International Anomalies and Their Short-Sale Costs

DMITRIY MURAVYEV, NEIL D. PEARSON, and JOSHUA M. POLLET*

ABSTRACT

Short-sale costs almost completely eliminate the returns to international asset-pricing anomalies. We study 145 anomalies in 27 countries over nearly 18 years and find an average pre-fee long-short return of 0.37% per month, roughly 50% larger than for comparable strategies implemented in the U.S. CRSP universe. This return is driven largely by the unusually low returns of stocks on the short side rather than unusually high returns on the long side. Yet these same stocks are expensive to short. Once we account for stock-borrow fees on short positions and lending revenue on long positions, the average long-short return falls to -0.04% per month and is statistically indistinguishable from zero. Thus, strong international return predictability does not translate into profitable standard long-short strategies after the main cost of short selling is incorporated.

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* Dmitriy Muravyev and Neil D. Pearson are with the Gies College of Business of the University of Illinois at Urbana-Champaign and the Canadian Derivatives Institute. Joshua M. Pollet is with the Gies College of Business of the University of Illinois at Urbana-Champaign. We thank Theis Jensen, Bryan Kelly, and Lasse Pedersen for the signals for the international anomalies trading strategies. Funding from the CDI and Gies College Grants allowed us to obtain the Markit and FIS borrow fee data, respectively.

Correspondence: Neil D. Pearson, Department of Finance, University of Illinois at Urbana–Champaign, 1206 South Sixth Street, Champaign, Illinois 61820; e-mail: pearson2@illinois.edu.

Cross-sectional predictability patterns are a robust feature of stock returns around the world, according to Jensen, Kelly, and Pedersen (2023). Relatedly, Jacobs and Müller (2020) show that internationally anomalies are more robust in terms of both economic magnitude and statistical strength than in the U.S., especially in more recent data. Are these patterns exploitable using long-short strategies, net of the stock borrow fees that must be paid on the short leg? Our answer is "no." Before accounting for stock borrow fees, the average decile ten minus decile one long-short anomaly portfolio return is a highly significant 0.37% per month, or approximately 4.4% per year. But the average fee-adjusted long-short portfolio return is –0.04% per month, and insignificant.

Muravyev, Pearson, and Pollet (2025a; henceforth MPP) find that the average U.S. anomaly cannot be exploited using long-short strategies. Using recent (post-June 2006) U.S. data, the period for which stock borrow fee data are available, they show that pre-fee average abnormal returns on long-short anomaly strategies are driven by the short leg, and the long-short portfolio returns net of stock borrow fees are within a few basis points of zero. MPP interpret their findings as consistent with the hypothesis that anomaly returns have attenuated and stock borrow fees have risen to the point that the net-of-borrow-fee returns are close to zero, possibly due to sophisticated investors' efforts to exploit anomalies. MPP suggest that the remaining pre-fee anomaly performance persists precisely because the borrow fee is a common limit to arbitrage that prevents anomalies from being further exploited by sophisticated investors.

The much larger pre-fee anomaly returns in non-U.S. stock markets provide an opportunity to carry out a more challenging test of the hypothesis that anomalies are not profitable after accounting for borrow fees. A second advantage of the international context is that the anomalies were originally identified using U.S. data and their net-of-fee performance has not previously been explored in non-U.S. data, so the non-U.S. data allow for an out-of-sample test of the anomalies before and after adjusting for the borrow fee. This generalization across markets is particularly important given the concerns about potential data mining and p-hacking that have been raised in the literature on cross-sectional stock return predictability. A second way in which the analysis is (mostly) out-of-sample is that most of the anomalies were originally identified using data periods that end before the January 2007 beginning of our sample.

We begin by analyzing the performance of the Jensen, Kelly, and Pedersen (2023) anomalies in our sample period, before accounting for fees, using decile sorts to form portfolios

for each anomaly and country pair. Consistent with earlier results, international anomalies are strong—the average international anomaly provides a long-short portfolio pre-fee return of 0.37% per month, or approximately 4.4% per year. The high average long-short return is almost entirely due to the short leg (portfolio 1), with an average return of only 0.11% per month, considerably less than the average return on portfolio 2 of 0.32% per month. In contrast, the average return on the long leg (portfolio 10) is 0.48% per month. The average returns on portfolios 6-9 slightly exceed the portfolio 10 average return, indicating that that superior performance of the long-short portfolio is driven by the poor performance of the short leg (portfolio 1) rather than unusual performance on the long leg (portfolio 10) compared to the other portfolios in the top half of the decile sort. The finding that the long-short portfolio returns are due to the short leg is the first piece of evidence consistent with the hypothesis that anomaly performance does survive accounting for stock borrow fees.

We then consider the impact of the stock borrow fee, which is a common limit to arbitrage for sophisticated investors. The borrow fee is paid by investors who borrow stock to sell short, and the fee less financial intermediation costs (prime broker markups) is received by the long-side investors whose shares are borrowed. Thus, the fees are essentially shadow dividends, which decrease the performance of the short position by one amount and increase the performance of the long-side investors by a lesser (due to intermediation costs and the the fact that not all shares are lent) amount. These shadow dividends are not reflected in stock returns in standard databases and they are typically ignored in the literature.

The fee is proportional to the size of the short position and is paid every day the position is open. Thus, it differs from the commonly considered transactions costs such as the effective spread, which are paid only when a position is opened or closed. The typical borrow fee is at least an order of magnitude larger than typical trade execution costs, and it cannot be avoided by smart execution algorithms or other strategies intended to minimize trading costs.

We carefully modify returns to reflect the borrow fees paid and received on each side of the long-short anomaly strategies. For portfolio 1 (which would be sold short), a short seller would pay the entire borrow fee. We adjust the returns on the portfolio 1 stocks by adding the full fee to the returns. This increase in the returns of the portfolio 1 stocks decreases the performance of the short leg (portfolio 1) by the fee. The adjustment is large when the portfolio contains many high-fee stocks. For direct comparison with portfolio 10, we also report fee-

adjusted returns as if each portfolio is a collection of short positions for the other decile portfolios.

For portfolio 10 (which would be held long), an institutional investor whose shares are borrowed would receive the borrow fee, less the intermediation spreads charged by prime brokers, but only for the shares borrowed. The expected fee received by an investor who makes shares available to be borrowed is the product of the fee less intermediation spreads and the probability that the shares she makes available are borrowed. We estimate this probability as the utilization rate, the ratio of shares borrowed to shares available to be borrowed. We estimate the expected borrow fee received on portfolio 10 as the product of utilization and the fee less intermediation spreads. Thus, intermediation spreads (i.e., prime broker markups) and the utilization rate play critical roles in determining the expected borrow fee received for the stocks in portfolio 10 and the performance of the long-short strategies. For direct comparison with portfolio 10, we provide these partial fee-adjusted returns as if each portfolio is a collection of long positions the other decile portfolios.

The data indicate that the utilization rate is low for the typical stock. The average utilization rate across deciles for all country-anomaly pairs is 13.8%. The average utilization rate for portfolio 1 is 18.6% and the average rate for portfolio 10 is 14.6%. This low portfolio 10 utilization rate implies that the expected fee received by an investor with a long position in portfolio 10 is roughly an order of magnitude smaller than the fee paid by a short seller.

D'Avolio (2002) estimates the intermediation spread to be 30% of the fee. For example, if a hedge fund borrower pays a fee at the rate of 10% per year, the prime broker retains 3% (30% of 10%) and the ultimate share lender, perhaps an index fund, receives 7% (70% of 10%). The fact that the share lender does not receive the full fee paid by the short seller also impacts the returns on the long-short strategies.

The wedge between the fee paid by a short-seller and the expected fee received by a long holder who makes her shares available for borrowing drives our results. The average portfolio 1 borrow fee in our sample is 5.8% per year. This is substantial—its magnitude exceeds the average long-short spread of 4.4% per year. Thus, the long-short strategy can only be profitable net of fees if the expected fee received on the long leg (portfolio 10) exceeds 1.4% (= 5.8% – 4.4%) per year.

But the expected fee received by a long holder is very small, due to the large wedge between the fees paid by a short seller and the expected fees received by a long holder. Using the average portfolio 10 utilization of 14.6% and assuming 70% of the fee is passed through to the share lender, a long holder who makes her shares available to be borrowed expects to receive only 10.2% (= 14.6% × 70%) of the fee paid by the short seller. Even if the average portfolio 10 fee equals the 5.8% average portfolio 1 fee, the expected fee received on portfolio 10 is only 0.59% (= 10.2% × 5.8%) per year. The expected net fee on the long-short portfolio is then the 5.8% fee paid on the short leg less the 0.59% fee received on the long leg, or a net of 5.21% per year. This exceeds the long-short spread of 4.4% per year, making the long-short strategy unprofitable after accounting for fees.

The long-short strategy is slightly less profitable if one instead uses the average portfolio 10 fee in our sample of 5.1%. Using the 5.1% portfolio 10 average fee, the expected fee received on portfolio 10 is 0.52% (= 14.6% × 70% × 5.1%), slightly less than the 0.59% calculated in the preceding paragraph, and the expected net fee on the long-short portfolio is 5.28% (= 5.8% – 0.52%) per year.

A potential issue is that D'Avolio's (2002) estimate that 70% of the fee is passed to the long holder is for the U.S. market, and may not be relevant for all countries. But the conclusion that the predictability evident in international stock markets cannot be exploited using long-short strategies is not sensitive to the magnitude of the financial intermediation spread. If the financial intermediation spread were zero, that is, if the long holder received 100% of the fee paid by the short seller, the expected fee received on the portfolio 10 stocks would be 0.74% (= 14.6% × 100% × 5.1%) per year. In this unlikely scenario, which uses the upper bound of the expected fee paid to the long side, the expected net fee on the long-short portfolio is the 5.8% paid on the short leg less the 0.74% received on the long leg, or 5.06% per year. This continues to exceed the pre-fee long-short spread of 4.4% per year.

There is mild non-monotonicity for the average return across the portfolios in the top half, and the average return on portfolios 6-10 exceeds the average return on portfolio 10. Thus, the long side of this analysis could be implemented in a straightforward manner with portfolio 6 through portfolio 10. This non-monotonicity for average returns is not present across the portfolios in the bottom half, and so, it is still necessary to implement the short side using only portfolio 1 to generate substantial long-short performance before adjusting for the borrow fee.

The combined average return for the top half of portfolios is modestly higher at 0.53% per month before adjustment. Nevertheless, after adjusting the long side and the short side for the impact of the borrow fee, the long-short return while using this expanded group of portfolios on the long side is basically zero, that is, –0.02% per month.

In addition to reporting results for the average anomaly, we also report results for the 27 individual countries in our sample and for several groups of countries. The country-level results show that the near-zero aggregate estimate is not driven by a small number of poorly performing markets. In Table III, the fee-adjusted long-short estimate is negative in 18 of the 27 countries. Of the nine positive estimates, only South Africa and Switzerland are statistically significant at the 5% level. The cross-country pattern is closely related to borrowing costs. The correlation between the annualized borrowing-cost spread and fee-adjusted long-short performance is –0.80, and South Africa and Switzerland have the two smallest spreads.

The broader country subsamples in Table IV reinforce this conclusion. Before fees, the average monthly long-short return is 0.30% for the Big 3 markets (U.S., U.K, and Japan), 0.38% for developed markets excluding the Big 3, and 0.38% for emerging markets. After fees, the corresponding estimates are 0.04%, –0.05%, and –0.04%, and none is statistically significant. The contrast is sharper when countries are sorted by borrowing costs. The five lowest-fee countries retain a 0.10% monthly return with a *t*-statistic of 1.77, whereas the five highest-fee countries earn –0.24% with a *t*-statistic of –3.80. The high-fee group has stronger performance before fees, which is consistent with costly implementation allowing larger apparent anomalies to persist.

