

# Anomalies across the globe: Once public, no longer existent?

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## Abstract

Motivated by McLean and Pontiff (2016), we study the pre- and post-publication return predictability of 231 cross-sectional anomalies in 39 stock markets. Based on more than two million anomaly country-months, we find that the United States is the only country with a reliable post-publication decline in long/short returns. Collectively, our insights have implications for the recent literature on arbitrage trading, anomaly data mining, market segmentation, and the meta-analysis of return predictors.

**Keywords:** return predictability, international stock markets, arbitrage, publication impact, anomalies, trading strategies, market segmentation

JEL Classification Codes: G02, G12, G14, G15

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# 1 Introduction

In an intriguing paper, McLean and Pontiff (2016) study 97 return predictive variables in the U.S. stock market and find that long/short returns shrink significantly post-publication. Their results are consistent with the idea that arbitrageurs bet against mispricing documented in academic publications, which results in lower strategy returns. In this study, we explore post-publication effects of 231 anomalies in the U.S. and 38 international stock markets.

International stock markets are economically important. Based on World Bank data, non-U.S. countries account on average for about 58% of the world market capitalization and for almost 73% of global GDP during our sample period from January 1980 to December 2015. International stock markets are also scientifically important. Existing asset pricing tests in general tend to focus on the U.S. stock market, part of which leads Karolyi (2016, p. 2075) to conclude that “there is a large and persistent US (home) bias in academic research in Finance”. International out-of-sample tests may help to provide novel insights into the price discovery process and to enrich or challenge our understanding of price formation.

Indeed, we find surprisingly large differences between post-publication effects in the U.S. stock market and international markets. Our baseline U.S. estimates, both qualitatively and quantitatively, are in line with McLean and Pontiff (2016). For instance, for equally weighted (value-weighted) anomaly returns, we estimate a 36% (36%) post-sample and a highly significant 60% (65%) post-publication decline, although these economically large estimates appear to be partly explained by a general time trend during our sample period. In contrast, the same econometric framework suggests that none of the 38 international markets yields a reliable post-publication decline in anomaly returns.

We explore several possible explanations for this key result. Post-publication differences between the U.S. and international markets are stable across anomaly universes, including a subset of anomalies not studied in McLean and Pontiff (2016). General time effects, differences between in-sample anomaly profitability, differences between local risk factor exposure, or database issues can explain at best some of the return difference. Collectively, the most promising explanations are differences in limits to arbitrage and, arguably relatedly, differences in invested quantitative arbitrage capital. Nevertheless, at least parts of the large cross-country differences in post-publication effects could also be regarded as a new puzzle that calls for further theoretical and empirical investigation.

Besides extending McLean and Pontiff (2016), our analysis contributes to several streams of the literature. First, to our knowledge, and judging from the number of replicated papers (153), from anomaly-country combinations (6,894), or from total long/short anomaly months (2.096 million), we built and exploit the most comprehensive anomaly database constructed in the academic literature so far.<sup>1</sup> Almost all anomalies were originally documented in the U.S. stock market, which raises questions about their out-of-sample validity. Concerns about data snooping and statistical biases have already been expressed in studies such as Lo and MacKinlay (1990), Fama (1998) and Schwert (2003). These issues have recently received renewed attention in Chen and Zimmermann (2016), Harvey et al. (2016), Harvey (2017), Linnainmaa and Roberts (2016), McLean and Pontiff (2016), or Novy-Marx (2014). Our empirical analysis contributes to this ongoing debate. Averaged over our whole sample period, long/short anomaly returns in (various subsets of) international markets turn out to be similar in magnitude as the estimates for the

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<sup>1</sup>In terms of total implemented strategies (231), our anomaly universe appears to be the second largest after the U.S.-based study of Hou et al. (2016). Both Green et al. (2013) and Harvey et al. (2016) list more than 300 return predictive signals in their literature review, but do not attempt to replicate these anomalies.

U.S. market. This unconditional view suggests that many anomalies tend to be a global phenomenon and thus are unlikely to be mainly driven by data mining. Importantly, however, our findings also uncover large differences between the U.S. and international markets with respect to subperiods in both calendar time (i.e., time trends) and in event time (i.e., publication effects).

Second, and relatedly, we contribute to the recent debate about how time effects in general and the growth of the arbitrage industry in particular have affected anomaly returns. So far, there is little consensus on these questions, even though the discussion has mainly concentrated on the U.S. stock market only. For instance, with regard to the impact of arbitrage trading on momentum and value profitability, Hanson and Sunderan (2014, p. 1248) conclude that the “increase in capital has resulted in lower strategy returns”. In contrast, Israel and Moskowitz (2013, p. 275) “find little evidence that size, value, and momentum returns are significantly affected by changes in trading costs or institutional and hedge fund ownership over time.” Similarly, Chordia et al. (2014) show that abnormal returns for twelve anomalies attenuate towards zero over time, whereas Haugen and Baker (1996) do not find a pronounced trend in their earlier sample period.<sup>2</sup> Our findings point to a negative time trend as well as increased post-publication arbitrage trading for the average anomaly in the U.S., but not in international markets.

Third, our findings add to the large literature on international financial market segmentation. Asset pricing tests in Bekaert and Harvey (1995), Bekaert et al. (2011), Bekaert et al. (2014), Foerster and Karolyi (1999), Froot and Dabora (1999), Hau (2011), Rapach et al. (2013), and other papers often yield different results with respect to market integration. We contribute to this debate by providing evidence for seemingly strong geographic

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<sup>2</sup>Related discussions are provided, among others, in Fu and Huang (2016), Green et al. (2011), Green et al. (2017), Jacobs (2015, 2016), Jacobs and Müller (2016), or Schwert (2003).

stock market segmentation which appears to have significant effects on the formation of prices. In recent years as well as in post-publication periods, cross-sectional return predictability tends to be larger in international markets than in the U.S. stock market. From a practical point of view, these findings may offer quantitative arbitrageurs insights into ways to optimize their investment process.

