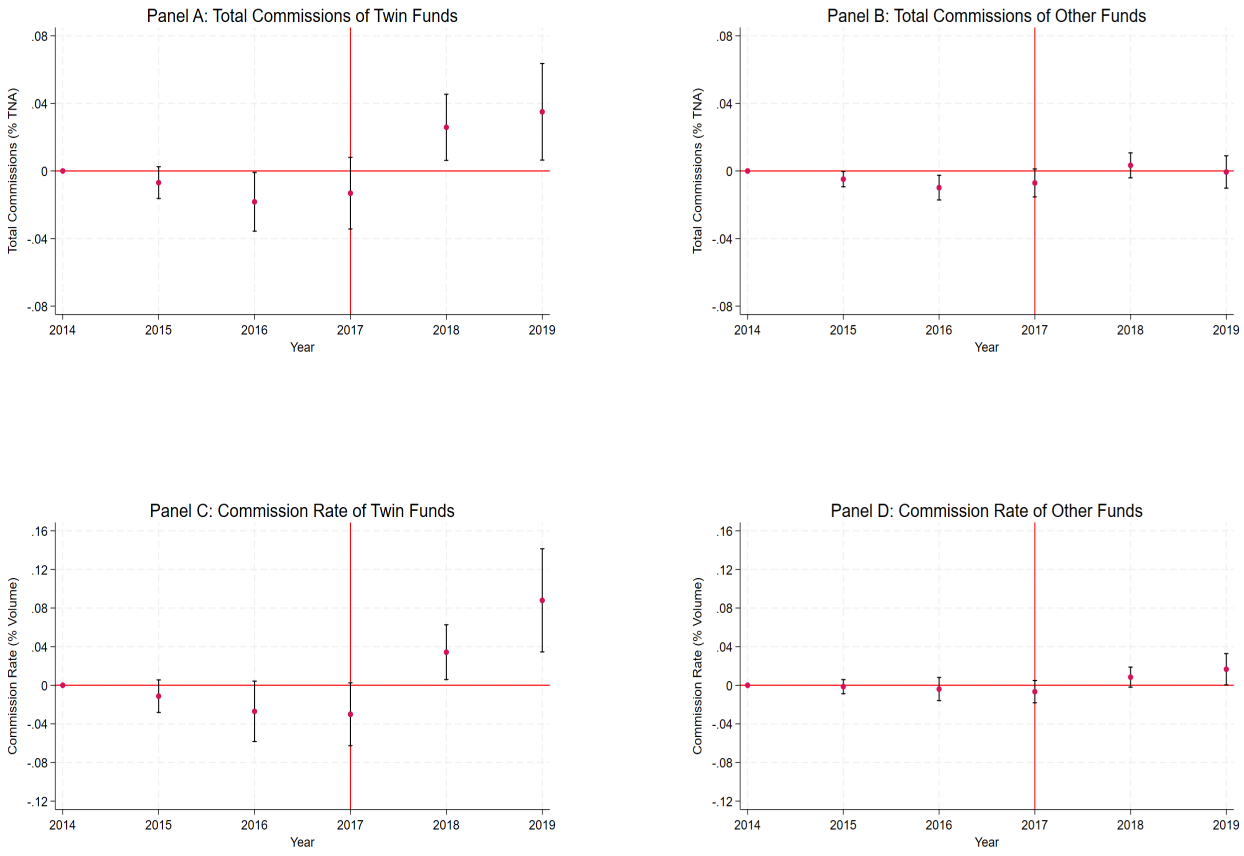


Figure 3: Total Commissions: Soft versus no Soft Dollar Funds

The figure presents a time series analysis, with two distinct lines plotted to compare the aggregate brokerage commissions paid by two different types of funds over our sample period. The sample includes annual data from 2014 to 2019, focusing on actively managed, diversified global and US equity funds that are open-ended and domiciled in the US. The first line is a solid black line representing our treatment group *Twin Funds* (US-domiciled funds with at least one EU twin during the fiscal year). The second line is a black-dashed line representing our control group *Other Funds* (US-domiciled funds without any EU twin funds during the fiscal year). The x-axis of the graph represents the years of our sample. At the same time, the y-axis denotes the aggregate brokerage commissions paid by the fund over the fiscal year scaled by the fund's average net assets during the same period (Total Commissions). Panel A reports brokerage commissions for funds that paid commissions to broker-dealers for brokerage and research services in the four years before the regulation took place (Soft Dollar Funds). Panel B reports brokerage commissions for all the remaining funds (No Soft Dollar Funds). A vertical line at year-end 2017 allows us to visually compare the total commissions during the four years before the regulation took place against the two years since the regulation was in place.