The anomaly-level estimates in Appendix Table I reveal meaningful heterogeneity around the aggregate result. After fees, 81 of the 145 long-short estimates are negative and 64 are positive. Using a 5% significance threshold, 41 estimates are significantly negative and 24 are significantly positive. Several momentum, profitability, and valuation signals remain profitable after fees, while many investment, liquidity, and skewness signals reverse sign. Thus, the aggregate estimate should not be interpreted as showing that every individual anomaly disappears. It shows that the typical anomaly does not provide positive fee-adjusted performance, and that significantly negative outcomes are more common than significantly positive outcomes.

Our primary findings regarding the fee-adjusted performance of anomalies rely on a combined dataset of borrow fee and utilization information from two vendors, namely Markit and FIS, to increase accuracy and to increase the number of stocks in each portfolio with the necessary fee and utilization information. The results are largely unchanged if data from only one of the vendors is used. The average anomaly long-short return using the Markit (FIS) only sample before the fee adjustment is 0.38% (0.36%) and the corresponding long-short return after the fee adjustment is within a few basis points of zero. Ultimately the fee and utilization information at the stock-month level is highly correlated across vendors and the overlap in the stocks covered by each vendor is greater than 90%.

There are compositional changes in borrow fee coverage in the Markit and FIS datasets that are substantial. This leads to average fee slowly increasing over time as the fraction small-cap and micro-cap stocks with borrow fees in the sample increases. In particular, there is greater coverage of stocks outside of the major national stock market indices. The gap due to fees is attenuated for larger stocks in the dominant indices, such as S&P 500 and Russell 2000. Consequently, the differential due to short-sale costs is most relevant for equal-weighted strategies using small cap stocks. The underlying anomalies are about 25% stronger for equal-weighted strategies compared to value-weighted strategies and this greater strength is entirely due to differences in the performance of decile 1. Once again, these patterns provide evidence that the common limit to arbitrage allowing these anomalies to persist is the borrow fee. The compositional changes in fee coverage for the borrow fee data are substantial. This leads to average fee slowly increasing over time as the fraction small-cap and micro-cap stocks in the sample increases.

The remainder of the paper is organized as follows. Section I describes the data and the anomaly sample selection. Section II presents the main findings for the 145 anomalies across 27 countries, including the results for raw returns and net-of-fee returns. Section III investigates the quality of the borrow fee data from the two vendors and also evaluates the impact of risk-adjustment using a national market single factor model. Section IV discusses implications of our findings in the broader context of research regarding anomalies, considers alternative implementations of anomalies, and discusses market inefficiency in an international context. Section V concludes.

I. Data sources and summary statistics

A. Building the dataset

This section describes the construction of the international anomaly sample for our analysis. This includes how we identify and select the anomalies, the countries, the time period, the stock borrow fee, and other data. We apply several filters in constructing the sample. We also present basic summary statistics to characterize the sample.

This project merges global equity anomalies with stock borrow fees from Markit and FIS to calculate fee-adjusted portfolio returns. The analysis sorts stocks on a monthly basis from January 2007 through November 2024 and includes the 27 countries with sufficient borrow fee coverage; the resulting panel of decile returns contains 2,465,820 observations at the country, month, and anomaly level.

The underlying stock return data as well as the anomaly signals are from the global factor file used in Jensen, Kelly, and Pedersen (2023). This data is available via WRDS. We merge stock identifiers to this dataset from the Compustat Global and Compustat North America security dictionaries. These stock identifiers are used to merge stock returns and anomaly signals to the borrow fee information from Markit and FIS. Monthly stock returns are already in USD and so we do not convert these returns. The borrow fee is quoted as a percentage of the stock price in local currency, and so, we use foreign exchange rates to convert the borrow fee to US dollars when we calculate returns that reflect the borrow fee, that is, fee-adjusted returns.

We begin with the common stocks in the global factor file(Compustat TPCI = 0 for non-US equities and common = 1 for US/Canada equities). We add issue-level identifiers (ISIN, SEDOL, CUSIP, ticker) from Compustat Global (or Compustat North America) using GVKEY and keep primary listings (primary_sec == 1). We normalize all dates to month-end midnight for consistency. To improve match rates without accidentally linking equities across countries, we infer a dominant ISIN prefix per country and build a GVKEY and ISIN prefix pair. Missing ISIN information is filled and mismatched ISIN prefixes are corrected only when a same-country prefix exists for that specific GVKEY in Compustat.

The stock borrow fee data for each stock is from two sources: Markit and FIS. We aggregate daily information from Markit into monthly measures. For each month, these statistics are merged to the specific equity issue. For equities in Compustat Global, the main source of equity return data, this merge uses ISIN as the primary identifier and SEDOL as a secondary

identifier. For equities listed in North America, identifiers are from Compustat North America and the merge uses CUSIP as the primary identifier.

Because the Markit data can contain multiple rows for each stock, we prioritize the record with nonmissing indicative fee and utilization information followed by largest number of shares on loan. In full merge diagnostics for 2007–2024, 4,535,172 of 9,921,235 factor rows match to Markit (45.7%), and only 35,304 matches rely on SEDOL as the secondary identifier (<1% of matches), indicating that this alternative is rarely invoked. A corresponding procedure is used to merge FIS borrow fee information to stocks in Compustat Global and Compustat North America.

We apply count filters within each month to the borrow fee information from each source, Markit or FIS. If there are fewer than 4 daily observations for the month, then the monthly records for all variables are set to missing. If borrow fee information from only one source is available, then that source is used. If borrow fee information from both sources is available, then the two sources are combined to produce quantity-weighted average fee and the supply-weighted average utilization. The weights are based on the relevant variables for the number of shares on loan and the number of shares available for loans at the end of the previous month in each dataset. Implicitly, this approach aggregates the information in the two datasets as if these dataset contain non-overlapping samples of stock loans. The main results do not change substantially if we use equal-weighting across the sources. We also preserve source-specific identifiers for the borrow fee and utilization to confirm that the main results are not impacted if we only use one of the two sources.

Having merged equity returns and anomaly signals to borrow fee information, we can sort stocks into portfolios using each anomaly signal and calculate the resulting portfolio returns each month. A short list of anomalies with extremely discrete signals preclude sorting stocks into deciles. These 8 anomalies are excluded from our analysis. We apply a market capitalization filter to remove any stock with a market capitalization below $50 million in USD at the end of the previous month. For each anomaly and country pair in a particular month, we require a minimum of 20 stocks with non-missing market capitalization, return, and borrow fee information. If this threshold is not met, the portfolios returns are not calculated for the anomaly and country pair in this month.

For each country-month, we sort stocks into deciles using a rank-based method that guarantees 10 groups of approximately equal number of stocks for each anomaly. We multiply each anomaly signal from the end of the preceding month by its sign from the anomaly code file so that higher values of the anomaly signal should imply higher expected returns. For a small set of moderately discrete signals, we add a small noise term that can be replicated to break groups of large ties.

The monthly raw return for each stock is winsorized at the 0.1 and 99.9 percentiles by month. Fee-adjusted returns use the average daily borrow fee for the month converted to a 30-day equivalent to mimic the impact of the borrow fee on returns as if an investor was holding a portfolio of short positions. Utilization-adjusted returns to mimic a portfolio of long positions receives only a portion of the borrow fee given by$0.7 \times \text{fee} \times \text{utilization}$ and is also converted to a 30-day equivalent. These adjustments are converted to US dollars using the exchange rate at the end of the month so that borrow fee, initially quoted in local currency, reflects currency movements during the month. Thus, these stock returns remain in USD. Long-short portfolio returns are computed as decile 10 returns minus decile 1 returns for raw, fee-adjusted, and utilization-adjusted returns.

Within each decile portfolio for each anomaly, in a given month, from a particular country, the stock returns and other performance measures are equally weighted across stocks. In our main analysis, we aggregate monthly performance for each decile across anomaly and country pairs on an equal-weighted basis. Using this information, we can also aggregate across anomalies within each decile for a given country or aggregate across countries within each decile for a given anomaly.

B. Summary statistics for the underlying stocks

Table I presents summary statistics by country for the underlying sample of stock-month observations that match to stock borrow fee and utilization data from Markit or FIS. The sample includes stocks for 27 countries from January 2007 through November 2024. For each of the columns, the row labeled ‘All’ reports the equal-weighted average across the countries in the sample. The first column indicates that most countries are included in the analysis for the entire sample period, that is, 25 of the 27 countries have 215 months of data. However, two countries, Brazil and Malaysia, are only included for the majority of months, but not the entire sample period. Thus, the sample across countries is nearly a balanced panel of country and month pairs.

The second column labeled 'Average # of Anomalies' establishes the comparability of the anomaly samples across the countries. For example, Australia, Canada, France, Germany, Italy, Netherlands, Switzerland, United Kingdom, and the United States are missing less than 1 of the 145 anomalies in our baseline sample per month. More generally, 20 of the 27 countries are missing fewer than 5 anomalies per month and the average country is missing only about 3 anomalies per month. Thus, most of the anomaly strategies in our analysis are implementable for the vast majority of the countries during the sample period. Even at the low end of the range with an average of about 128 of 145 anomalies for New Zealand and about 136 of 145 anomalies for Brazil, anomaly coverage is fairly broad. This pattern limits the extent to which any of the cross-country differences could be attributed to the numbers of distinct anomaly signals available for the countries in the sample.

There are three differences across countries worthy of discussion. First, and most importantly, the measures related to stock borrowing also vary considerably across countries. For example, the average borrow fee in the first row of Table I for all countries is 4.45% on an annualized basis. The average borrow fee by country ranges from about 1.5% for stocks in South Africa to about 9% for stocks in Turkey. Thus, there is substantial cross-country heterogeneity in the specific limit to arbitrage created by the stock borrow fee that is faced by sophisticated long-short investors. This heterogeneity is unrelated to the original discovery of each anomaly, almost all of which were initially analyzed using stocks listed in the US. The variation for average utilization across countries is also quite wide. For several countries, such as Mexico and South Africa, average utilization is less than 10%, but in other countries, including Brazil, South Korea, and Turkey, average utilization is more than 20%. These differences in the levels of the typical borrow fee and utilization across countries imply that the implementation of similar anomaly strategies may face quite different frictions from financial intermediation across countries.

Second, the number of stocks listed in each country differs substantially. For instance, the United States has more than 3,000 stocks with borrow fee data in given month. Similarly, Japan has more than 2,000 stocks. Several smaller markets, such as Belgium and Mexico, have fewer than 60 stocks available in the typical month during the sample period. This variation in the number of stocks across countries provides the motivation for our requirement that each monthly observation of a strategy and country pair only enters the performance analysis if at least 20 stocks can be assigned to the underlying decile portfolios for that observation.

Lastly, the average market capitalization, measured in millions of US dollars, for the underlying stocks in each country ranges from about $1,300 in New Zealand to roughly $9,900 in the Netherlands. Due to the requirement that each underlying stock match to borrow fee and utilization data, the sample is tilted to stocks with higher market capitalizations compared to the broader set of stocks with anomaly signals. Nevertheless, this tilt does not eliminate large variations in market capitalization across countries. Any cross-country comparisons reflect national markets with meaningfully different compositions in terms of both market capitalization and the number of listed stocks, in addition to the differences of direct interest in the market for borrowing stock. These comparisons have to be treated with some caution because countries do not have nearly identical samples of underlying stocks.

Next, we shift to simple time-series patterns for the borrow fee. Figure 1 shows how the average stock borrow fee for the underlying stocks changes during the sample period. The figure plots three-month trailing average of annualized borrowing fees from January 2007 through November 2024 for three different groups of countries: All Countries, Big 3 (Japan, the United Kingdom, and the United States), and Developed excluding Big 3. The group of emerging markets is defined using MSCI classifications in 2006. This group consists of Brazil, Israel, South Korea, Malaysia, Mexico, South Africa, Taiwan, and Turkey. The group of emerging markets and the big three are excluded from the category Developed minus Big 3.