Fourth, we contribute to the rapidly emerging literature on the meta-analysis of market anomalies. This work aims at developing a better understanding of when, where, and why anomalies tend to work (or not to work). Again, most of the literature focuses on the U.S. market. Selected references include Engelberg et al. (2016), Green et al. (2013, 2016), Hou et al. (2015, 2016), Harvey et al. (2016), Jacobs (2015), Keloharju et al. (2016), Lewellen (2015), Novy-Marx and Velikov (2016), Stambaugh (2012, 2014, 2015), and Stambaugh and Yuan (2017). We add to the few studies (e.g., Fama and French (2017), Griffin et al. (2010), Hou et al. (2011), Jacobs (2016), Jacobs and Müller (2016)) that take an international perspective.

## **2 Empirical approach and baseline results**

### **2.1 Data**

We mainly rely on five sources. We obtain daily stock market data for the U.S. (all other countries) from CRSP (Datastream). We gather accounting data in the case of the U.S. market (all international markets) from Compustat (Worldscope). Finally, we collect analyst earnings forecasts and recommendations for all markets from I/B/E/S.

We follow previous work (e.g., Griffin et al. (2010), Hou et al. (2011), Ince and Porter (2006), Jacobs (2016)) in cleaning the Datastream data. The major screens are as follows.

We require stocks to have non-missing identifier, return, and market capitalization data, and to be traded in the home country of the firm. We use the generic industry and firm name screens proposed in Griffin et al. (2010) to exclude non-common equity. We identify delisted firms following the method proposed in Ince and Porter (2006) and by additionally checking the Worldscope “inactive date”. In an attempt to eliminate remaining data errors, we screen returns as proposed in Hou et al. (2011). In addition, we winsorize return and market capitalization data at the 0.1% and the 99.9% level. To assure that our findings are not driven by the smallest and most illiquid stocks, we require stocks to have a one-month lagged market capitalization of at least ten million USD.

The baseline sample period runs from January 1980 to December 2015. The start date aims at balancing the trade-off between maximizing the length of the time-series and maximizing the number of anomalies and countries that can be taken into account. Most international stock markets have limited stock market data in earlier years, and accounting data is generally not available before 1980. The baseline sample period assures that meaningful cross-country comparisons can be made.

## **2.2 Anomalies**

Our goal is to base our analysis on a reasonably representative universe of all cross-sectional anomalies proposed in the literature, provided that the return predictors can be implemented for (at least some) international markets with the data described in the previous section.

We start by replicating 80 of the 97 anomalies relied on McLean and Pontiff (2016). Some classical papers concerned with return predictors such as beta (Fama and MacBeth (1973)) or firm size (Banz (1981)) have sample periods that end before the start of our

sample period, and thus do not qualify for the empirical analysis. Other anomalies based on, for instance, corporate governance proxies (Gompers et al. (2003)) or short interest (Dechow et al. (2001)) cannot be computed due to a lack of data availability for international markets. A few further return predictors (such as dividend omissions) have missing or too few international observations during the original sample period.

To these 80 anomalies used in McLean and Pontiff (2016), we add a second set of 151 cross-sectional return phenomena. Their selection is inspired by the anomaly universe used in other recent work on the “big picture” view on anomalies, some of which is cited in the introduction, as well as by an additional literature review.

In sum, and as Table 1 shows in more detail, we implement 231 anomalies based on 153 papers, most of which have been published in leading finance or accounting journals.

### **Please insert Table 1**

There is necessarily some subjectivity in the selection of specific anomalies, sample periods, publication dates, and reference papers.<sup>3</sup> However, the qualitative nature of our

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<sup>3</sup>Consider the following three examples. First, with respect to the selection process, we follow McLean and Pontiff (2016) in implementing some return predictors (such as a few liquidity-based variables) that the original studies do not necessarily interpret as anomalies or mispricing. We also regard interactions of return predictors with other firm variables as distinct anomalies, provided that the original paper considers this interaction to be an important and novel finding. Examples are “enhanced” momentum strategies, which are based on interactions of past returns and, for instance, high stock-level turnover (e.g., Lee and Swaminathan (2000)), low residual analyst coverage (Hong et al. (2000)) or continuous information arrival (Da et al. (2014)). Second, with respect to sample periods, some authors extend their sample period during the revision process. We use the sample period in the published paper version. Third, with respect to publication dates, Table 1 cites Hong and Kacperczyk (2009) in the context of the performance of “sin” stocks. A paper of Fabozzi et al. (2008) on this issue has been published earlier in a peer-reviewed academic journal, but the authors prominently mention an earlier working paper version of Hong and Kacperczyk (2009).

findings is robust to a broad range of plausible modifications and sensitivity checks, as shown in Section 3.

Following McLean and Pontiff (2016), our baseline analysis includes all anomalies, irrespective of the statistical significance or economic magnitude documented in the original papers or established in our own tests.<sup>4</sup> We later take in-sample profitability into account.

In this context, it should be highlighted that we do not intend to exactly replicate the original studies. Sometimes, this would be impossible due to, for instance, limited global data availability or data base changes even for the U.S. over time. In addition, almost all original papers rely on CRSP/Compustat or other U.S. data bases, which typically allows the authors to study a sample period that starts well before January 1980.

Importantly, the 153 papers also strongly differ in their methodologies (e.g., Fama and MacBeth (1973) slope coefficients vs. long-short portfolio returns; weighting schemes), timing conventions (e.g., yearly or quarterly accounting data), data screens (e.g., the treatment of small firms, certain industries, or tails of the distribution), control variables, and further dimensions (such as raw returns vs. factor alphas).