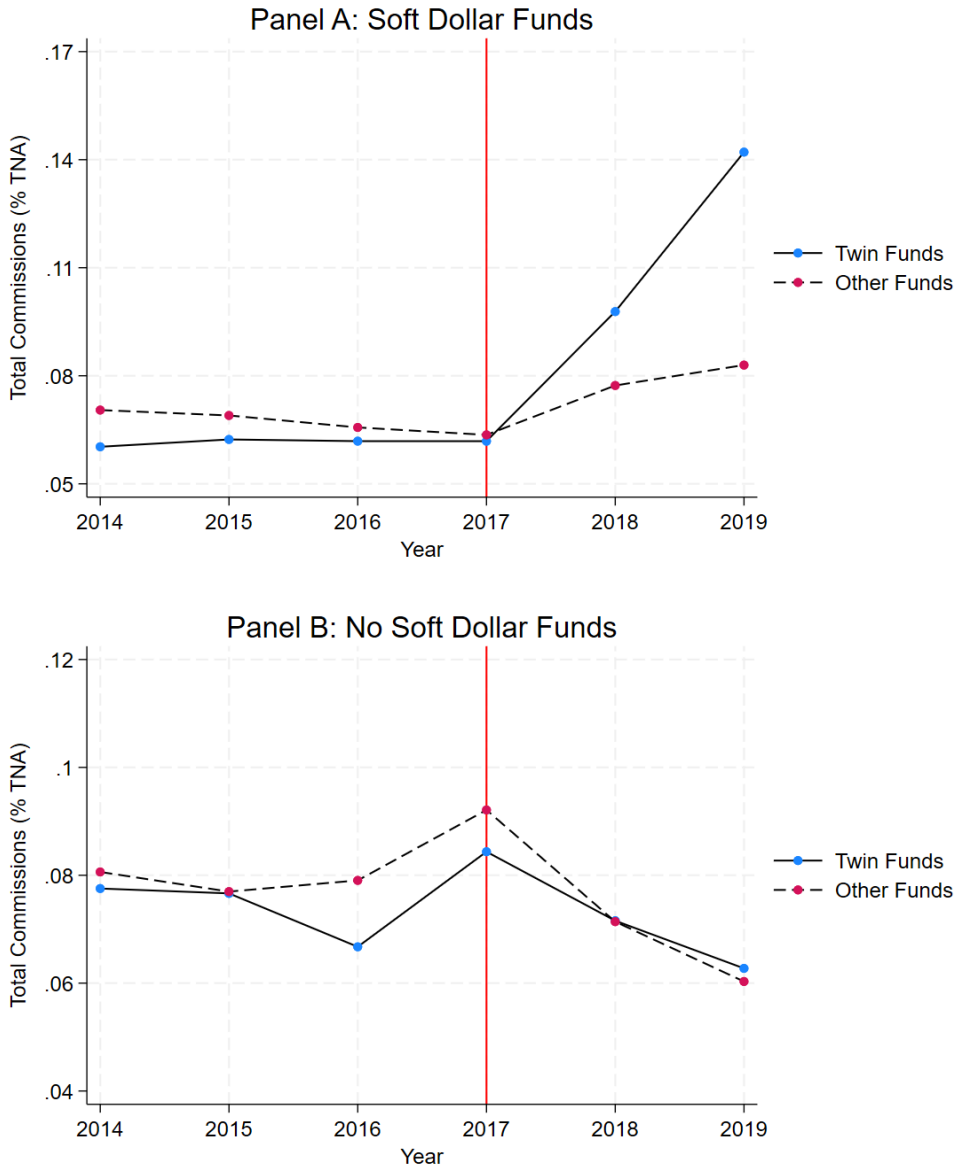


Figure 4: Commission Rate: Soft versus no Soft Dollar Funds

The figure presents a time series analysis, with two distinct lines plotted to compare the aggregate brokerage commissions paid by two different types of funds over our sample period. The sample includes annual data from 2014 to 2019, focusing on actively managed, diversified global and US equity funds that are open-ended and domiciled in the US. The first line is a solid black line representing our treatment group *Twin Funds* (US-domiciled funds with at least one EU twin during the fiscal year). The second line is a black-dashed line representing our control group *Other Funds* (US-domiciled fund without any EU twin funds during the fiscal year). The x-axis of the graph represents the years of our sample. At the same time, the y-axis denotes the aggregate brokerage commissions paid by the fund over the fiscal year scaled by the fund's trading volume during the same period (Commission Rate). Panel A reports brokerage commissions for funds that paid commissions to broker-dealers for brokerage and research services in the four years before the regulation took place (Soft Dollar Funds). Panel B reports brokerage commissions for all the remaining funds (No Soft Dollar Funds). A vertical line at year-end 2017 allows us to visually compare the total commissions during the four years before the regulation took place against the two years since the regulation was in place.