To calculate this average borrow fee for a given month, we begin with an equally-weighted average of the fee across the underlying stocks in each country with anomaly signals that match to borrow fee and utilization data from either of the vendors for each country and month. Next, we calculate and equally-weighted average across the countries in the country group of interest. Equal-weighting across countries, rather than equally weighting across all stocks, prevents the 'All Countries' series from skewing the measure towards the average fee in a few countries with a large number of stocks, e.g., Japan and the United States. In addition, this average fee measure characterizes the general borrow fee environment rather than the average borrow fee for decile 1, the typical short leg. Finally, we smooth each series in Figure 1 by using a 3-month moving average.

The most interesting feature of Figure 1 is the large increase in borrowing fees during the sample period. At the beginning of the sample period in 2007, the average borrow fee for the All Countries group is roughly 2.5% per year. By the end of the sample period in late 2024, the

corresponding average borrow fee is greater than 6.5%, an increase of more than 2.5 times its initial level. While this series does not rise smoothly throughout the sample period, the average borrow fee in 2024 is far above its pre-2010 level.

The increase is present in both of the displayed subgroups, but the magnitudes of the increase differ in both absolute and relative terms. For the Big 3, the increase is from approximately 2% to slightly less than 4% during the sample period. Essentially, the average borrow fee for the Big 3 nearly doubles, but the magnitude of the increase is considerably smaller than the increase for all countries as well as for the other developed markets. For the category Developed excluding Big 3, the average fee starts at about 2.4% and increases to more than 7.5% by the end of the sample period, an increase to more than triple the initial average fee. The low level of the Big 3 series is not representative of the broader international sample. Because countries receive equal weight in each series, the broad group-level borrowing conditions would be obscured if all stocks were equally-weighted due to the disproportionate number of equities listed in Japan and the United States.

The time-series pattern has two implications for the manuscript's analysis. First, the economic importance of borrowing costs is not constant during the sample period. A before-fee anomaly return that has similar performance before fees across the sub-periods represents a much less implementable opportunity when the borrow fee required to establish short positions is so much higher near the end of the sample period. Second, the widening gap between the average borrow fee for the Big 3 and other developed markets shows why international aggregation might accidentally conceal cross-country heterogeneity in anomaly performance. Strategies implemented primarily in the Big 3 markets face a materially lower average borrow fee going forward than otherwise similar strategies implemented in the remaining markets.

Since Figure 1 reflects the average borrow fee across all of the underlying stocks, it does not by itself measure the full fee paid to short the decile 1 portfolio or the proportional benefit received on the long side for holding the decile 10 portfolio. Those portfolio-specific quantities are reported in subsequent tables. Instead, the purpose of Figure 1 is to establish the broader pattern that if the borrow fee is a common limit to arbitrage, then this limit is becoming substantially more important. The figure also supports the paper's core approach: analyses based only on the unadjusted stock returns likely omit an implementation friction that has increased with time and is particularly important outside the largest and most developed national markets.

II. Main findings

A. Main findings using raw stock returns

Based on the portfolio formation procedure to sort stocks for each anomaly and country pair into deciles, as described in Section I, Table II presents performance metrics and other statistics for the decile portfolios. Panel A displays the means of the time-series average of monthly returns (raw) for each of the ten decile portfolios. The average stock borrow fee for each portfolio is reported on an annualized basis. In Panel B we evaluate the performance of each portfolio after adjusting for the full borrow fee as if the decile portfolio is held as a short position. The borrow fee during the evaluation period is added to each stock's return to adjust performance for the cost of borrowing stock. In Panel C we evaluate long positions from the perspective of institutions that participate in stock lending programs. The product of the borrow fee, the utilization rate, and the proportion 0.7 of the borrow fee passed through to the ultimate lender of each stock is added to each stock's return to adjust performance.

The results in Panel A show that the means of the raw portfolio returns are positive for each of the deciles. The difference between portfolio 10 and portfolio 1 is 0.37% per month, and is very similar to national market (CAPM) abnormal returns of 0.41% per month in Table V, Panel A discussed below. The unreported *t*-statistic for this difference is 8.2, indicating that these long-short strategies, in aggregate, offer a highly significant performance benefit if the stock borrow fee is not taken into account. The long-short performance is almost entirely due to the low average return of decile 1. Indeed, decile 10 has a slightly lower average return than decile 6 through decile 9.

The *t*-statistics in this and subsequent tables are computed using a panel regression in which the monthly portfolio return for each anomaly is regressed onto decile fixed effects, and the standard errors are double-clustered by anomaly and month. The estimate for each fixed effect is the average return for the corresponding decile with appropriate *t*-statistic in this context. Clustering by month is particularly important because the portfolio returns are often strongly correlated across anomalies. First, the sorting variables for several anomalies are not independent, and thus, stocks are often assigned to the same decile for different anomalies.

Second, the portfolio for decile 1 in particular contains many of the same high-fee stocks across anomalies. This statistical approach also captures any autocorrelation in anomaly returns.[1]

The results in Panel B show the means of the average fee-adjusted returns for the ten decile portfolios as if they are held short. These means exceed the corresponding means displayed in Panel A because the fee adjustment involves adding the full borrow fee to portfolio performance. The results in Panel C show the means of the average fee-adjusted returns for the ten decile portfolios as if they are held long by institutions that lend their shares. These means also exceed the corresponding means displayed in Panel A because the fee adjustment involves adding a proportion of the stock fee related to utilization and financial intermediation to portfolio performance. The relevant long-short performance is 0.55% for decile 10 in Panel C minus 0.59% for decile 1 in Panel B, that is, a net of –0.04% per month.

The fee adjustment disproportionately impacts the returns on the short side because the full borrow fee is required to adjust the performance of portfolio 1. This adjustment changes the return by nearly 50 basis points per month. The mean of the average return for portfolio 10 increases by only 7 basis points per month. As a result, the mean of the long-short portfolio return after adjusting for the borrow fee is essentially zero after appropriately adjusting for the stock borrow fee on both the short side and the long side. These results show that the statistically significant mean return for the long-short portfolio in Table II, Panel A disappears after adjusting for the stock borrow fee. This finding is consistent with the possibility that a marginal investor facing the stock borrow fee cannot profitably exploit these anomalies.

We revisit this main finding graphically using the cross-sectional distribution of the average long-short return for all anomaly and country pairs. Figure 2 shows the smoothed cross-sectional distributions of average monthly long-short returns for 3,930 anomaly and country pairs. For each anomaly-country observation, the blue curve is the distribution of the monthly average raw return on decile 10 minus the average raw return on decile 1. The red distribution reports the corresponding long-short fee-adjusted monthly average: the decile 10 monthly average return after adding the utilization-based fraction of the borrow fee to the long side minus

[1] Naïve *t*-statistics computed from the cross-sectional standard deviations, across the 145 anomaly portfolios and 27 countries, of the time-series average portfolio abnormal returns implicitly assume that there is no cross-sectional correlation in the abnormal returns for the decile portfolios in a given month. Because this assumption is almost certainly not satisfied, these *t*-statistics would only provide largely uninformative upper bounds on the range of *t*-statistics that could be computed based on different cross-correlation assumptions.

the decile 1 average return after adjusting the full borrow fee on the short side. The blue and red dashed vertical lines mark the respective cross-sectional medians of the two distributions, 0.38% and –0.03% per month.

The main result is the massive leftward shift in the entire distribution after borrowing costs are incorporated. Before the adjustment, the raw long-short distribution is centered well to the right of zero with a median of 0.38% per month. After applying the borrow fee adjustments to the short and long sides, the median falls by approximately 0.41 percentage points to –0.03%. The red distribution reaches its peak near zero and places roughly equal mass to the left and right of zero. The disappearance of the average long-short return is not merely a comparison of two isolated estimates of aggregate performance. Instead, it is a systematic shift across the average monthly long-short return distribution for all anomaly and country pairs. Adjusting for the borrow fee eliminates the positive long-short average return for a substantial portion of the anomaly and country pairs rather than impacting only a small number of unusually expensive strategies. While the variance of the distribution does shrink and the peak of the density function is higher after adjusting for the fees, dispersion only decreases modestly. The main impact of adjusting for the borrow fee is a change to the central location of the distribution, not a major reduction in the cross-sectional heterogeneity of performance.

Figure 2 complements the aggregate evidence in Table II. The blue median of 0.38% closely matches the approximately 0.37% raw long-short return reported in the portfolio tables, and the red median of –0.03% closely matches their approximately –0.04% fee-adjusted estimate. A comparison of means from the table does not fully reveal the mechanism. The raw anomaly differential before adjustment is distributed across many country and anomaly pairs and the reduction in performance after accounting for the borrow fee is similarly widespread. This pattern supports the interpretation of stock borrow fee as a common limit to arbitrage rather than a performance hurdle confined to a few countries or anomalies. The figure supports the manuscript's main finding: long-short anomaly performance based on raw stock returns appears to be broadly positive, but the implementable return available to an investor facing the stock borrow fee is centered very near zero.

B. Analysis of anomalies and the impact of the borrow fee by country

The main purpose of Table III is to disaggregate the fee-adjusted performance of the anomaly strategies by country. The Spread column measures the annualized impact of the

borrow fee adjustment as applied to the two sides of the strategy: the full average borrow fee for the decile 1 short position minus 0.7 times utilization times the average borrow fee for the decile 10 long position. The Decile 1 column reports the average monthly return after adding the full borrow fee to the return on the short-side portfolio, while the Decile 10 column reports the average monthly return after adding the proportion of the adjusted fee received by a long investor that ultimately lends the shares. The Difference column is the fee-adjusted long-short average for decile 10 minus decile 1 and the *t*-statistic for this difference is estimated from a panel regression with standard errors double-clustered by anomaly and month.

The all-country differential performance in the first row is –0.04% per month. Based on the corresponding *t*-statistic reported in the last column, this differential performance is not significantly different from zero at any conventional level of significance. Moreover, it is of the wrong sign for anomalies to be profitable after accounting for stock borrow fees. Consequently, the statistically significant differential before any adjustment for the stock borrow fee cannot be exploited by sophisticated investors facing the fee. This pooled result in the first row is completely unsurprising given the results in Table II. Once again, the aggregated anomaly return across countries does not survive the implementation costs faced by a marginal investor. Such an investor must pay the full borrow fee on the short position but receives only a proportion of the fee on the long position, due to the wedge crated by utilization and financial intermediation. This leads to a net annualized cost of about 5.3%, on average, as reported in the first column at the top of the table.

The near-zero estimate for all countries after adjusting for the borrow fee could obscure potentially interesting patterns of country-level heterogeneity. Two patterns indicate that, in spite of any heterogeneity, these anomalies are not exploitable after adjusting for the borrow fee in most of the countries in our sample. First, the estimate of the fee-adjusted Difference is negative in 18 of 27 countries. Second, of the nine countries with positive estimates, four estimates are less than 10 basis points and only two estimates are positive and statistically significant: South Africa (0.37%; *t*-statistic = 4.02) and Switzerland (0.16%; *t*-statistic = 2.22). The fact that there are only two significantly positive long-short estimates at the 5% level of statistical significance for the 27 countries is compelling. This rate of rejection is only slightly higher than the anticipated rejection rate under the null hypothesis if we assume that each statistical test is independent.

At the same time, the mechanism explaining the absence of exploitability may be revealed by the cross-country pattern. The annualized Spread ranges from slightly more than 1.5% in South Africa to about 9.5% in Turkey. Across the 27 country rows there is a correlation of –0.8 between the Spread column and the fee-adjusted monthly Difference column. This pattern indicates that the heterogeneous wedge between the cost imposed on the short side and the benefit received on the long side explains the country-level long-short performance results. So, it should not be particularly surprising that the two countries with significantly positive differences also have the two smallest spreads: South Africa at 1.58% and Switzerland at 2.43%. Of course, the spread does not completely determine fee-adjusted performance. Both Japan and the Netherlands have relatively low spreads of 3.0% and 3.4% respectively, yet their long-short estimates are essentially zero.

The patterns in Table III support the main findings while providing some caveats. In general, there is no evidence that the anomaly strategies remain highly profitable in most countries after adjusting for the borrow fee. The estimates for the majority of countries are negative and most of the remaining country-specific estimates are near zero both economically and statistically. Nevertheless, South Africa and Switzerland are country-specific exceptions, and so, the main finding should not be interpreted as a statement that positive anomaly performance is impossible in every market. The country-level evidence supports the finding that the before-fee anomaly return is not exploitable in general by an investor who bears the full short-side fee while receiving only the utilization-adjusted lending benefit on the long side.