In this light, we aim at capturing the intent of the study under consideration while simultaneously forming a common framework for all anomalies. More specifically, we do not use different investment universes or different methodologies for different anomalies.

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<sup>4</sup>The Online Appendix provides more detailed information about anomaly availabilities, returns, and t-statistics in our in-sample (and other event-time) periods. For instance, the average anomaly has 225 in-sample observations in the U.S. market and 155 in-sample observations in the average developed market. 92% of anomalies generate positive equally weighted in-sample returns in the U.S. market. The corresponding estimate for pooled developed markets is 87%. The average in-sample t-statistic for equally weighted anomaly returns in the U.S. is 3.39. The corresponding estimate for pooled developed markets is 2.74 when standard errors are clustered by month and 2.46 when standard errors are clustered by both month and country.



Instead, we always rely on all eligible firms (as discussed in the previous section) with non-missing data to create country-neutral quintile-based long-short portfolios in each month. Separately for each (country, month, anomaly) combination, we compute the return of a portfolio that goes long in the presumably 20% most underpriced stocks and short in the 20% presumably most overpriced stocks. To assure diversification, we condition (with few exceptions for some firm event-based anomalies) on country-level anomaly months with at least 25 eligible firms. With respect to accounting data, we use yearly updated values and the conservative timing convention of Fama and French (1993) in order to avoid look-ahead bias and to assure comparability across countries. Close to 15% of the anomalies are based on binary indicators (such as a firm having a decrease in analyst earnings forecasts) and thus do not qualify for a quintile-based sorting procedure. In these cases, we go long (or short) the event firms and offset the position with the portfolio of non-event firms.

This common basis is intended to reasonably reflect the real-life arbitrage process. The typical quantitative arbitrageur may be more likely to consistently apply his own data screens and investment guidelines rather than to exactly follow the many different approaches described in the respective academic papers. From an academic point of view, our framework is also inspired by Richardson et al. (2010) who criticize that “to date very few papers have made a serious attempt to bring some structure to the anomaly literature” (p. 422). Similarly, Subrahmanyam (2010, p. 28) highlights in his literature review on return predictors: “(...) disparate methodologies are used by different researchers and there usually is little attempt to demonstrate robustness across methods. This is another reason why the picture remains murky and suggests a need for clarifying studies.”

In all asset pricing tests, returns are expressed in local currency and account for dividends as well as for capital actions. We consider both equally-weighted portfolio returns and value-weighted portfolio returns for each anomaly, as both approaches have their

merits. Value weighting returns arguably gives a better estimate of how economically important an anomaly is, as portfolio returns are dominated by larger firms. Weighting returns equally potentially better reflects how widespread a return phenomenon is. McLean and Pontiff (2016) follow the baseline approach used in the original anomaly studies, almost all of which rely on equally weighted returns.

### **2.3 Unconditional profitability of anomalies**

Our initial stock market universe consists of all countries classified as developed or emerging stock markets by MSCI at least at some point during our sample period. However, in our baseline analysis, we use only the 39 stock markets that have at least 20,000 eligible anomaly months, as defined below. This cut-off is arbitrarily chosen and intended to allow for meaningful comparisons between the U.S. and international markets. Using alternative cut-offs does not affect any insights.

In this context, we only consider (anomaly, country) combinations for which at least five valid estimates for both in-sample, post-sample, and post-publication returns can be computed. In-sample returns are defined as the returns during max(first month of the original anomaly sample period, January 1980) and the end of the original sample period. Post-sample returns are defined as the returns following the last month of the original sample period and preceding the month of the publication in a peer-reviewed journal. The computation of out-of-sample returns starts in the publication month.

The final sample consists of about 2.096 million anomaly months. To mitigate the impact of outliers, we winsorize the pooled long/short portfolio returns at the 0.1% and the 99.9% level. Using the raw data does not affect inferences.

Table 2 provides country-by-country information about the number of eligible anomaly

months, the number of distinct anomalies, and the start of the sample period. While there is substantial cross-country variation, large international markets such as Australia, Canada, Germany, France, Japan, or the U.K. are broadly comparable to the U.S. market. In all these countries, the sample period starts in 1980, and we can rely on more than 200 eligible anomalies accounting for typically more than 70,000 anomaly months.

### **Please insert Table 2**

Table 2 also displays the unconditional magnitude of the average long/short return produced by the anomalies on a country-per-country basis. A few notable patterns emerge. First, in most countries, equally weighted portfolios generate larger returns than value-weighted portfolios. This is consistent with the notion that both mispricing and limits to arbitrage tend to be stronger for smaller stocks. Second, for the majority of countries, pooled long/short returns are statistically significantly positive at the 1% level. Third, and with the notable exception of Japan, the aforementioned large developed stock markets are broadly comparable with respect to their average long/short anomaly return.

Panel A of Table 3 provides similar statistics for different country universes. In the average anomaly month of the international sample, the unconditional return is about 49 bp for equally weighted returns and 38 bp for value-weighted returns. The respective estimates for the U.S. market are 58 bp and 33 bp (see Table 2). In line with Jacobs (2016), point estimates are higher in developed markets than point estimates in emerging markets. The magnitude of the average anomaly is similar in different geographic regions. In sum, based on the estimates presented so far, the U.S. stock market appears to be roughly comparable with international markets. This unconditional view also suggests that data mining is unlikely to be the major explanation for the abnormal U.S. return patterns documented in the original studies.

### Please insert Table 3

However, Panel B of Table 3 shows subperiod results which do uncover differences between the U.S. and international markets. There is a clear negative time trend with respect to U.S. anomaly profitability, but not with respect to the pooled international anomaly profitability. Most notably, and consistent with Green et al. (2017), the average value-weighted long/short return in the most recent subsample period (2004-2015) is reduced to 16 bp in the U.S. market. This value is only marginally (t-stat 1.67) different from zero. In contrast, the corresponding estimate for the pooled international sample is 38 bp and highly statistically significant.