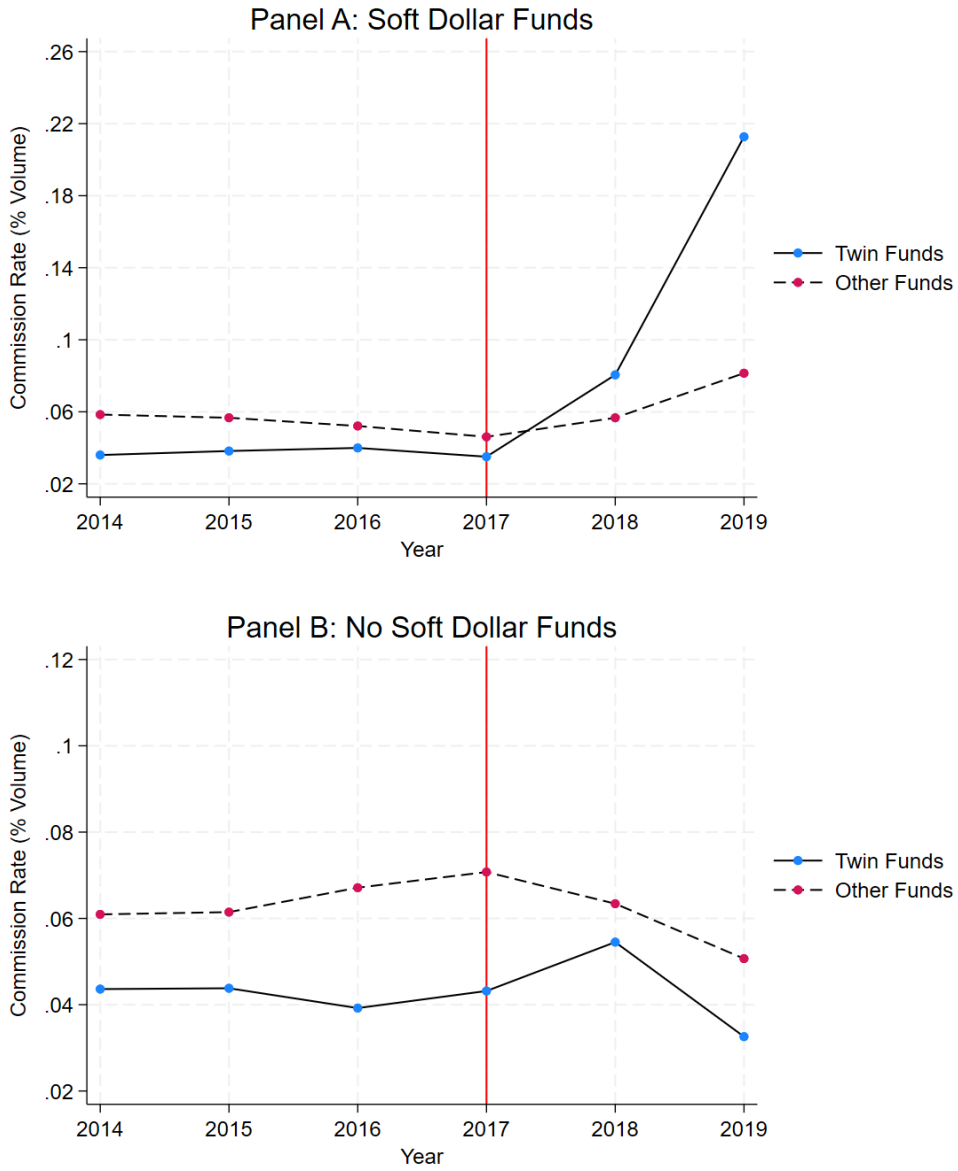


Figure 5: The Impact of MiFID II on Total Commissions

This figure plots point estimates and 90% confident intervals of the differences in funds' brokerage commission payments between each year in our sample period and the baseline year (2014) from a panel regression, with style fixed effects, and lagged controls (*fund size, family size, expense ratio, fund turnover, net return, fund age, and fund flows*). The sample includes annual data from 2014 to 2019, focusing on actively managed, diversified global and US equity funds that are open-ended and domiciled in the US. Panels A and C are restricted to *Twin* funds (US-domiciled funds with at least one EU twin at fiscal year-end). Panels B and D include US-domiciled funds with the same investment style but without any EU twin funds during the fiscal year. In addition, Panels A and B report brokerage commissions for funds that paid commissions to broker-dealers for brokerage and research services in the four years before the regulation took place (Fund with Soft Dollars). Panels C and D report brokerage commissions for all the remaining funds (Funds without Soft Dollar). A vertical line at year-end 2017 allows us to visually compare the total commissions during the four years before the regulation took place against the two years since the regulation was in place. A vertical line at year-end 2017 allows us to visually compare the total commissions during the four years before the regulation took place against the two years since the regulation was in place. At the same time, the y-axis denotes the differences in aggregate brokerage commissions paid over the fiscal year, scaled by the fund's average net assets during the same period (Total Commissions). We adjust for serial correlation by clustering standard errors at the fund level.