C. Country groups and borrowing costs

Table IV examines whether the main results differ across broad country groups and across countries with different average stock-borrowing costs. The country classifications are fixed using the MSCI classification in 2006, before the January 2007 start of the sample. The Big 3 group consists of the United Kingdom, Japan, and the United States. The emerging-market group consists of Brazil, Israel, South Korea, Malaysia, Mexico, South Africa, Taiwan, and Turkey, while Developed minus Big 3 contains the remaining developed markets. Difference Before is the average monthly decile 10 minus decile 1 return before the fee adjustment. Spread is the annualized difference between the full decile 1 borrow fee imposed on the short side and 0.7 times utilization times the decile 10 borrow fee credited to the long side. Difference After is

the corresponding monthly long-short return after applying these asymmetric adjustments. The reported *t*-statistics use standard errors double-clustered by anomaly and month.

The All Countries row reproduces the aggregate finding from Table II and Table III for convenient reference. The average long-short return is 0.37% per month before accounting for the borrow fee, while the annualized spread between the short-side cost and long-side benefit is about 5.3%. After adjustment, the decile 1 and decile 10 average monthly returns are 0.59% and 0.55%, respectively, leaving a Difference After of –0.04% with a t-statistic of –0.71. Thus, the economically large before-fee return becomes statistically insignificant and economically indistinguishable from zero once we account for the borrow fee.

The classification into categories of countries reveals that this conclusion is not due to an outsize role of any particular group: Big 3, Developed markets excluding the Big 3, or Emerging markets. Before fees, Big3, Developed minus Big 3, and Emerging have similar long-short returns in the Difference Before column ranging from 0.30% to 0.38% per month. The fee-adjusted performance in the Difference After column range from –0.05% to 0.04%, with *t*-statistics ranging from –0.86 to 0.59. While it is generally assumed that the Big 3 markets are the most efficient and the Emerging markets are the least efficient, these groups of countries do not offer any evidence of exploitable fee-adjusted performance.

Sorting countries by the average borrow fee produces a bit more of a contrast, but still does not lead to a cluster of clearly exploitable anomalies. Based on the country averages reported in Table I, the five lowest-fee countries are Japan, the Netherlands, South Africa, Switzerland, and the United States and the five highest-fee countries are Turkey, Malaysia, France, Sweden, and Israel. Before adjustment, the high-fee country group has the stronger anomaly returns before adjustment of 0.41% per month compared to 0.30% for the low-fee country group. However, the Spread due to the borrow fee is 8.06% per year in the high-fee group and more than fully offsets this before-fee performance. For the low-fee countries, the borrow fee adjustment reduces the estimated long-short monthly return by about 0.20 percentage points per month to 0.10%. While this estimate of 0.10% has a *t*-statistic of 1.77, that is, it is marginally significant at the 10% level, the residual performance is economically underwhelming at less than 1% per year.

The high-fee category has the strongest apparent anomaly performance before implementation costs are considered, but they also contain the largest wedge from the borrow

fee. The pattern is consistent with the interpretation that an unusually strong before-fee anomaly return persists whenever the anomaly is especially costly to exploit, rather than representing a large net opportunity for a marginal investor.

III. Borrow fee data validity and single factor risk adjustment

A. Validity of stock borrow fee data from each vendor

Table V analyzes whether the main finding depends on the borrow fee and utilization data for a specific vendor. We begin this analysis by revisiting the first row of each panel in Table II using only the information from each data provider separately. Since the underlying set of stocks is the union of monthly observations matching to borrow fee and utilization data from either Markit, FIS, or both, using only one data provider at a time leads to a smaller sample of underlying stocks. Nevertheless, the pattern for average portfolio returns across the deciles for the baseline sample reported in the first row Panel A is very similar to the Markit sample in the second row and to the FIS sample in the third row of this same panel. In each row of Panel A the source of the long-short differential is largely due to the particularly low performance of decile 1 compared to the other deciles. Indeed, the performance in decile 6 through decile 10 is within 10 basis points of each other even across rows in this panel. The key statistic of interest is the long-short return before any fee adjustment, that is, decile 10 minus Decile 1: 0.37% for the baseline sample, 0.38% for the Markit sample, and 0.36% for the FIS sample. The close similarity of these estimates of long-short performance indicates any differences in the collection of borrow fee information for particular stocks across the two vendors does not impact the substantial abnormal performance observed prior to any adjustment for the stock borrow fee.

Panel B revisits the adjustments to portfolio performance based on the stock borrow fee as if the portfolios are held as short positions. Analogously, Panel C revisits the adjustments based on the borrow fee as if these portfolios are held as long positions. While there is more variation due to the adjustments between the results for the baseline specification and the results restricted to only using one data vendor, the overall patterns remain strikingly similar across the corresponding rows within each panel. There is a huge shift upwards for decile 1 in Panel B compared to Panel A due to the short-side adjustment related to the borrow fee. The upward shift in Panel C for decile 10 when held as a long position is far more modest. Thus, the performance of the short side and the long side are nearly identical after appropriately adjusting each side for the impact of the stock borrow fee on portfolio performance. The differential performance

estimates, calculated as decile 10 in Panel C minus decile 1 in Panel B, are negligible for all three samples: -0.04% for the baseline sample, -0.00% for the Markit sample, and -0.01% for the FIS sample.

Panel D of Table V reports the average number of stocks per anomaly portfolio for the baseline sample using the combination and for each data vendor separately. FIS provides modestly broader coverage with an average of about 38 stocks in the typical decile portfolio compared to an average of about 37 stocks in the corresponding portfolio for Markit. Since the baseline sample using the combined data has about 39 stocks in the average decile portfolio, each data vendor separately includes more than 90% of the combined universe of stocks with borrow fee and utilization information, that is, most stocks are covered by both vendors. While it is still likely that there are differences across vendors in a modest of cases, these differences do not appear to fundamentally alter the sample of underlying stocks or our main findings.

B. Risk-adjustment using a national market single factor model

The main results in the previous section use raw stock returns as the performance metric. To rule out the possibility that there is some form of differential systematic risk loading across decile portfolios and somehow this loading is correlated with stock borrow fees, we revisit the main analyses using the monthly abnormal stock return from a national single-factor market model (CAPM) as the performance metric. Table VI follows the same structure as Table II, but analyzes the monthly abnormal returns. Panel A displays the means of the time-series average of monthly abnormal returns relative to the national market for each anomaly and country pair across the ten decile portfolios. For convenient comparison, we report the average stock borrow fee on an annualized basis as well as average utilization for each portfolio again.

In Panel B, we evaluate the abnormal performance of each portfolio after adjusting for the full borrow fee. This analysis is conducted as if the decile portfolio is held as a short position. The full borrow fee during the evaluation period is added to each stock's return to adjust performance for the cost of borrowing stock. Once again, in Panel C we evaluate long positions from the perspective of institutions that participate in stock lending programs. The product of the borrow fee, the utilization rate, and the proportion 0.7 of the borrow fee passed through to the ultimate lender of each stock is added to each stock's return to adjust performance.

The results in Panel A show that the means of the abnormal portfolio returns have a distinct pattern. The abnormal performance for decile 1 is negative, strongly significantly

different from zero, and much lower than all of the other deciles. There is also a clear monotonic pattern from decile 1 to decile 5. Decile 6 through decile 9 have slightly positive abnormal return estimates that are not economically or statistically different from zero. The abnormal return for decile 10 is virtually indistinguishable from zero. The difference between portfolio 10 and portfolio 1 is 0.41% per month or about 5% per year. This differential is quite close to the corresponding raw return estimate of 0.37% per month in Table II, Panel A. Thus, a simple systematic risk adjustment does not change the performance patterns before adjusting for the stock borrow fee. The long-short performance is entirely due to the low abnormal return of decile 1 compared to the other decile portfolios. Just as in Table II, decile 10 has a slightly lower average abnormal return than decile 6 through decile 9.

The results in Panel B show the means of the average fee-adjusted abnormal returns for the ten decile portfolios as if they are held short. The results in Panel C show the means of the average fee-adjusted abnormal returns for the ten decile portfolios as if they are held long by institutions that lend their shares. The relevant long-short performance is 0.07% for decile 10 in Panel C minus 0.06% for decile 1 in Panel B, that is, a net of 0.01% per month. The fee adjustment disproportionately impacts the returns on the short side because the full borrow fee is required to adjust the performance of decile 1. Just as in Table II, this adjustment for the borrow fee changes performance by nearly 50 basis points per month going from Panel A to Panel B. The mean of the average abnormal return for portfolio 10 increases by only 7 basis points per month from Panel A to Panel C. As a result, the mean of the long-short abnormal returns after adjusting for the borrow fee is basically zero after adjusting for the stock borrow fee on both the short side and the long side.

Following the pattern established for raw returns in Table II, these results for abnormal performance confirm that that the statistically significant mean abnormal return for the long-short portfolio in Panel A of Table VI completely disappears after adjusting for the stock borrow fee. The patterns documented for raw stock returns are not altered in a noticeable manner if we use a simple risk-adjustment procedure. This table also confirms quite cleanly that the abnormal performance for decile 1 disappears after adjusting for the fee and that decile 10 is not the source of the long-short abnormal performance before fee adjustment.

The main purpose of Table VII is to revisit the disaggregated results presented in Table III with an abnormal performance metric based on the national market single factor model. The

Spread column measures the annualized impact of the borrow fee adjustment as applied to the two sides of the strategy: the full average borrow fee for the decile 1 short position minus 0.7 times utilization times the average borrow fee for the decile 10 long position. The Decile 1 column is the average monthly abnormal return after adding the full borrow fee to the return on the short-side portfolio. The Decile 10 column is the average monthly abnormal return after adding the proportion of the adjusted fee received by a long investor that ultimately lends the shares. The Difference column is the fee-adjusted long-short average abnormal return for decile 10 minus decile 1. The t-statistic for this difference is estimated from a panel regression with standard errors double-clustered by anomaly and month.

First, the all-country differential performance estimate in the first row is nearly identical to zero and the corresponding t-statistic reported in the last column is negligible. This pooled result in the first row is matches the aggregate abnormal return results after adjusting for the fee in Table VI. However, this aggregate estimate for all countries could hide important patterns of country-level heterogeneity. These anomalies are not generally exploitable after adjusting for the borrow fee in most of the countries in our sample. First, the estimate of the fee-adjusted Difference is negative in 13 of 27 countries. Second, of the 14 countries with positive estimates, 8 estimates are less than 10 basis points and only four estimates are positive and statistically significant: Australia, South Africa, Switzerland, and the United Kingdom.

IV. Representativeness and alternative specifications

A. Representativeness of the stocks with borrow fees compared to equity universe

To evaluate the representativeness of the sample of stocks with borrow fee and utilization information, we compare the performance patterns before any fee adjustment in the baseline sample to the corresponding patterns in a broader universe of stocks with anomaly signals in Table VIII. In other words, we compare the performance of the decile portfolios for the baseline sample using the underlying set of stocks that match to stock borrow fee and utilization data in Markit or FIS for a given month to the performance of deciles formed using an extended sample that includes the baseline sample and also all otherwise eligible monthly stock observations. The extended sample includes each stocks in a given month with an anomaly signal even when the specific stock does not match to borrow fee or utilization information.

According to Panel C of Table VIII, the average number of stocks in each decile increases from 39 for the baseline sample to 53 in this extended sample. Thus, the data requirement imposed by the necessity of borrow fee and utilization information to implement the performance adjustment reduces the universe of stocks by more than 20%. This reduction has the potential to change the performance of the typical strategy compared to the broader universe of international equities, and consequently, limit the validity of the analysis to a specific sample. However, if anomaly performance before adjusting for fees is largely similar for the extended sample then this potential concern becomes a modest caveat rather than a compelling issue.