Even though these findings do not account for the changing (country, anomaly) universe over time, they already suggest that publication effects may differ between the U.S. and other markets. Panel C of Table 3, which shows pooled long/short anomaly months separately for in-sample, post-sample, and post-publication periods, supports this view. The descriptive statistics indicate a pronounced post-publication drop in the U.S., but not in the average international market. We more formally test this conjecture in the following section.

#### 2.4 Baseline findings on the impact of publication effects

Our baseline regression model at the country-level is motivated by McLean and Pontiff (2016):

$$R_{i,t} = \alpha_i + \beta_1 * Post - Sample Dummy_{i,t} + \beta_2 * Post - Publication Dummy_{i,t} + \epsilon_{i,t} \quad (1)$$

In equation 1,  $R_{i,t}$  refers to the raw long/short return of anomaly  $i$  in month  $t$  in a given country. The post-sample dummy is one if  $t$  is after the end of the original sample but

still pre-publication and zero otherwise. The post-publication dummy is one if  $t$  is equal to or larger than the month of the publication and zero otherwise.  $\alpha_i$  captures anomaly fixed effects. Standard errors are clustered by month. In addition to these country-level regressions, we also analyze the aggregate impact of anomaly publication by pooling data for (at least some) non-U.S. markets. In these regressions, we include fixed effects for (country, anomaly) pairs.

We are interested in measuring the market impact of publication-informed trading. The most natural proxy for our goal is thus the regression coefficient of the post-publication dummy. The coefficient of the post-sample dummy could reflect both (the upper bound of) data mining/statistical biases and implications of arbitrage trading. The latter assumes that at least some market participants learn about mispricing before the official publication date, for instance by attending seminars as well as by reading the working paper version or forthcoming publication.

Our key findings on post-publication effects are summarized in Tables 4 and 5. Table 4 reports country-level regression results, which quantify the average absolute change (in bp per month) in anomaly profitability in the post-sample and post-publication period relative to the in-sample period. Table 5 reports aggregated results and additionally provides estimates of implied relative changes (in %) in monthly anomaly profitability.

### **Please insert Tables 4 and 5**

In Table 4, our findings for the U.S stock market are in line with the results in McLean and Pontiff (2016). This is noteworthy as we rely on a shorter sample period, on a broader set of anomalies, and on a common methodological framework rather than exactly following the screens and approaches of the original papers.

The post-sample (post-publication) coefficient for equally weighted portfolio returns in regression equation 1 is -0.265 (-0.442). These numbers indicate a 26.5 bp (44.2 bp) drop in monthly anomaly profitability post-sample (post-publication). Both estimates are significant at the 1% level.<sup>5</sup> The average predictor in the U.S. stock market has an in-sample mean return of about 74 bp. The regression coefficients thus imply that, relative to the in-sample mean, the average anomaly return decreases by 36% post-sample and by 60% post-publication (see Table 5). The respective estimates in McLean and Pontiff (2016) are 26% and 58%.

With respect to value-weighted U.S. portfolio returns, the post-sample coefficient is -0.175 (t-stat -2.00) and the post-publication coefficient is -0.315 (t-stat -2.82). Relative to the in-sample mean of 48.5 bp, these estimates imply a decrease of 36% and 65%.

Our estimates for international markets in both Table 4 and Table 5 stand in contrast to these findings. With respect to the post-sample dummy in the country-level regressions, only the estimates for Hongkong are significantly negative. With respect to the post-publication dummy, only the value-weighted results for China are significantly negative. On the other hand, some estimates for both dummies are significantly positive. This finding holds for both equally and value-weighted returns.

Table 5, which aggregates the international markets, provides a similar message. Irrespective of whether we consider all international markets, only MSCI developed markets, or only large stock markets with more than 60,000 anomaly months, there is no evidence for a post-publication decline in international anomaly profitability. The same holds true if

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<sup>5</sup>Nevertheless, the post-publication coefficient is statistically different from the post-sample coefficient both in the equally weighted portfolio analysis ( $p=0.03$ ) and the value-weighted analysis ( $p=0.08$ ). Thus, even under the very conservative assumption that the post-sample coefficient captures only statistical biases and no arbitrage trading, there is still a post-publication drop in U.S. anomaly profitability.

we condition on the ten international markets with the highest average equally weighted or value-weighted in-sample strategy return. The average equally (value-) weighted in-sample return in these countries is 62.3 bp (55.3 bp), which is comparable to the U.S. estimates of 74 bp and 48.5 bp, respectively.

Among the ten aggregate specifications for international markets (five samples, two return weighting schemes), the coefficient for the post-publication dummy ranges from -3 bp to +16 bp (t-statistic -0.35 to 2.23). Regression coefficients for the post-sample dummy are similar.

Focusing on the relative (instead of on the absolute) change in anomaly profitability does not change insights. As shown in Panels B and D of Table 5, we estimate a post-publication change ranging between -6% and +36%. In other words, and as additionally visualized in the Online Appendix, the drop in anomaly profitability exists in the U.S. stock market only.

### **3 What explains the differences between the U.S. and other developed markets?**

In the following, we explore potential reasons for the striking discrepancies in post-publication effects between the U.S. stock market and international markets. For brevity and due to the presumed economic similarity, we contrast the U.S. against the pooled anomaly months of other developed markets in all remaining tests, unless noted otherwise. This approach corresponds to regression specification 2 of Table 5. Using all countries or plausible alternative country groups does not change any insights, as already indicated in Table 5.

### 3.1 Anomaly universe

The baseline results rely on the full set of 231 anomalies. It may be that the differences between the U.S. and international stock markets do not represent a general phenomenon, but can be traced back to a specific group of anomalies. However, Table 6 shows that this is not the case.