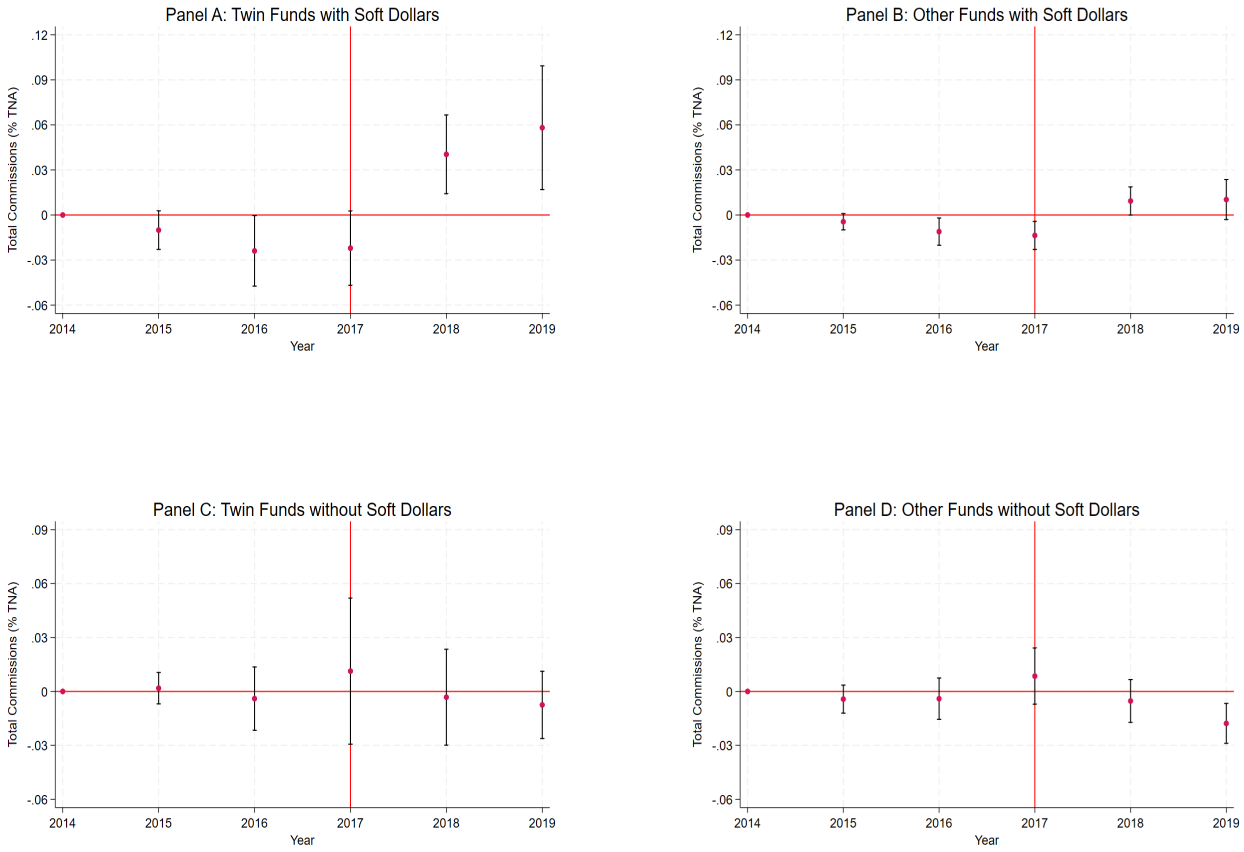


Figure 6: The Impact of MiFID II on Commission Rate

This figure plots point estimates and 90% confident intervals of the differences in funds' brokerage commission payments between each year in our sample period and the baseline year (2014) from a panel regression, with style fixed effects, and lagged controls (*fund size, family size, family funds, expense ratio, fund turnover, net return, fund age, and broker-sold fund*). The sample includes annual data from 2014 to 2019, focusing on actively managed, diversified global and US equity funds that are open-ended and domiciled in the US. Panels A and C are restricted to *Twin* funds (US-domiciled funds with at least one EU twin at fiscal year-end). Panels B and D include US-domiciled funds with the same investment style but without any EU twin funds during the fiscal year. In addition, Panels A and B report brokerage commissions for funds that paid commissions to broker-dealers for brokerage and research services in the four years before the regulation took place (Fund with Soft Dollars). Panels C and D report brokerage commissions for all the remaining funds (Funds without Soft Dollar). A vertical line at year-end 2017 allows us to visually compare the total commissions during the four years before the regulation took place against the two years since the regulation was in place. A vertical line at year-end 2017 allows us to visually compare the total commissions during the four years before the regulation took place against the two years since the regulation was in place. At the same time, the y-axis denotes the differences in aggregate brokerage commissions paid over the fiscal year, scaled by the fund's trading volume during the same period (Commission Rate). We adjust for serial correlation by clustering standard errors at the fund level.