The results in Panel A show that the patterns for the raw returns across the deciles are quite similar for the baseline and the extended samples. First, the average return for decile 1 is economically different from the other portfolios. Second, there is a monotonic pattern from decile 1 to decile 5 for both samples. Third, average returns for decile 6 through decile 9 are quite similar to each other within both samples. Fourth, the performance of decile 10 is modestly lower than the performance of decile 6 through decile 9 in both samples. Lastly, the average return across the samples is within a few basis points between corresponding deciles for decile 3 through decile 10 and virtually indistinguishable for deciles 6 through decile 9. The only somewhat interesting distinction is the lower return of -0.01% for decile 1 in the extended sample compared to 0.11% for the baseline sample. The stocks in decile 1 of the extended sample have somewhat worse performance than those in the baseline sample. Nevertheless, the long-short difference between decile 10 and decile 1 is 0.37% per month for the baseline sample and 0.45% for the extended sample. For both samples, decile 1 seems to drive this performance difference because the performance of decile 10 is not economically different from several of the other deciles in either sample.

Panel B of Table VI revisits this analysis by replacing raw performance with the average abnormal stock return from a national market single factor model. Following the patterns in Panel A, the abnormal returns across the deciles are quite similar for the baseline and the extended samples. First, the average abnormal return for decile 1 is economically different from the other portfolios. Second, the average abnormal return displays a monotonic pattern from decile 1 to decile 5 for both samples. Third, average abnormal returns for decile 6 through decile 9 are quite similar to each other within both samples. Fourth, the performance of decile 10 is modestly lower than the performance of decile 6 through decile 9 and economically

indistinguishable from zero for both samples. The only interesting difference is the lower return for decile 1 in the extended sample of -0.51% compared to 0.42% for the baseline sample.

The long-short abnormal return difference between decile 10 and decile 1 is 0.41% per month for the baseline sample and 0.49% for the extended sample. For both samples, decile 1 drives this performance difference and the abnormal return for decile 10 is essentially zero for both samples. While shorting decile 1 appears to be even more relevant for the extended sample, the stocks with this very low average return do not match to borrow fee or utilization information in Markit or FIS. In all likelihood this missing information masks a high shadow cost to short.

B. Alternative implementations of the anomaly strategies

There are many possible implementations of the underlying anomalies. One alternative implementation is to ensure that the underlying decile portfolios for each country and anomaly pair in a particular month do not reflect the returns of a very small number of stocks. In Table IX we require at least 50 stocks to be sorted for the anomaly and country pair instead of only 20 stocks as in our baseline specifications. Table IX has the same structure as Table II, but uses this more stringent requirement regarding the number stocks before including a particular portfolio return observation in the analysis.

Panel A displays the means of the time-series average of monthly stocks returns for each anomaly and country pair across the ten decile portfolios. In Panel B, we evaluate the stock return of each portfolio after adjusting for the full borrow fee. This analysis is conducted as if the decile portfolio is held as a short position. The full borrow fee during the evaluation period is added to each stock's return to adjust performance for the cost of borrowing stock. Finally, in Panel C we evaluate long positions from the perspective of institutions that participate in stock lending programs. The product of the borrow fee, the utilization rate, and the proportion 0.7 of the borrow fee passed through to the ultimate lender of each stock is added to each stock's return to adjust performance.

The estimates in Panel A indicate that the raw portfolio returns before adjusting for the borrow fee share the same pattern across deciles as in Table II. If anything, the decile 1 is slightly closer to zero, strongly significantly different from zero, and much lower than all of the other deciles. The strong monotonic pattern from decile 1 to decile 5 is still present, while decile 6 through decile 9 have similar average returns. The difference between portfolio 10 and portfolio 1 is 0.40% per month or about 5% per year. This differential is quite close to the

corresponding baseline estimate of 0.37% per month calculated from Table II, Panel A. The more stringent restriction regarding the number of stocks does not alter the performance patterns before adjusting for the stock borrow fee. The long-short performance is entirely due to the low average return of decile 1 compared to the other decile portfolios. Once again, decile 10 has a slightly lower average return than decile 6 through decile 9.

The estimates in Panel B show the means of the average fee-adjusted portfolio returns for the ten decile portfolios as if they are held short. The results in Panel C show the means of the average fee-adjusted abnormal returns for the ten decile portfolios as if they are held long by institutions that lend their shares. The relevant long-short performance is 0.07% for decile 10 in Panel C minus 0.06% for decile 1 in Panel B, that is, a net of 0.01% per month. The fee adjustment disproportionately impacts the returns on the short side because the full borrow fee is required to adjust the performance of decile 1. Just as in Table II, this adjustment for the borrow fee changes performance in decile 1 by nearly 50 basis points per month going from Panel A to Panel B. The mean of the average abnormal return for portfolio 10 increases by only 7 basis points per month from Panel A to Panel C. As a result, the mean of the long-short abnormal returns after adjusting for the borrow fee is basically zero after adjusting for the stock borrow fee on both the short side and the long side. These results verify that the specific number of stocks required to implement each anomaly sort is not an accidentally pivotal decision that would substantially alter the findings of this analysis.

Table X examines how the main findings change when the stocks within the portfolio for each anomaly and country pair are value-weighted instead of equal-weighted. We preserve the equal-weighting across anomaly and country pairs to avoid the countries with the largest stock markets from dominating the results. This is an important alternative to the equal-weighted portfolios in Table II because value weighting places more emphasis on firms with large market capitalizations within each country and anomaly sort. In general, these stocks will have lower borrow fees.

The comparison of Panel A in Table X with corresponding panel in Table II shows that value-weighting stocks attenuates the apparent average anomaly return even before adjusting for the stock borrow fee. In Table II, the raw decile 10 minus decile 1 difference is 0.37% per month, but under value weighting, the corresponding differential performance is only 0.25% per month before any fee adjustment. Since most anomalies have stronger performance with equal-

weights, this attenuation should not be a surprise. The aggregate performance before fee adjustment is still about 3% per year. Of course, value weighting also changes each anomaly's exposure to the borrow fee adjustment. The average annual borrow fee across the ten value-weighted deciles is about 2.5% per year, compared to about 4.5% for the equal-weighted portfolios in Table II.

Panels B and C show why the lower impact of the borrow fee does not change the main findings. Applying the full fee to the short side raises the relevant decile 1 fee-adjusted average monthly return to 0.54% in Panel B. At the same time, the corresponding adjustment on the long side increases the decile 10 return slightly from 0.52% in Panel A to 0.55% in Panel C. The fee-adjusted long-short differential is therefore approximately 0.01% per month: the 0.55% long-side return in Panel C minus the 0.54% short-side return in Panel B. Once again, there is virtually nothing left after the fee adjustment on both sides.

V. Conclusion

We study whether the strong cross-sectional return predictability documented outside the United States survives after accounting for stock-borrowing costs. Using 145 anomalies in 27 countries over nearly 18 years, we find an average pre-fee return spread of 0.37% per month between stocks with the highest and lowest anomaly scores. This spread is driven almost entirely by the unusually low returns of stocks in the bottom decile. Stocks in the top decile do not outperform those in the other portfolios in the upper half of the sort.

Stock-borrowing costs eliminate this apparent profitability. A short seller pays the full borrow fee throughout the life of the position, whereas a long investor receives only the portion passed through by its intermediary and only when its shares are borrowed. This wedge is large because utilization is low. Once we apply these asymmetric adjustments, the average long-short return falls to -0.04% per month and is statistically indistinguishable from zero.

The near-zero post-fee return is robust across data sources and portfolio designs. It remains when we use either Markit or FIS alone, adjust returns with a national-market single-factor model, require more stocks in each country-anomaly sort, or value-weight the underlying positions. Most country-level estimates are also small after fees, although a few remain positive and statistically significant. These results make data coverage or a particular portfolio implementation unlikely to explain the aggregate finding.

The results distinguish statistical return predictability from feasible arbitrage. International replication before costs does not by itself establish an investable anomaly: the stocks that make the short leg attractive are also costly to borrow. Our analysis does not establish that borrow fees cause mispricing, nor does it rule out specialized strategies or inframarginal traders with lower costs. It does show that the standard long-short portfolios used to evaluate international anomalies earn essentially no return for a marginal investor once the main short-sale cost is included. Stock-borrowing fees are therefore a common limit to arbitrage across otherwise diverse national markets.

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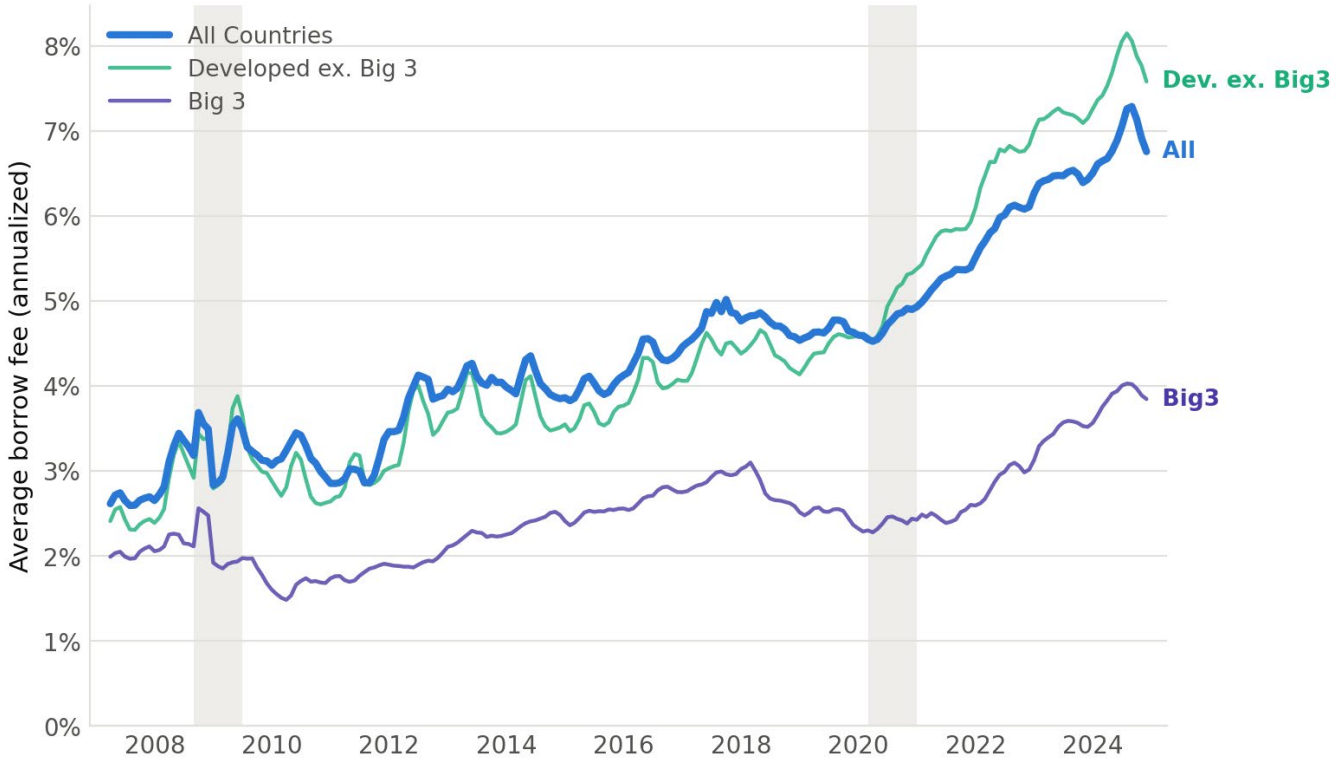


Figure 1. Average borrow fee for different groups of countries. This figure presents the average stock borrow fee as an annualized rate for different groups of countries across anomaly and country pairs using equal-weighted portfolios. Each series is the plot of a 3-month moving average for the stock borrow fee of the specific group of countries. The country groups are based on the MSCI classification before the start of the sample period in 2006. The list of emerging markets at that time is BRA, ISR, KOR, MYS, MEX, ZAF, TWN, and TUR. The underlying sample of stocks includes the common stocks in the global factor file from Jensen, Kelly, and Pedersen (2023) with anomaly signals at the end of each preceding month that match to borrow fee and utilization data in either Markit or FIS during the subsequent month, subject to the stock filters in Section II. The blue line is the average borrow fee equally-weighted across all countries. The purple line is for the three countries with the three largest stock markets: namely JPN, GBR, and USA. The green line is the set of developed markets excluding the three largest stock markets, JPN, GBR, and USA as well as excluding the emerging markets listed above.