#### **Please insert Table 6**

In Panels A to D, we distinguish between four anomaly categories as proposed in McLean and Pontiff (2016). Event predictors are anomalies based on corporate events or changes in performance. Market predictors are mainly or exclusively based on lagged financial data such as returns, prices, trading volume, or shares outstanding. Fundamental predictors are based on financial statement data. Valuation predictors are constructed from both market and fundamental data.

In Panels E and F, we distinguish between the 80 anomalies that are also relied on in McLean and Pontiff (2016) and our alternative set of 151 anomalies. For the average developed market (including the U.S.), the correlation between a meta anomaly that averages the equally weighted monthly in-sample returns of the anomalies relied on in McLean and Pontiff (2016) and an equivalent meta anomaly constructed from the alternative anomalies is 0.54. Both sets thus contain partly different information about the cross-section of returns.

In absolute terms, our U.S. estimates for the post-publication drop are even larger for the alternative set of anomalies than for the original set. In relative terms, U.S. estimates for both sets of anomalies are similar, as the alternative set has higher in-sample returns. In sum, the U.S. findings again confirm the insights of McLean and Pontiff (2016).



Nevertheless, there is again no evidence for a post-publication drop in other developed markets.

### **3.2 In-sample anomaly profitability**

As shown in Table 3 as well as in the Online Appendix, in-sample returns tend to be higher in the United States than in the average non-U.S. market. From a statistical point of view, higher in-sample returns leave more room for an out-of-sample decrease (in bp per month) in anomaly profitability. From an economic point of view, arbitrageurs may be more likely to trade on anomalies or in countries with higher in-sample returns. Nevertheless, the tests in Table 5, which condition on the ten non-U.S. countries with the highest in-sample returns, already suggest that differences in in-sample returns are unlikely to be a key driver of our findings. We now test this conjecture in several further ways.

The average anomaly in developed markets (including the U.S.) produces an in-sample equally weighted return of close to 50 bp, but the standard deviation is substantial (48 bp). In this light, Panel A of Table 7 tests whether anomalies with higher equally weighted in-sample returns decline more after they have been published, and whether this possibility weakens the differences between the U.S. and international markets. More specifically, we include interactions between the in-sample equally weighted mean return of each anomaly and the post-sample and post-publication dummy variables.

**Please insert Table 7**

Inferences do not change. For instance, the coefficients in Panel A for the equally weighted results imply that the average anomaly (an anomaly with an in-sample mean return that is one standard deviation larger than the average) experiences a 43 bp (76 bp)

post-publication drop in the U.S., but a 12 bp (6 bp) increase in international markets. Panel B mirrors the approach in Panel A, but the interactions are based on the value-weighted in-sample return. Our conclusions are similar.

In Panels C and D, we replicate the analysis, but now rely on in-sample t-statistics instead of on long/short returns. The analysis yields very similar findings. For instance, in Panel C, the average equally weighted anomaly has an in-sample t-statistic of 3.14 based on standard errors that are clustered by month. The average anomaly is estimated to experience a 44 bp post-publication drop in profitability in the U.S., but a 12 bp post-publication increase in the average developed market. The respective estimates for an anomaly with an in-sample t-statistic that is one standard deviation (2.70) larger than the average return predictor are -68 bp (U.S.) and +9 bp (other developed markets).

In Panels E and F, we condition on strategies that are particularly successful in-sample. More specifically, we only use anomalies that produce an in-sample monthly mean long/short return of 100 bp based on equally weighted stocks (Panel E) or value-weighted stocks (Panel F) in the average developed market. This cut-off is arbitrarily chosen; alternative values do not change inferences. The procedure results in 37 anomalies (Panel E) and 19 anomalies (Panel F), which tend to be related to medium-term momentum, and, to a lesser extent, analyst revisions or earnings announcements. The findings indicate that these historically particularly successful anomalies show a large drop in profitability in the U.S. market, but not in the typical developed market.

Finally, in Panels G and H, we focus on strategies that have equally or value-weighted in-sample returns that are higher in non-U.S. developed markets than in the U.S. stock market. With respect to equally weighted stocks (Panel G), this condition results in 53 strategies with an average in-sample return of 49 bp in developed markets, but only 21

bp in the United States. Relying on value-weighted stocks (Panel H) yields 93 anomalies with an average in-sample return of 61 bp in developed markets, but only 33 bp in the United States. Nevertheless, there is again no evidence of a reliable post-publication decrease in anomaly profitability for the average developed market, neither in absolute terms (regression coefficients) nor in relative terms (percentage drop).

### 3.3 Time effects

The results presented so far may not necessarily be related to anomaly publication, but could be the results of general time effects. In Panels A to C of Table 8, we address this possibility in three different ways.

#### **Please insert Table 8**

In Panel A, we include a linear time trend. In Panel B, we alternatively include month fixed effects. Both approaches indeed subsume a substantial fraction of the explanatory power of the U.S. post-publication dummies, which nevertheless remain significant. Again, findings for the average developed market are close to zero.

In Panel C, we start our sample period in January 1995 instead of in January 1980. As in the baseline analysis, we only consider (anomaly, country) combinations for which all three types of returns (in-sample, post-sample, post-publication) can be computed. In total, 180 anomalies enter the analysis. The findings for the U.S. market tend to increase in magnitude. The estimates for international markets are virtually zero.

In sum, while general time effects appear to partly reduce the role of post-sample and post-publication effects in the U.S. market, they cannot fully explain the differences between the U.S. and other developed markets.

### 3.4 Asset pricing models

Investors may be primarily concerned with alphas rather than with the raw long/short returns that have been the focus so far. Potentially, post-publication U.S. anomaly portfolios differ from international anomaly portfolios in their local risk factor exposure, and this may explain part of the differences in our baseline findings.