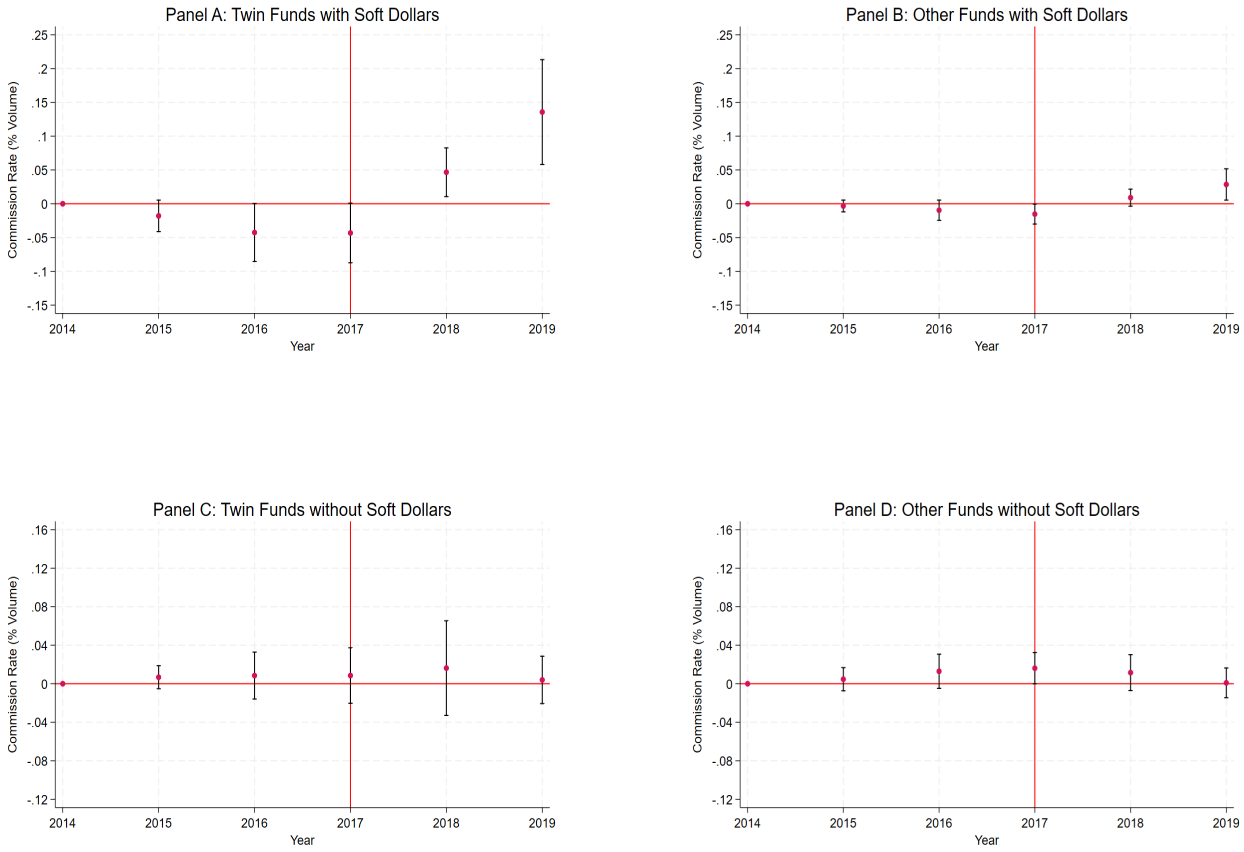


Table A1: Variable definitions

Variable	Definition
Post	Indicator variable for years 2018 and 2019 and zero for the period 2014-2017.
Twin	Indicator variable for US-domiciled funds managed by the same team and under the same investment style as other identical funds available for sale in Europe (including the UK).
Fund Size	Natural logarithm of monthly average TNA (Total Net Assets under management) during the fiscal year.
Family Size	Natural logarithm of monthly average aggregate TNA of all funds in the family during the fiscal year.
Expense Ratio	Total annual expenses and fees divided by year-end TNA (in %). The expense ratio includes the fund's administrative and management fees but does not include brokerage commissions or other transaction costs.
Fund Turnover	Minimum of the fund's dollar purchases and sales during the fiscal year, scaled by the fund's average total net assets. This measure excludes trades induced by fund inflows and outflows, thus capturing largely discretionary trades. This is the measure of turnover that funds report to the Securities and Exchange Commission.
Net Return	Annual fund net-of-fee return during the fiscal year (in %).
Fund Age	Number of years since the fund inception date at the fiscal year-end.
Fund Flows	Net annual growth in fund assets beyond reinvested dividends defined as $Flows_t = [TNA_t - TNA_{t-12} \times (1 + Ret_t)] \div [TNA_{t-12} \times (1 + Ret_t)]$ (in %).
Commissions ($mm)	the aggregate brokerage commissions paid by the fund during the fiscal year as reported in N-CEN form (Item C.16.b) and N-SAR form (Item 21) (in $ MM).
Total Commissions (% TNA)	Total Commissions scaled by the fund's monthly average net assets during the fiscal year as reported in N-CEN form (Item C.19) and N-SAR form (Item 75.B) (in %).
Commission Rate (% Volume)	Total Commissions scaled by the fund's trading turnover (in %). Trading turnover is the product of the fund's turnover ratio and the fund's monthly average net assets during the fiscal year.
Soft Dollar	Indicator variable for funds that have been paying commissions to broker-dealers for brokerage and research services during the four years before the regulation took place (2014-2017).
CA Twin	Indicator variable for US-domiciled funds managed by the same team and under the same investment style as other identical funds available for sale in Canada.
Net Performance	Annualized fund net performance is measured by the alpha from a global 4-factor model, calculated by estimating the global Fama-French 3-factor model, augmented with the global momentum factor using after-fee monthly returns. The global market value-weighted stock index net of the risk-free rate is used as the market factor. The global SMB (size factor), global HML (book-to-market factor), and global WML (momentum factor) factors from developed markets are obtained from Kenneth French's website. We estimate each fund's factor loadings for each month using a 60-month rolling estimation window (with a minimum of 36 observations). Monthly alphas are annualized during the fund's fiscal year.
Gross Performance	Annualized fund net performance is measured by the alpha from a global 4-factor model, calculated by estimating the global Fama-French 3-factor model, augmented with the global momentum factor using after-fee monthly returns. The global market value-weighted stock index net of the risk-free rate is used as the market factor. The global SMB (size factor), global HML (book-to-market factor), and global WML (momentum factor) factors from developed markets are obtained from Kenneth French's website. We estimate each fund's factor loadings for each month using a 60-month rolling estimation window (with a minimum of 36 observations). Monthly alphas are annualized during the fund's fiscal year.
Twins	Indicator variable for either US-domiciled funds with at least one EU twin or EU-domiciled funds with at least one US twin at the current period.
US Fund	Indicator variable that equals one for funds domiciled in the US and zero for EU-domiciled funds.
Twin Size	Natural logarithm of monthly average aggregate TNA of European twin funds associated with the fund during the fiscal year.
Twin Family	Indicator variable for US-domiciled funds under a fund family that offers at least one US fund managed by the same team and under the same investment style as other identical funds available for sale in Europe (including the UK).
Global Investment	Indicator variable for funds with a global investment style as defined by Morningstar.

Internet Appendix for
"MiFID II Research Unbundling:
Cross-border Impact on Asset Managers"

In this appendix, we provide additional statistics and robustness tests for the analysis of the article. Specifically:

- Table IA.1: Sample of EU Twins over Time and across Styles
- Table IA.2: Fund-level sample characteristics of EU Twins
- Table IA.3: The Impact of MiFID II on Brokerage Commissions: EU Twin Size
- Table IA.4: The Impact of MiFID II on Brokerage Commissions: Twin Family
- Table IA.5: The Impact of MiFID II on Brokerage Commissions: Global Funds
- Figure IA.1: Example of twin funds

Table IA.1: Sample of EU Funds over Time and across Styles

This table reports the total number of EU-domiciled funds and fund families as well as funds and fund families with US twins in our data set. Twin funds are defined as those managed by the same team, under the same investment style, and available for sale in the US and Europe (including the UK). EU twins are funds domiciled in Europe. Our sample of European countries includes Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Guernsey, Hungary, Iceland, Ireland, Isle of Man, Italy, Jersey, Latvia, Liechtenstein, Lithuania, Luxembourg, Andorra, Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland, United Kingdom, Gibraltar, Malta, Monaco, and San Marino. EU Twin Families are fund families that offer at least one twin fund in the US and Europe. The number of funds and fund families is reported over our sample period (Panel A) and across the different investment styles included in our sample (Panel B). The sample is based on global and US equity diversified actively managed open-end funds domiciled in Europe from 2014 to 2019. US equity funds are further sorted into large-cap blend, large-cap growth, large-cap value, mid-cap, and small-cap as classified by Morningstar.