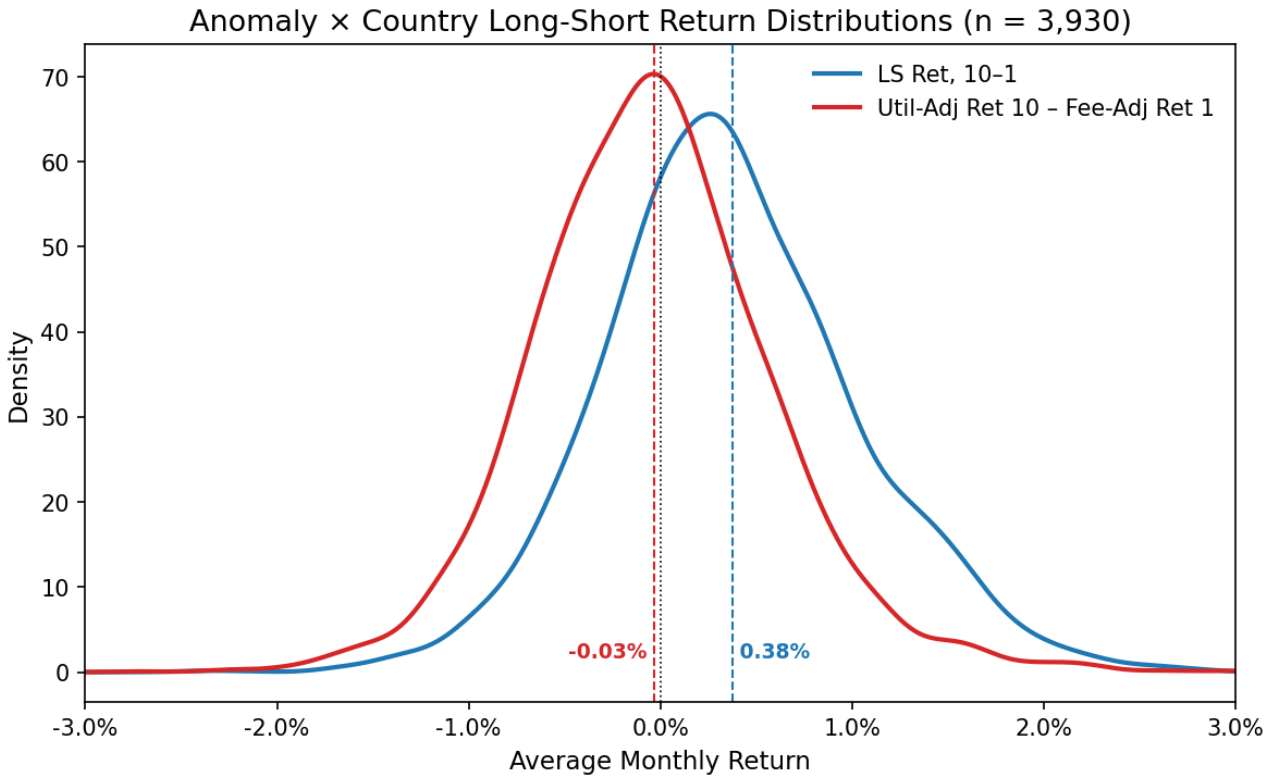


Figure 2. Long-short return distributions across anomalies and countries. This figure presents the smoothed kernel density function of the long-short average monthly return across anomaly and country pairs using equal-weighted portfolios. The sample includes the common stocks in the global factor file from Jensen, Kelly, and Pedersen (2023) with anomaly signals at the end of each preceding month that match to borrow fee and utilization data in either Markit or FIS during the subsequent month, subject to the stock filters in Section II. Stocks are sorted into deciles for each anomaly and country pair using a particular signal from the end of the preceding month and held in portfolios for the subsequent month. The performance of a strategy in a given month is included as long as there are at least 20 stocks that are sorted for the strategy and country pair. The blue curve is the estimated density function for the monthly average long-short return across anomaly and country pairs without adjusting for the stock borrow fee. The red curve is the estimated density function for monthly average long-short return across anomaly and country pairs after adjustment for the stock borrow fee. To adjust the short side of each strategy for the borrow fee, the full borrow fee during the evaluation period is added to each stock's return. To adjust the long side of each strategy, the product of the borrow fee, the utilization rate, and the proportion 0.7 of the borrow fee passed through to the ultimate lender is added to each stock's return. The vertical lines of the corresponding color represent the medians of the respective density functions. The sample period is January 2007 to November 2024.

Table I

Summary statistics for each country

This table presents the average of various summary statistics for the stocks in each country. The sample includes the common stocks in the global factor file from Jensen, Kelly, and Pedersen (2023) with anomaly signals at the end of each preceding month that match to borrowing fee and utilization data in either Markit or FIS during the subsequent month, subject to the stock filters in Section II. The borrow fee is annualized and utilization is reported as a percentage. The sample period is January 2007 to November 2024.

Country	Number of Months	Average # of Anomalies	Average Borrow Fee	Average Utilization	Average # of Stocks	Average Market Cap.
All	212	142.1	4.45%	13.72%	389.3	4,315
AUS	215	144.9	4.17%	15.19%	348.7	3,083
BEL	215	142.7	3.82%	10.42%	57.3	3,773
BRA	183	135.6	5.11%	21.72%	65.2	5,089
CAN	215	145.0	3.26%	14.59%	371.4	4,060
DNK	215	141.1	5.02%	13.26%	49.8	4,259
FIN	215	141.9	4.79%	13.76%	63.6	2,901
FRA	215	145.0	6.71%	14.69%	242.3	8,563
DEU	215	145.0	4.37%	15.51%	223.1	7,658
HKG	215	144.9	3.98%	13.81%	513.6	4,589
ISR	215	139.4	5.99%	10.75%	94.0	1,653
ITA	215	144.3	3.49%	14.34%	140.2	3,666
JPN	215	143.0	2.38%	14.26%	2023.1	3,639
KOR	215	139.4	5.11%	22.50%	887.2	1,500
MYS	162	142.4	7.44%	10.65%	149.6	2,732
MEX	215	139.2	3.56%	7.03%	54.7	4,333
NLD	215	144.0	2.51%	11.48%	58.1	9,915
NZL	215	127.8	4.41%	9.64%	41.3	1,269
NOR	215	139.9	5.31%	15.77%	97.4	2,780
SGP	215	143.9	5.13%	10.21%	142.1	2,876
ZAF	215	143.5	1.45%	6.18%	97.7	3,003
ESP	215	143.7	5.26%	18.46%	77.4	7,433
SWE	215	143.8	6.07%	13.76%	163.4	2,849
CHE	215	144.7	1.86%	10.23%	133.6	8,521
TWN	215	142.0	5.01%	24.26%	788.4	1,632
TUR	215	138.9	8.99%	15.61%	83.9	1,992
GBR	215	145.0	2.91%	7.00%	498.0	4,446
USA	215	145.0	2.17%	15.28%	3046.6	8,302

Table II

Statistics for the average return across equal-weighted portfolios formed for each strategy and country

This table presents the average of the monthly raw return across anomaly and country pairs using equal-weighted portfolios. The sample includes the common stocks in the global factor file from Jensen, Kelly, and Pedersen (2023) with anomaly signals at the end of each preceding month that match to borrow fee and utilization data in either Markit or FIS during the subsequent month, subject to the stock filters in Section II. Stocks are sorted into deciles for each anomaly and country pair using a particular signal from the end of the preceding month and held in portfolios for the subsequent month. The performance of a strategy in a given month is included as long as there are at least 20 stocks that are sorted for the strategy and country pair. In Panel A portfolio perfomance is not adjusted for the stock borrow fee. In Panel B for short positions, we evaluate the performance of each portfolio after adjusting for the full borrow fee. The borrow fee during the evaluation period is added to each stock's return to adjust performance for the cost of borrowing stock. In Panel C for long positions, the product of the borrow fee, the utilization rate, and the proportion 0.7 of the borrow fee passed through to the ultimate lender is added to each stock's return to adjust performance. The t-statistics are computed using a panel regression in which the monthly portfolio return for each anomaly and country pair is regressed onto decile fixed effects and the standard errors are double-clustered by anomaly and month. The estimate for each decile fixed effect is the average return for the corresponding decile with the appropriate t-statistic. The sample period is January 2007 to November 2024.

	1 Low	2	3	4	5	6	7	8	9	10 High
Panel A: Average monthly raw returns across decile portfolios sorted for each anomaly and country										
Average return	0.11%	0.32%	0.40%	0.45%	0.49%	0.52%	0.54%	0.56%	0.56%	0.48%
Average fee (annual)	5.80%	4.72%	4.32%	4.13%	4.02%	4.02%	4.04%	4.15%	4.37%	5.08%
Average utilization	18.60%	15.34%	13.96%	13.17%	12.66%	12.40%	12.31%	12.41%	12.84%	14.59%
Average # of stocks	38.6	39.1	39.0	39.1	39.2	38.9	39.0	39.1	39.0	39.5
Average return (t-stat)	0.25	0.77	1.00	1.13	1.24	1.32	1.38	1.44	1.43	1.21
Panel B: Average monthly returns across decile portfolios after fee adjustment using entire borrow fee (short position)										
Average return	**0.59%**	0.70%	0.75%	0.78%	0.81%	0.84%	0.87%	0.90%	0.91%	0.89%
Average return (t-stat)	1.35	1.69	1.85	1.95	2.05	2.13	2.21	2.28	2.31	2.24
Panel C: Average monthly returns across decile portfolios after fee adjustment based on utilization and intermediation (long position)										
Average return	0.23%	0.39%	0.46%	0.50%	0.53%	0.56%	0.58%	0.60%	0.60%	**0.55%**
Average return (t-stat)	0.54	0.94	1.13	1.24	1.34	1.42	1.48	1.54	1.54	1.39

Table III
Performance measures for each country

This table presents the average of various performance measures across anomalies for each country using equal-weighted portfolios. The sample includes the common stocks in the global factor file from Jensen, Kelly, and Pedersen (2023) with anomaly signals at the end of each preceding month that match to borrowing fee and utilization data in either Markit or FIS during the subsequent month, subject to the stock filters in Section II. Stocks are sorted into deciles for each anomaly and country pair using a particular signal from the end of the preceding month and held in portfolios for the subsequent month. The performance of a strategy in a given month is included as long as there are at least 20 stocks that are sorted for the strategy and country pair. In the column, Spread, we report the differential impact of the borrow fee on an annualized basis, that is, the average of the borrow fee for Decile 1 (short position) minus the average of 0.7 multiplied by utilization multiplied by the borrow fee for Decile 10 (long position). For the column, Decile 1, we evaluate monthly performance using returns for Decile 1 adjusted for the full borrow fee. The borrow fee during the evaluation period is added to each stock's return to adjust performance for the cost of borrowing stock. For the column, Decile 10, we evaluate monthly performance using returns for Decile 10 adjusted for the product of the borrow fee, the utilization rate, and the proportion 0.7 of the borrow fee passed through to the ultimate lender is added to each stock's return to adjust performance. The column, Difference, is the difference between columns Decile 10 and Decile 1. The t-statistic for each difference is computed using a panel regression in which the monthly long-short difference for each anomaly and country pair is regressed onto a constant and the standard errors are double-clustered by anomaly and month. The sample period is January 2007 to November 2024.