We test this conjecture in Panels D and E of Table 8. In Panel D, we rely on the CAPM, which already has been public knowledge at the beginning of our sample period. We implement a two-stage regression approach. First, we regress the time-series of country-specific anomalies on the local excess market return. We do so separately for the time-series of in-sample returns and the time-series of post-sample/post-publication returns; using a single regression does not change insights. Abnormal returns are then defined as the intercept plus the fitted value of the residual. Second, we perform a regression as before (see equation 1). In Panel E, we rely on local Fama and French (1993) alphas instead of the CAPM. In both cases, inferences remain unchanged.

### 3.5 Database issues

The Datastream/Worldscope databases have been relied on in many papers published in top finance journals. Nevertheless, market coverage may be an issue, particular in earlier years of the sample period. The percentage of stocks covered by Datastream/Worldscope for a given country-year may be smaller than the corresponding coverage of CRSP/Compustat for U.S. stocks, and the differences in coverage may be related to differences in stock characteristics such as firm size. Further discussions and comparisons of databases can be found in Dai (2012), Ince and Porter (2006), Jacobs (2016), or Karolyi (2016), among others. Nevertheless, we do not find convincing evidence for the

conjecture that the level or changes in international data availability during our sample period could be the main driver of our findings.

First, as shown in Panel C of Table 8, the large cross-county differences are also observable in the more recent 1995-2015 period, when international data appear to be widely available via Datastream and Worldscope. Second, taking time fixed effects or time trends into account does not change the qualitative nature of our findings.

Third, coverage is likely to be best for developed markets, larger firms, and stock market data (as opposed to accounting data). However, we do not find evidence for post-publication effects in large markets such as U.K., Japan, or Canada. In addition, the value-weighted results, which are dominated by larger firms, are comparable to the equally weighed results. Table 6 also shows that the results for market-based anomalies are comparable to the results for fundamental-, valuation-, or event-based anomalies.

Fourth, the Online Appendix reports results obtained for the U.S. market when conditioning on stock months with joint availability on both Datastream and Worldscope as well as on CRSP/Compustat. Findings are slightly weaker, but insights do not change. The U.S. remains the only market with a statistically significant, robust, and economically meaningful post-publication drop in anomaly profitability.

### **3.6 Limits to arbitrage**

The dynamics of anomaly profitability in the U.S. market (non-U.S. developed markets) appear to be (in)consistent with the idea of a post-publication increase in informed arbitrage trading. A possible explanation for these findings is that impediments to arbitrage may be more binding in international markets.

To explore this conjecture, we first study five widely used firm-level proxies for limits to arbitrage. We consider firm size, turnover, the fraction of zero return days as in Lesmond et al. (1999), bid-ask spreads as in Corwin and Schultz (2012), and idiosyncratic volatility. The first four variables proxy for the arbitrageur’s transaction costs, while idiosyncratic volatility proxies for the arbitrageur’s holding costs (e.g., Pontiff (2006)).

Panel A of Table 9 compares the average firm characteristic in the U.S. anomaly portfolios with the average firm characteristic in the pooled other developed markets. We focus on the post-publication period, but our findings also holds for the full sample. There is no clear pattern. Firm size, spreads, and idiosyncratic volatility<sup>6</sup> are roughly comparable. There is some evidence of lower transaction costs in the U.S., but holding costs appear to be comparable or even slightly higher in the U.S. market. Differences in standard arbitrage costs thus seem to explain at best a fraction of the large differences in post-publication effects.

### **Please insert Table 9**

Nevertheless, there may be other important direct and indirect differences in impediments to arbitrage that are more difficult to quantify. Such limits to arbitrage may be related to, for instance, shorting costs, investment mandates, benchmarking issues, currency risk, and the operational or institutional market framework. Discussions of selected aspects of market segmentation or arbitrage in international stock markets are provided in Bekaert et al. (2011), Gagnon and Karolyi (2010), Griffin et al. (2010), or Hung et al. (2015), among others. The U.S. stock market arguably also has lower information costs.

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<sup>6</sup>Idiosyncratic volatility is computed from monthly returns. Using daily returns increases the positive difference between the U.S. market and other developed markets. However, this finding may be mechanically related to the higher fraction of non-zero return days in the U.S. market.

For instance, data is more readily available, backtesting periods can be easily extended, and most academic asset pricing papers cover the U.S. market.

Another friction is the relatively low number of stocks in many non-U.S. markets. Arbitrageurs implementing filter rules or aiming at style- and sector-neutral investing will often face a (potentially too) small investment universe. In addition, this lack of diversification could also result in more downside risk, which could lead to principal-agent problems in the sense of Shleifer and Vishny (1997). Indeed, Panel B of Table 9 shows that the left tail of the return distribution of pooled anomaly months contains considerably more crash risk in non-U.S. developed markets than in the U.S. market in the post-publication period.

Many of the aforementioned cross-country differences in limits to arbitrage should be weaker among the largest stocks in the largest development markets. Large stocks tend to be more liquid and to have lower shorting costs than smaller stocks. Large developed markets assure a sufficient degree of diversification even among the subsample of large stocks. In addition, large developed markets are probably closest to the U.S. in terms of market accessibility, the institutional framework, or the operational framework.

We thus condition on Australia, Canada, France, Germany, Japan, and the United Kingdom (see also Table 2), and rerun the construction of all anomalies as well as the baseline analysis of post-publication effects with big stocks only. Following Fama and French (2008), big stocks are required to have a market capitalization above the median market capitalization of NYSE stocks. This restriction has a massive impact on the investment universe as well as on the anomaly composition in these large developed markets. For instance, relative to our baseline analysis, which already excludes stocks smaller than ten million USD, both the number of eligible firms and the number of eligible firm months

decrease by more than 80%.<sup>7</sup>

The findings in Panel C of Table 9 are indeed consistent with the limits to arbitrage argument. The coefficient on the post-publication dummy in large developed markets is now negative, albeit not statistically significant. The average anomaly is estimated to decrease by about 7 to 8 bp, which, given the low in-sample profitability of anomalies among the largest stocks, implies a relative drop of slightly more than 25%. Running the same analysis for the U.S. market yields a statistically significant post-publication decrease of 16 to 17 bp, which implies a relative drop of about 60%. In sum, limits to arbitrage likely explain a substantial fraction, but not all, of the cross-country differences.