Panel A: Sample over time

	2014	2015	2016	2017	2018	2019
Total EU Funds	3727	3905	3826	3751	3693	3503
Total EU Families	799	820	793	776	758	738
EU Twin Funds	257	251	271	269	266	242
EU Twin Families	101	101	107	104	101	94

Panel B: Sample across styles

	Global	US Large-cap			US Mid-cap	US Small-cap
		Blend	Growth	Value		
Total EU Funds	3971	234	93	64	88	47
Total EU Families	836	172	74	50	76	43
EU Twin Funds	223	41	37	31	27	22
EU Twin Families	92	34	26	23	23	19

Table IA.2: Fund-level sample characteristics of EU Funds

This table presents descriptive statistics for the sample of global and US equity diversified actively managed open-end funds domiciled in Europe (including the UK) from 2014 to 2019. The sample includes EU-domiciled funds with US twins in our data set. All the variables are measured annually and include fund TNA ($millions), family TNA ($billions), annual expense ratio, annual fund turnover, annual net return, the years since the fund's inception date, annual fund flows and annualized value added computed as the product of lagged TNA and the five-factor alphas from estimating the Carhart's four-factor model augmented by a global markets factor using after-fee monthly fund returns. Detailed variable definitions are in Table A1 in the Appendix.

Panel A: Full Sample

	mean	sd	p25	p50	p75	N
Fund TNA ($MM)	386.75	696.48	43.06	134.23	393.70	22405
Family TNA ($BB)	7.30	10.68	0.58	3.00	9.22	22405
Expense Ratio (% Annual)	1.66	0.79	1.20	1.56	1.96	22405
Fund Turnover (% Annual)	0.89	1.05	0.19	0.54	1.20	22405
Net Return (% Annual)	6.19	17.01	-6.13	2.43	21.49	22405
Fund Age (years)	16.07	9.14	9.33	14.67	20.67	22405
Fund Flows (% Annual)	9.18	47.56	-15.38	-1.11	20.04	22405
Net Alpha (% Annual)	-3.16	8.49	-8.29	-3.04	1.40	22405
Gross Alpha (% Annual)	-1.51	8.47	-6.58	-1.51	2.98	22405

Panel B: Twin Funds

	mean	sd	p25	p50	p75	N
Fund TNA ($MM)	639.45	939.72	82.52	285.61	739.72	1556
Family TNA ($BB)	11.13	12.07	1.61	6.82	16.54	1556
Expense Ratio (% Annual)	1.50	0.56	1.17	1.49	1.77	1556
Fund Turnover (% Annual)	0.72	0.74	0.21	0.48	0.99	1556
Net Return (% Annual)	7.86	15.87	-3.52	4.92	20.13	1556
Fund Age (years)	14.32	8.89	7.25	12.17	19.54	1556
Fund Flows (% Annual)	11.13	56.94	-18.46	-2.55	19.77	1556
Net Alpha (% Annual)	-1.57	6.83	-5.32	-1.42	2.22	1556
Gross Alpha (% Annual)	-0.09	6.84	-3.89	-0.14	3.58	1556

Table IA.3: The Impact of MiFID II on Brokerage Commissions: EU Twin Size

This table presents results on the impact of MiFID II research unbundling on funds' brokerage commission payments from difference-in-differences models. The sample includes annual data from 2014 to 2019, focusing on actively managed, diversified global and US equity funds that are open-end and domiciled in the US. The dependent variable is the aggregate brokerage commissions paid by the fund over the fiscal year scaled by either the fund's average net assets or trading volume during the same period. *Twin Size* is the natural logarithm of the monthly average aggregate TNA of European twin funds associated with the fund during the fiscal year. The *Post* variable equals one in 2018 and 2019 and zero for 2014-2017. Control variables (*fund size, family size, expense ratio, fund turnover, net return, fund age, and fund flows*) are lagged one period. Table A1 in the Appendix provides a complete list of definitions for these variables. We adjust for serial correlation by clustering standard errors at the fund level. t-statistics are reported in parentheses. * denotes significance at the 10% level, ** denotes significance at the 5% level and *** denotes significance at the 1% level.

	Total Commissions (% TNA)		Commission Rate (% Volume)	
	(1)	(2)	(3)	(4)
Post × Twin Size	0.002***	0.002***	0.004***	0.003***
	(2.89)	(2.74)	(3.21)	(2.96)
Twin Size	-0.000*	-0.000	-0.001***	-0.000*
	(-1.95)	(-0.34)	(-4.25)	(-1.93)
Fund Size		-0.000		0.003
		(-0.18)		(1.14)
Family Size		-0.005***		-0.008***
		(-4.69)		(-4.07)
Expense Ratio		0.030***		0.016*
		(5.70)		(1.91)
Fund Turnover		0.034***		0.135***
		(5.00)		(7.20)
Net Return		-0.000***		-0.000*
		(-2.71)		(-1.73)
Fund Age		0.004		0.009**
		(1.23)		(2.01)
Fund Flows		-0.000		0.000
		(-0.96)		(0.19)
Style x Time Fixed Effects	Yes	Yes	Yes	Yes
Observations	11927	11927	11927	11927
Adjusted R^2	0.007	0.043	0.006	0.105