Country	Spread	Decile 1	Decile 10	Difference	t-statistic
	Decile 1 Fee minus 0.7*Utilization *Decile 10 Fee	Avg. Return Adj. For Fee	Avg. Return Adj. For 0.7*Utilization *Fee	Long-Short Average	Long-Short t-statistic
All Countries	5.28%	0.59%	0.55%	-0.04%	-0.71
Australia	5.01%	0.46%	0.65%	0.19%	1.53
Belgium	4.82%	0.55%	0.49%	-0.06%	-0.59
Brazil	5.94%	0.06%	0.12%	-0.02%	-0.09
Canada	4.59%	0.99%	0.86%	-0.13%	-1.22
Denmark	6.82%	0.78%	0.49%	-0.29%	-2.09
Finland	5.54%	0.69%	0.62%	-0.08%	-0.88
France	9.29%	0.82%	0.59%	-0.23%	-2.66
Germany	5.36%	0.35%	0.41%	0.06%	0.66
Hong Kong	4.86%	0.36%	0.43%	0.08%	0.76
Israel	6.09%	0.75%	0.72%	-0.03%	-0.23
Italy	3.96%	0.37%	0.44%	0.07%	0.81
Japan	3.03%	0.49%	0.48%	0.00%	-0.04
Korea, Republic of	4.85%	0.48%	0.61%	0.13%	1.25
Malaysia	7.61%	0.37%	0.13%	-0.23%	-1.75
Mexico	4.12%	0.53%	0.47%	-0.06%	-0.57
Netherlands	3.36%	0.68%	0.68%	0.00%	0.00
New Zealand	4.57%	0.78%	0.54%	-0.24%	-1.41
Norway	6.14%	0.51%	0.56%	0.04%	0.33
Singapore	5.71%	0.34%	0.32%	-0.01%	-0.13
South Africa	1.58%	0.29%	0.66%	0.37%	4.02
Spain	6.87%	0.29%	0.11%	-0.18%	-1.80
Sweden	7.75%	0.84%	0.62%	-0.22%	-2.40
Switzerland	2.43%	0.33%	0.49%	0.16%	2.22
Taiwan, Province of China	4.50%	0.99%	0.87%	-0.10%	-1.23
Turkey	9.52%	1.56%	1.10%	-0.47%	-4.57
United Kingdom	4.09%	0.22%	0.37%	0.14%	1.71
United States of America	3.80%	0.96%	0.93%	-0.03%	-0.37

Table IV

Performance measures for country groups

This table presents the average of various performance measures across anomalies for each country group using equal-weighted portfolios. Country groups are based on the MSCI classification before the start of the sample period in 2006. The list of emerging markets at that time is BRA, ISR, KOR, MYS, MEX, ZAF, TWN, TUR. The sample includes the common stocks in the global factor file from Jensen, Kelly, and Pedersen (2023) with anomaly signals at the end of each preceding month that match to borrowing fee and utilization data in either Markit or FIS during the subsequent month, subject to the stock filters in Section II. Stocks are sorted into deciles for each anomaly and country pair using a particular signal from the end of the preceding month and held in portfolios for the subsequent month. The performance of a strategy in a given month is included as long as there are at least 20 stocks that are sorted for the strategy and country pair. In the column, Difference Before, we report the average difference between the Decile 10 portfolio and the Decile 1 portfolio before adjusting for the borrow fee. In the column, Spread, we report the differential impact of the borrow fee on an annualized basis, that is, the average of the borrow fee for Decile 1 (short position) minus the average of 0.7 multiplied by utilization multiplied by the borrow fee for Decile 10 (long position). For the column, Decile 1, we evaluate monthly performance using returns for Decile 1 adjusted for the full borrow fee. The borrow fee during the evaluation period is added to each stock's return to adjust performance for the cost of borrowing stock. For the column, Decile 10, we evaluate monthly performance using returns for Decile 10 adjusted for the product of the borrow fee, the utilization rate, and the proportion 0.7 of the borrow fee passed through to the ultimate lender is added to each stock's return to adjust performance. The column, Difference After, is the difference between the Decile 10 column and Decile 1 column, both of which have been adjusted for the borrow fee. The t-statistic for each difference is computed using a panel regression in which the monthly long-short difference for each anomaly and country pair is regressed onto a constant and the standard errors are double-clustered by anomaly and month. The sample period is January 2007 to November 2024.

Country Group	Difference Before	Spread	Decile 1	Decile 10	Difference After	t-statistic
	Long-Short Average Before Fee Adj.	Decile 1 Fee minus 0.7*Utilization *Decile 10 Fee	Avg. Return Adj. For Full Fee	Avg. Return Adj. For 0.7*Utilization *Fee	Long-Short Average After Fee Adj.	Long-Short After Fee Adj. t-statistic
All Countries	0.37%	5.28%	0.59%	0.55%	-0.04%	-0.71
Big 3: GBR, JPN, USA	0.30%	3.63%	0.56%	0.59%	0.04%	0.59
Developed minus Big 3	0.38%	5.46%	0.57%	0.52%	-0.05%	-0.86
Emerging: BRA, ISR, KOR, MYS, MEX, ZAF, TWN, TUR	0.38%	5.55%	0.65%	0.62%	-0.04%	-0.74
5 Countries With Lowest Average Borrow Fee	0.30%	2.85%	0.55%	0.65%	0.10%	1.77
5 Countries With Highest Average Borrow Fee	0.41%	8.06%	0.89%	0.65%	-0.24%	-3.80

Table V

Comparison of results for Markit fee data versus FIS fee data

This table presents the average of the monthly raw return across anomaly and country pairs using equal-weighted portfolios. The sample includes the common stocks in the global factor file from Jensen, Kelly, and Pedersen (2023) with anomaly signals at the end of each preceding month that match to borrow fee and utilization data in either Markit or FIS during the subsequent month, subject to the stock filters in Section II. The first row of each panel reports the results for the baseline sample used in Table 2 using combined data based on information from both of the vendors. The second row of each panel reports results only for stocks with fee and utilization data in Markit. The third row of each panel reports results only for stocks with FIS utilization and fee data. Stocks are sorted into deciles for each anomaly and country pair using a particular signal from the end of the preceding month and held in portfolios for the subsequent month. The performance of a strategy in a given month is included as long as there are at least 20 stocks that are sorted for the strategy and country pair. In Panel A portfolio perfomance is not adjusted for the stock borrow fee. In Panel B for short positions, we evaluate the performance of each portfolio after adjusting for the full borrow fee. The borrow fee during the evaluation period is added to each stock's return to adjust performance for the cost of borrowing stock. In Panel C for long positions, the product of the borrow fee, the utilization rate, and the proportion 0.7 of the borrow fee passed through to the ultimate lender is added to each stock's return to adjust performance. In Panel D we report the average proportion of stocks with anomaly signals in each portfolio that match to utilization and fee data. The sample period is January 2007 to November 2024.

	1 Low	2	3	4	5	6	7	8	9	10 High
Panel A: Average monthly raw returns across decile portfolios sorted for each anomaly and country										
Average return (Baseline)	0.11%	0.32%	0.40%	0.45%	0.49%	0.52%	0.54%	0.56%	0.56%	0.48%
Average return (Markit)	0.07%	0.30%	0.38%	0.43%	0.46%	0.49%	0.51%	0.54%	0.53%	0.45%
Average return (FIS)	0.11%	0.31%	0.40%	0.44%	0.48%	0.51%	0.53%	0.55%	0.55%	0.47%
Panel B: Average monthly returns across decile portfolios after fee adjustment using entire borrow fee (short position)										
Average return (Baseline)	0.59%	0.70%	0.75%	0.78%	0.81%	0.84%	0.87%	0.90%	0.91%	0.89%
Average return (Markit)	0.54%	0.67%	0.72%	0.75%	0.78%	0.81%	0.83%	0.86%	0.87%	0.86%
Average return (FIS)	0.63%	0.72%	0.77%	0.80%	0.83%	0.86%	0.88%	0.91%	0.93%	0.92%
Panel C: Average monthly returns across decile portfolios after fee adjustment based on utilization and intermediation (long position)										
Average return (Baseline)	0.23%	0.39%	0.46%	0.50%	0.53%	0.56%	0.58%	0.60%	0.60%	0.55%
Average return (Markit)	0.21%	0.38%	0.44%	0.48%	0.52%	0.54%	0.56%	0.59%	0.59%	0.54%
Average return (FIS)	0.35%	0.45%	0.51%	0.54%	0.58%	0.60%	0.62%	0.64%	0.66%	0.62%
Panel D: Average number of stocks in each decile portfolio with borrow fee data										
Average # of stocks (Baseline)	38.58	39.08	38.98	39.08	39.18	38.88	38.98	39.08	38.98	39.48
Average # of stocks (Markit)	36.18	36.67	36.58	36.67	36.77	36.47	36.57	36.67	36.57	37.08
Average # of stocks (FIS)	37.25	37.74	37.64	37.74	37.84	37.54	37.64	37.74	37.64	38.15

Table VI

Statistics for the average abnormal return across equal-weighted portfolios formed for each strategy and country

This table presents the average of the monthly abnormal return (alpha) from a national single factor model (CAPM) across anomaly and country pairs using equal-weighted portfolios. The sample includes the common stocks in the global factor file from Jensen, Kelly, and Pedersen (2023) with anomaly signals at the end of each preceding month that match to borrow fee and utilization data in either Markit or FIS during the subsequent month, subject to the stock filters in Section II. Stocks are sorted into deciles for each anomaly and country pair using a particular signal from the end of the preceding month and held in portfolios for the subsequent month. The performance of a strategy in a given month is included as long as there are at least 20 stocks that are sorted for the strategy and country pair. In Panel A portfolio perfomance is not adjusted for the stock borrow fee. In Panel B for short positions, we evaluate the performance of each portfolio adjusted for the full borrow fee. The borrow fee during the evaluation period is added to each stock's alpha to adjust performance for the cost of borrowing stock. In Panel C for long positions, the product of the borrow fee, the utilization rate, and the proportion 0.7 of the borrow fee passed through to the ultimate lender is added to each stock's alpha to adjust performance. The t-statistics are computed using a panel regression in which the monthly portfolio return for each anomaly and country pair is regressed onto decile fixed effects and the standard errors are double-clustered by anomaly and month. The estimate for each decile fixed effect is the average return for the corresponding decile with the appropriate t-statistic. The sample period is January 2007 to November 2024.

	1 Low	2	3	4	5	6	7	8	9	10 High
Panel A: Average abnormal returns across decile portfolios sorted for each anomaly and country										
Average alpha	-0.42%	-0.19%	-0.10%	-0.04%	0.00%	0.03%	0.06%	0.08%	0.08%	0.00%
Average fee (annual)	5.80%	4.72%	4.32%	4.13%	4.02%	4.02%	4.04%	4.15%	4.37%	5.08%
Average utilization	18.60%	15.34%	13.96%	13.17%	12.66%	12.40%	12.31%	12.41%	12.84%	14.59%
Average # of stocks	38.6	39.1	39.0	39.1	39.2	38.9	39.0	39.1	39.0	39.5
Average alpha (t-stat)	-5.51	-3.53	-2.07	-1.02	0.04	0.78	1.35	1.78	1.59	-0.06
Panel B: Average abnormal returns across decile portfolios after fee adjustment using entire borrow fee (short position)										
Average alpha	**0.06%**	0.19%	0.26%	0.29%	0.33%	0.36%	0.39%	0.42%	0.43%	0.41%
Average alpha (t-stat)	0.84	3.57	5.45	6.73	7.77	8.44	8.92	9.22	8.78	6.93
Panel C: Average abnormal returns across decile portfolios after fee adjustment based on utilization and intermediation (long position)										
Average alpha	-0.30%	-0.12%	-0.04%	0.00%	0.04%	0.07%	0.10%	0.12%	0.12%	**0.07%**
Average alpha (t-stat)	-3.98	-2.28	-0.97	0.06	1.05	1.73	2.31	2.77	2.53	1.16

Table VII
Adjusted alphas for countries

This table presents the average of various performance measures across anomalies for each country using equal-weighted portfolios. The sample includes the common stocks in the global factor file from Jensen, Kelly, and Pedersen (2023) with anomaly signals at the end of each preceding month that match to borrowing fee and utilization data in either Markit or FIS during the subsequent month, subject to the stock filters in Section II. Stocks are sorted into deciles for each anomaly and country pair using a particular signal from the end of the preceding month and held in portfolios for the subsequent month. The performance of a strategy in a given month is included as long as there are at least 20 stocks that are sorted for the strategy and country pair. In the column, Spread, we report the differential impact of the borrow fee on an annualized basis, that is, the average of the borrow fee for Decile 1 (short position) minus the average of 0.7 multiplied by utilization multiplied by the borrow fee for Decile 10 (long position). For the column, Decile 1, we evaluate monthly performance using the alpha from a single factor model (CAPM) for Decile 1 adjusted for the full borrow fee. The borrow fee during the evaluation period is added to each stock's return to adjust performance for the cost of borrowing stock. For the column, Decile 10, we evaluate monthly performance using returns for Decile 10 adjusted for the product of the borrow fee, the utilization rate, and the proportion 0.7 of the borrow fee passed through to the ultimate lender is added to each stock's return to adjust performance. The column, Difference, is the difference between columns Decile 10 and Decile 1. The t-statistic for each difference is computed using a panel regression in which the monthly long-short difference for each anomaly and country pair is regressed onto a constant and the standard errors are double-clustered by anomaly and month. The sample period is January 2007 to November 2024.