### 3.7 Arbitrage capital

Possibly as a consequence of limits to arbitrage, the post-publication amount of capital allocated to quantitative arbitrage strategies may be large in the U.S. (e.g., Calluzzo et al. (2016), Chordia et al. (2014), Green et al. (2011), Qu et al. (2015)) relative to other markets. As a consequence, the U.S. market may exhibit a stronger decrease in anomaly returns. We offer two pieces of supporting evidence for this conjecture in the following.

First, we perform a test of market integration. Coordinated global arbitrage following anomaly publication could result in stronger comovement of country-level anomaly portfolios (e.g. Barberis and Shleifer (2003), Barberis et al. (2005)). More specifically, the returns of the long or short leg of U.S. anomaly portfolios could increase in correlation

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<sup>7</sup>This screen also implies that smaller developed markets (Austria, Belgium, etc.) typically have too few eligible firms to implement a sufficiently broad anomaly universe with a sufficiently long time series. Imposing an even higher hurdle on market capitalization often substantially decreases the number of implementable anomalies even in the largest developed markets, but does not lead to different insights.



with the return of the long or short leg of anomaly portfolios in other developed markets.

To test this hypothesis, we first compute rolling 36 month correlations between each (anomaly leg, developed market) pair and the corresponding U.S. estimates. Recall that we construct long/short quintiles for each anomaly, with the exception of the about 15% “binary” anomalies, which we exclude in the following. We then compare these correlations with the return correlation in the third quintile. Stocks in this portfolio are neither overvalued nor undervalued. Comparing the correlation between these “neutral” portfolios with the correlation between the anomaly portfolios thus controls for currency fluctuations, time effects, or increased globalization in general.

Panels A and B of Table 10 show little evidence for an abnormal post-publication increase in global correlations. For instance, with respect to equally weighted portfolio returns in the long leg, the average correlation between the U.S. and other developed markets indeed increases from 0.436 (in-sample) to 0.572 (post-publication). However, the control stocks show a similar increase (0.451 to 0.585). In sum, there is no or very weak evidence for increased market integration following anomaly publication.

### **Please insert Table 10**

In our second test, we analyze whether the U.S. baseline estimates disappear in a sample period in which quantitative arbitrage trading was arguably less common. In this context, many studies argue that hedge funds are probably closest to the idea of sophisticated quantitative arbitrageurs.<sup>8</sup> Findings in Agarwal et al. (2015), Cao et al. (2016), French (2008), and other papers suggest that hedge funds’ impact on the U.S. stock market

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<sup>8</sup>See, for instance, Akbas et al. (2015), Brunnermeier and Nagel (2004), Brav et al. (2008), Kokkonen and Suominen (2015), and the literature review of Agarwal et al. (2015).

was weak until the early years of the 2000s, but has increased massively since then.<sup>9</sup> In addition, the average short interest ratio for U.S. stocks has massively increased in the post-2000 period as well (e.g., Hanson and Sunderan (2014)). In a comprehensive study of U.S. return predictability, Green et al. (2017) highlight a marked shift in 2003, which they attribute to several changes in the information and trading environment that made exploiting mispricing easier.

In light of these findings, we replicate our baseline U.S analysis, but now set the sample period end to December 2003. This approach conditions on the 84 anomalies that have in-sample, post-sample, and post-publication returns during the period from January 1980 to December 2003. As Panel C of Table 10 shows, the coefficients for both the post-sample and the post-publication dummy turn out to be economically small and statistically indistinguishable from zero. These findings possibly reflect a much lower degree of U.S. quantitative arbitrage trading during this period.

## 4 Conclusion

We implement country-level versions of 231 cross-sectional return anomalies published in peer-reviewed finance and accounting journals. The more than two million anomaly country-months in this exceptionally large data set allow us to conclude that, unconditionally, long/short return predictability is similar across most developed stock markets. However, among the 39 countries in our analysis, only the U.S. shows a robust and significant post-publication decline in long/short returns.

We explore several possible mechanisms behind the surprisingly large differences be-

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<sup>9</sup>This pattern is also reflected in academic publications. Agarwal et al. (2015) state that four leading finance journals published only 16 papers on hedge funds prior to 2005, but 105 papers since 2005.

tween the return dynamics in the U.S. and international markets. Overall, our findings are most consistent with the idea that sophisticated investors learn about mispricing from academic studies, but then focus mainly on the U.S. market, probably due to lower impediments to arbitrage. Collectively, our insights have implications for arbitrage trading, data mining in cross-sectional return predictability, international market segmentation, and the meta-analysis of market anomalies.

Our findings suggest different directions for future research. First, a thorough analysis of geographic differences in capital invested in quantitative arbitrage strategies is needed. Second, our findings call for a better understanding of the general time trends in country-level long/short return predictability. Third, even among non-U.S. countries, there is large cross-country variation in conditional and unconditional anomaly profitability that warrants further investigation.