Table IA.4: The Impact of MiFID II on Brokerage Commissions: Twin Family

This table presents results on the impact of MiFID II research unbundling on funds' brokerage commission payments from difference-in-differences models. The sample includes annual data from 2014 to 2019, focusing on actively managed, diversified global and US equity funds that are open-end and domiciled in the US. The dependent variable is the aggregate brokerage commissions paid by the fund over the fiscal year scaled by either the fund's average net assets or trading volume during the same period. *Twin* is an indicator variable for US-domiciled funds with at least one EU twin at fiscal year-end. *Twin Family* is an indicator variable for US-domiciled funds under a fund family that offers at least one US fund managed by the same team and under the same investment style as other identical funds available for sale in Europe (including the UK). The *Post* variable equals one in 2018 and 2019 and zero for 2014-2017. Control variables (*fund size, family size, expense ratio, fund turnover, net return, fund age, and fund flows*) are lagged one period. Table A1 in the Appendix provides a complete list of definitions for these variables. We adjust for serial correlation by clustering standard errors at the fund level. t-statistics are reported in parentheses. * denotes significance at the 10% level, ** denotes significance at the 5% level and *** denotes significance at the 1% level.

	Total Commissions (% TNA)		Commission Rate (% Volume)	
	(1)	(2)	(3)	(4)
Post × Twin	0.026**	0.025**	0.050***	0.046**
	(2.32)	(2.20)	(2.64)	(2.42)
Twin	0.001	0.000	-0.003	0.001
	(0.29)	(0.11)	(-0.92)	(0.39)
Post × Twin Family	0.016**	0.017**	0.033***	0.034***
	(2.46)	(2.58)	(3.10)	(3.45)
Twin Family	-0.012***	0.004	-0.028***	-0.015**
	(-2.63)	(1.00)	(-3.68)	(-2.35)
Controls	No	Yes	No	Yes
Style x Time Fixed Effects	Yes	Yes	Yes	Yes
Observations	11927	11927	11927	11927
Adjusted R^2	0.008	0.045	0.008	0.107

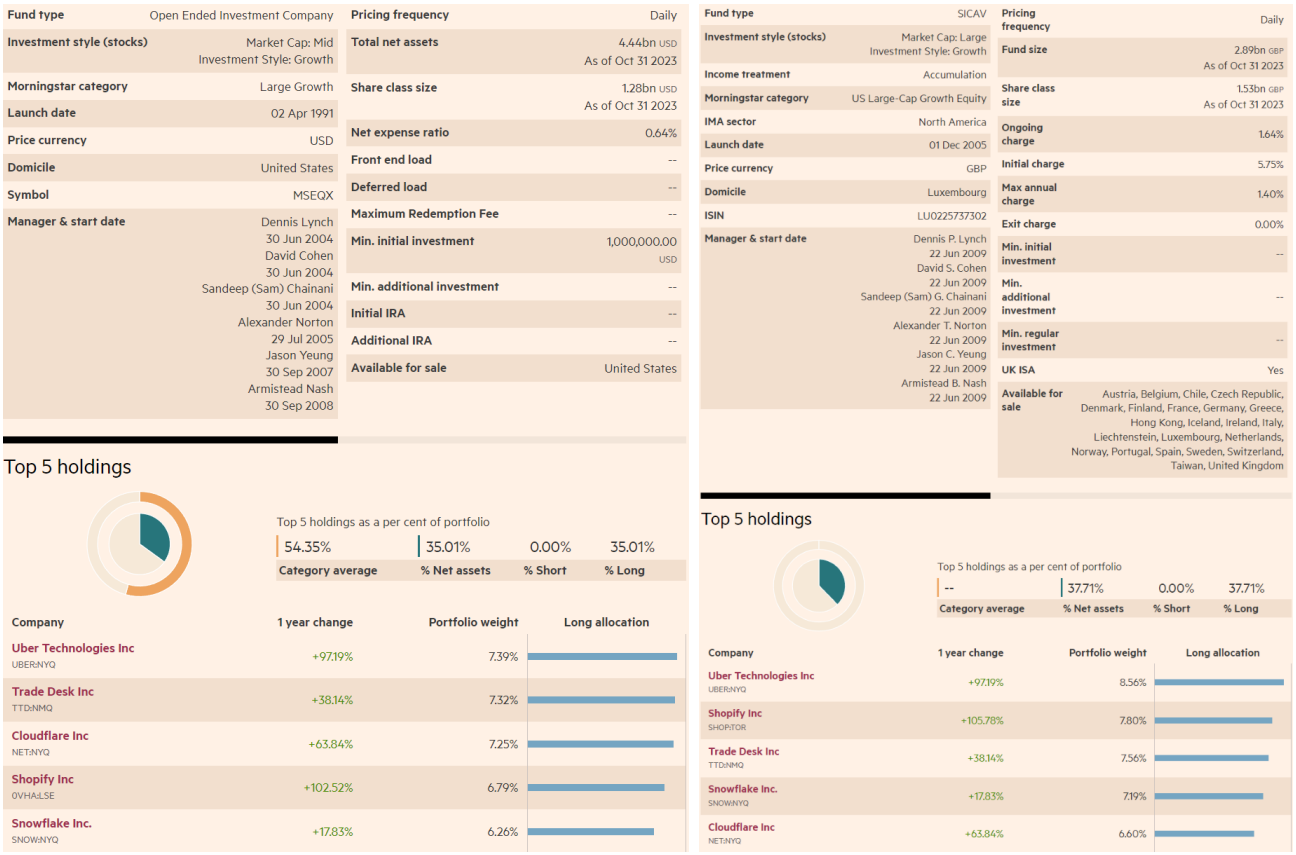
Table IA.5: The Impact of MiFID II on Brokerage Commissions: Global Funds