Country	Spread	Decile 1	Decile 10	Difference	t-statistic
	Decile 1 Fee minus 0.7*Utilization *Decile 10 Fee	Avg. Alpha Adj. For Fees	Avg. Alpha Adj. For Utilization*Fees	Long-Short Average	Long-Short t-statistic
All Countries	5.28%	0.06%	0.07%	0.00%	0.08
Australia	5.01%	-0.20%	0.05%	0.26%	2.26
Belgium	4.82%	0.17%	0.15%	-0.02%	-0.18
Brazil	5.94%	0.05%	0.02%	-0.01%	-0.06
Canada	4.59%	0.24%	0.20%	-0.04%	-0.45
Denmark	6.82%	0.07%	-0.17%	-0.25%	-1.83
Finland	5.54%	0.22%	0.17%	-0.05%	-0.55
France	9.29%	0.36%	0.16%	-0.20%	-2.41
Germany	5.36%	-0.11%	-0.02%	0.09%	1.20
Hong Kong	4.86%	-0.07%	0.06%	0.13%	1.62
Israel	6.09%	-0.03%	0.01%	0.04%	0.34
Italy	3.96%	0.04%	0.13%	0.09%	1.16
Japan	3.03%	0.12%	0.16%	0.04%	0.72
Korea, Republic of	4.85%	0.12%	0.28%	0.15%	1.56
Malaysia	7.61%	0.23%	0.02%	-0.21%	-1.91
Mexico	4.12%	-0.07%	-0.08%	-0.01%	-0.14
Netherlands	3.36%	0.06%	0.12%	0.06%	0.63
New Zealand	4.57%	0.16%	-0.02%	-0.18%	-1.11
Norway	6.14%	0.02%	0.10%	0.08%	0.65
Singapore	5.71%	-0.18%	-0.13%	0.05%	0.56
South Africa	1.58%	-0.18%	0.20%	0.38%	4.17
Spain	6.87%	0.10%	-0.06%	-0.16%	-1.78
Sweden	7.75%	0.10%	-0.09%	-0.19%	-2.08
Switzerland	2.43%	-0.31%	-0.10%	0.21%	3.10
Taiwan, Province of China	4.50%	0.18%	0.15%	-0.05%	-0.65
Turkey	9.52%	0.70%	0.27%	-0.43%	-4.45
United Kingdom	4.09%	-0.13%	0.04%	0.17%	2.17
United States of America	3.80%	0.06%	0.13%	0.07%	1.06

Table VIII

Comparison of the initial anomaly strength in the baseline sample and an extended sample

This table presents average monthly performance measures across anomaly and country pairs using equal-weighted portfolios. The sample of stocks includes the common stocks in the global factor file from Jensen, Kelly, and Pedersen (2023) with anomaly signals at the end of each preceding month, subject to the stock filters in Section II. The first row of each panel reports the results for the baseline sample used in Table 2, that is, restricted to stocks which match to borrow fee and utilization data from one or both of the vendors, Markit and FIS. The second row of each panel reports results for an extended sample that includes all stocks with anomaly signals that meet the stock filters in Section II, even if there is no match to borrow fee and/or utilization data. Stocks are sorted into deciles for each anomaly and country pair using a particular signal from the end of the preceding month and held in portfolios for the subsequent month. The performance of a strategy in a given month is included as long as there are at least 20 stocks that are sorted for the strategy and country pair. In Panel A, we report the average monthly return and do not adjust for the stock borrow fee. In Panel B, we report the average monthly abnormal performance (alpha) for each portfolio from a national single factor model (CAPM) and this measure is also not adjusted for the borrow fee. In Panel C, we report the average number of stocks for each portfolio formed monthly for a given anomaly and country pair. The sample period is January 2007 to November 2024.

	1 Low	2	3	4	5	6	7	8	9	10 High
Panel A: Average monthly raw returns across decile portfolios sorted for each anomaly and country										
Average return (Baseline)	0.11%	0.32%	0.40%	0.45%	0.49%	0.52%	0.54%	0.56%	0.56%	0.48%
Average return (Extended)	-0.01%	0.26%	0.36%	0.43%	0.48%	0.51%	0.54%	0.55%	0.55%	0.44%
Panel B: Average monthly alphas across decile portfolios sorted for each anomaly and country										
Average alpha (Baseline)	-0.42%	-0.19%	-0.10%	-0.04%	0.00%	0.03%	0.06%	0.08%	0.08%	0.00%
Average alpha (Extended)	-0.51%	-0.23%	-0.11%	-0.04%	0.01%	0.05%	0.08%	0.09%	0.09%	-0.02%
Panel C: Average number of stocks in each decile portfolio with borrow fee data										
Average # stocks (Baseline)	38.6	39.1	39.0	39.1	39.2	38.9	39.0	39.1	39.0	39.5
Average # stocks (Extended)	52.4	52.9	52.8	52.9	53.0	52.7	52.8	52.9	52.8	53.3

Table IX

Statistics for the average return across equal-weighted portfolios formed with at least 50 stocks for each strategy

This table presents the average of the monthly raw return across anomaly and country pairs using equal-weighted portfolios. The sample includes the common stocks in the global factor file from Jensen, Kelly, and Pedersen (2023) with anomaly signals at the end of each preceding month that match to borrow fee and utilization data in either Markit or FIS during the subsequent month, subject to the stock filters in Section II. Stocks are sorted into deciles for each anomaly and country pair using a particular signal from the end of the preceding month and held in portfolios for the subsequent month. The performance of a strategy in a given month is included as long as there are at least 50 stocks that are sorted for the strategy and country pair. In Panel A portfolio perfomance is not adjusted for the stock borrow fee. In Panel B for short positions, we evaluate the performance of each portfolio after adjusting for the full borrow fee. The borrow fee during the evaluation period is added to each stock's return to adjust performance for the cost of borrowing stock. In Panel C for long positions, the product of the borrow fee, the utilization rate, and the proportion 0.7 of the borrow fee passed through to the ultimate lender is added to each stock's return to adjust performance. The t-statistics are computed using a panel regression in which the monthly portfolio return for each anomaly and country pair is regressed onto decile fixed effects and the standard errors are double-clustered by anomaly and month. The estimate for each decile fixed effect is the average return for the corresponding decile with the appropriate t-statistic. The sample period is January 2007 to November 2024.

	1 Low	2	3	4	5	6	7	8	9	10 High
Panel A: Average monthly raw returns across decile portfolios sorted for each anomaly and country										
Average return	0.04%	0.27%	0.36%	0.41%	0.45%	0.48%	0.50%	0.52%	0.52%	0.43%
Average fee (annual)	5.99%	4.83%	4.42%	4.21%	4.11%	4.10%	4.13%	4.25%	4.48%	5.21%
Average utilization	18.87%	15.46%	14.02%	13.18%	12.67%	12.40%	12.30%	12.38%	12.83%	14.59%
Average # of stocks	39.5	40.0	39.9	40.0	40.1	39.8	39.9	40.0	39.9	40.4
Average return (t-stat)	0.10	0.66	0.90	1.05	1.16	1.24	1.30	1.36	1.34	1.11
Panel B: Average monthly returns across decile portfolios after fee adjustment using entire borrow fee (short position)										
Average return	**0.53%**	0.66%	0.71%	0.75%	0.78%	0.80%	0.83%	0.86%	0.87%	0.85%
Average return (t-stat)	1.24	1.61	1.78	1.89	1.99	2.08	2.15	2.22	2.25	2.16
Panel C: Average monthly returns across decile portfolios after fee adjustment based on utilization and intermediation (long position)										
Average return	0.18%	0.35%	0.42%	0.46%	0.49%	0.52%	0.54%	0.56%	0.56%	**0.51%**
Average return (t-stat)	0.41	0.84	1.04	1.17	1.27	1.34	1.40	1.46	1.45	1.29

Table X

Statistics for the average return across value-weighted portfolios formed for each strategy and country

This table presents the average of the monthly raw return across anomaly and country pairs using value-weighted portfolios. The sample includes the common stocks in the global factor file from Jensen, Kelly, and Pedersen (2023) with anomaly signals at the end of each preceding month that match to borrow fee and utilization data in either Markit or FIS during the subsequent month, subject to the stock filters in Section II. Stocks are sorted into deciles for each anomaly and country pair using a particular signal from the end of the preceding month and held in portfolios for the subsequent month. The performance of a strategy in a given month is included as long as there are at least 20 stocks that are sorted for the strategy and country pair. In Panel A portfolio perfomance is not adjusted for the stock borrow fee. In Panel B for short positions, we evaluate the performance of each portfolio after adjusting for the full borrow fee. The borrow fee during the evaluation period is added to each stock's return to adjust performance for the cost of borrowing stock. In Panel C for long positions, the product of the borrow fee, the utilization rate, and the proportion 0.7 of the borrow fee passed through to the ultimate lender is added to each stock's return to adjust performance. The t-statistics are computed using a panel regression in which the monthly portfolio return for each anomaly and country pair is regressed onto decile fixed effects and the standard errors are double-clustered by anomaly and month. The estimate for each decile fixed effect is the average return for the corresponding decile with the appropriate t-statistic. The sample period is January 2007 to November 2024.

	1 Low	2	3	4	5	6	7	8	9	10 High
Panel A: Average monthly raw returns across decile portfolios sorted for each anomaly and country										
Average return	0.27%	0.38%	0.44%	0.46%	0.49%	0.51%	0.53%	0.54%	0.55%	0.52%
Average fee (annual)	3.41%	2.62%	2.37%	2.24%	2.17%	2.17%	2.20%	2.27%	2.43%	2.90%
Average utilization	15.19%	12.37%	11.23%	10.55%	10.15%	9.98%	9.93%	10.06%	10.47%	11.81%
Average # of stocks	38.6	39.1	39.0	39.1	39.2	38.9	39.0	39.1	39.0	39.5
Average return (t-stat)	0.64	0.96	1.13	1.22	1.31	1.37	1.43	1.45	1.48	1.39
Panel B: Average monthly returns across decile portfolios after fee adjustment using entire borrow fee (short position)										
Average return	**0.54%**	0.59%	0.63%	0.64%	0.66%	0.68%	0.70%	0.72%	0.75%	0.75%
Average return (t-stat)	1.31	1.48	1.61	1.68	1.76	1.83	1.89	1.93	2.00	2.00
Panel C: Average monthly returns across decile portfolios after fee adjustment based on utilization and intermediation (long position)										
Average return	0.33%	0.41%	0.46%	0.48%	0.51%	0.53%	0.54%	0.55%	0.57%	**0.55%**
Average return (t-stat)	0.80	1.03	1.18	1.27	1.35	1.41	1.47	1.49	1.53	1.47