This table presents results on the impact of MiFID II research unbundling on funds' brokerage commission payments based on whether the fund has a global or domestic investment mandate. The sample includes annual data from 2014 to 2019, focusing on actively managed, diversified global and US equity funds that are open-end and domiciled in the US. The dependent variable is the aggregate brokerage commissions paid by the fund over the fiscal year scaled by either the fund's average net assets or trading volume during the same period. The treatment group (*Twin*) includes US-domiciled funds with at least one EU twin at fiscal year-end. The control group includes US-domiciled funds with the same investment style but without any EU twin funds during the fiscal year. The *Post* variable equals one in 2018 and 2019 and zero for 2014-2017. *Global Investments* is an indicator variable that equals one if the fund has a global investment mandate, and zero if the fund is fully focusing on investing in US stocks. Control variables (*fund size, family size, expense ratio, fund turnover, net return, fund age, and fund flows*) are lagged one year. Table A1 in the Appendix provides a complete list of definitions for these variables. We adjust for serial correlation by clustering standard errors at the fund level. t-statistics are reported in parentheses. * denotes significance at the 10% level, ** denotes significance at the 5% level and *** denotes significance at the 1% level.

	Total Commissions (% TNA)		Commission Rate (% Volume)	
	(1)	(2)	(3)	(4)
Global Investments=0 × Post × Twin	0.023*	0.022*	0.044**	0.042**
	(1.92)	(1.89)	(2.27)	(2.18)
Global Investments=1 × Post × Twin	0.052**	0.050**	0.102***	0.095***
	(2.55)	(2.44)	(2.78)	(2.61)
Global Investments=0 × Twin	-0.002	0.005	-0.017***	-0.004
	(-0.56)	(1.31)	(-3.43)	(-1.07)
Global Investments=1 × Twin	-0.007	-0.005	-0.013	-0.007
	(-1.18)	(-0.92)	(-1.64)	(-1.09)
Controls	No	Yes	No	Yes
Style x Time Fixed Effects	Yes	Yes	Yes	Yes
Observations	11927	11927	11927	11927
Adjusted R^2	0.007	0.044	0.007	0.106

Figure IA.1: Example of twin funds

This figure presents the Morgan Stanley - US Equity Large Growth Funds as an example of an EU-US mutual fund twin in the sample. The same team of portfolio managers currently manages these two funds and have identical holdings. The only difference between these two funds is the countries in which they are available for sale.



Fund type	Open Ended Investment Company
Investment style (stocks)	Market Cap: Mid Investment Style: Growth
Morningstar category	Large Growth
Launch date	02 Apr 1991
Price currency	USD
Domicile	United States
Symbol	MSEQX
Manager & start date	Dennis Lynch 30 Jun 2004 David Cohen 30 Jun 2004 Sandeep (Sam) Chainani 30 Jun 2004 Alexander Norton 29 Jul 2005 Jason Yeung 30 Sep 2007 Armistead Nash 30 Sep 2008

Pricing frequency	Daily
Total net assets	4.44bn USD As of Oct 31 2023
Share class size	1.28bn USD As of Oct 31 2023
Net expense ratio	0.64%
Front end load	--
Deferred load	--
Maximum Redemption Fee	--
Min. initial investment	1,000,000.00 USD
Min. additional investment	--
Initial IRA	--
Additional IRA	--
Available for sale	United States

Top 5 holdings

Top 5 holdings as a per cent of portfolio

54.35%	35.01%	0.00%	35.01%
Category average	% Net assets	% Short	% Long

Company	1 year change	Portfolio weight	Long allocation
Uber Technologies Inc UBER:NYQ	+97.19%	7.39%	
Trade Desk Inc TTD:NMQ	+38.14%	7.32%	
Cloudflare Inc NET:NYQ	+63.84%	7.25%	
Shopify Inc 0VHA:LSE	+102.52%	6.79%	
Snowflake Inc. SNOW:NYQ	+17.83%	6.26%	

Fund type	SICAV
Investment style (stocks)	Market Cap: Large Investment Style: Growth
Income treatment	Accumulation
Morningstar category	US Large-Cap Growth Equity
IMA sector	North America
Launch date	01 Dec 2005
Price currency	GBP
Domicile	Luxembourg
ISIN	LU0225737302
Manager & start date	Dennis P. Lynch 22 Jun 2009 David S. Cohen 22 Jun 2009 Sandeep (Sam) G. Chainani 22 Jun 2009 Alexander T. Norton 22 Jun 2009 Jason C. Yeung 22 Jun 2009 Armistead B. Nash 22 Jun 2009

Pricing frequency	Daily
Fund size	2.89bn GBP As of Oct 31 2023
Share class size	1.53bn GBP As of Oct 31 2023
Ongoing charge	1.64%
Initial charge	5.75%
Max annual charge	1.40%
Exit charge	0.00%
Min. initial investment	--
Min. additional investment	--
Min. regular investment	--
UK ISA	Yes
Available for sale	Austria, Belgium, Chile, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Taiwan, United Kingdom

Top 5 holdings

Top 5 holdings as a per cent of portfolio

--	37.71%	0.00%	37.71%
Category average	% Net assets	% Short	% Long

Company	1 year change	Portfolio weight	Long allocation
Uber Technologies Inc UBER:NYQ	+97.19%	8.56%	
Shopify Inc SHOP:TOR	+105.78%	7.80%	
Trade Desk Inc TTD:NMQ	+38.14%	7.56%	
Snowflake Inc. SNOW:NYQ	+17.83%	7.19%	
Cloudflare Inc NET:NYQ	+63.84%	6.60%	