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Table 1: Anomaly universe

ID	Description	Paper	ID	Description	Paper
1	Firm age	Barry and Brown (1984)	31	Volume/market value of equity	Haugen and Baker (1996)
2	Long-term reversal	DeBondt and Thaler (1985)	32	Long-term earnings forecasts	Porta (1996)
3	Leverage	Bhandari (1988)	33	Accruals	Sloan (1996)
4	Cash flow/debt	Ou and Penman (1989)	34	Momentum-book/market	Asness (1997)
5	Current ratio	Ou and Penman (1989)	35	Change in absolute dividend	Benartzi et al. (1997)
6	Delta current ratio	Ou and Penman (1989)	36	Reverse stock splits	Desai and Jain (1997)
7	Delta quick ratio	Ou and Penman (1989)	37	Stock splits	Desai and Jain (1997)
8	Delta sales-to-investory	Ou and Penman (1989)	38	Delta capex - delta industry capex	Abarbanell and Bushee (1998)
9	Quick ratio	Ou and Penman (1989)	39	Delta sales - delta inventory	Abarbanell and Bushee (1998)
10	Sales/cash	Ou and Penman (1989)	40	Delta sales - delta sg&a	Abarbanell and Bushee (1998)
11	Sales/inventory	Ou and Penman (1989)	41	Firm strength	Abarbanell and Bushee (1998)
12	Short-term reversal	Jegadeesh (1990)	42	Analyst FY2 to FY1 estimate	Achour et al. (1998)
13	Twelve month momentum	Jegadeesh (1990)	43	Forecast revision ratio	Achour et al. (1998)
14	Analyst forecast revision	Stickel (1991)	44	Six month consensus forecast change	Achour et al. (1998)
15	Moving average 100 days	Brock et al. (1992)	45	Dollar trading volume	Brennan et al. (1998)
16	Moving average 200 days	Brock et al. (1992)	46	Share volume	Datar et al. (1998)
17	Book equity/market equity	Fama and French (1992)	47	O-score	Dichev (1998)
18	Delta depreciation-to-pp&e	Holthausen and Larcker (1992)	48	Z-score	Dichev (1998)
19	Depreciation-to-pp&e	Holthausen and Larcker (1992)	49	Zmijewski bankruptcy risk	Dichev (1998)
20	Momentum-reversal	Jegadeesh and Titman (1993)	50	Discounted residual income	Frankel and Lee (1998)
21	Standard momentum	Jegadeesh and Titman (1993)	51	Dividend yield	Naranjo et al. (1998)
22	Cash flow/market value of equity	Lakonishok et al. (1994)	52	Consecutive earnings increases	Barth et al. (1999)
23	Sales growth	Lakonishok et al. (1994)	53	Industry momentum	Moskowitz and Grinblatt (1999)
24	Dividend initiation	Michaely et al. (1995)	54	Industry reversal	Moskowitz and Grinblatt (1999)
25	Sales/price	Barbee et al. (1996)	55	Coskewness	Harvey and Siddique (2000)
26	Earnings announcement return	Chan et al. (1996)	56	Momentum-res. analyst coverage	Hong et al. (2000)
27	Momentum-PEAD	Chan et al. (1996)	57	Momentum-firm size	Hong et al. (2000)
28	Cash flow variance	Haugen and Baker (1996)	58	Share repurchases	Ikenberry et al. (1995)
29	Return on equity	Haugen and Baker (1996)	59	Momentum-turnover	Lee and Swaminathan (2000)
30	Volume trend	Haugen and Baker (1996)	60	F-Score	Piotroski (2000)

[continued overleaf]

ID	Description	Paper	ID	Description	Paper
61	Down analyst forecast	Barber et al. (2001)	91	Earnings persistence	Francis et al. (2004)
62	Up analyst forecast	Barber et al. (2001)	92	Earnings predictability	Francis et al. (2004)
63	Advertising / market value of equity	Chan et al. (2001)	93	52-week high	George and Hwang (2004)
64	R&D / market value of equity	Chan et al. (2001)	94	Momentum-52-week high	George and Hwang (2004)
65	R&D/sales	Chan et al. (2001)	95	Return consistency	Grinblatt and Moskowitz (2004)
66	Volatility of dollar trading volume	Chordia et al. (2001)	96	Net operating assets	Hirshleifer et al. (2004)
67	Volume variance	Chordia et al. (2001)	97	Change in consensus recommendation	Jegadeesh et al. (2004)
68	Abnormal short-term volume	Gervais and Odean (2001)	98	Analyst recommendation level	Jegadeesh et al. (2004)
69	Alpha momentum	Grundy and Martin (2001)	99	Momentum-liquidity	Lesmond et al. (2004)
70	KZ financial constraints	Lamont et al. (2001)	100	Tax/income	Lev and Nissim (2004)
71	Price shock-turnover increase	Pritamani and Singal (2001)	101	Earnings surprise-dollar volume	Mendenhall (2004)
72	Bankruptcy score	Shumway (2001)	102	Earnings surprise-idio. volatility	Mendenhall (2004)
73	Illiquidity	Amihud (2002)	103	Analyst earnings surprise (stdev)	Mendenhall (2004)
74	Dividend resumption	Boehme and Sorescu (2002)	104	Style reversal	Teo and Woo (2004)
75	Analyst forecast dispersion	Diether et al. (2002)	105	Investment	Titman et al. (2004)
76	Analyst forecast revision-dispersion	Dische (2002)	106	Analyst dispersion in long-term growth	Anderson and Dyl (2005)
77	Bookmarket-distress	Griffin and Lemmon (2002)	107	Accruals quality	Francis et al. (2005)
78	Style autocorrelation (size)	Lewellen (2002)	108	Capital gain overhang	Grinblatt and Han (2005)
79	Style autocorrelation (book/market)	Lewellen (2002)	109	Long-term reversal-price delay	Hou and Moskowitz (2005)
80	Growth in inventory	Thomas and Zhang (2002)	111	Price delay	Hou and Moskowitz (2005)
81	Book/market-idiosyncratic volatility	Ali et al. (2003)	110	Price delay-PEAD	Hou and Moskowitz (2005)
82	Book/market-share price	Ali et al. (2003)	112	Price delay-idiosyncratic volatility	Hou and Moskowitz (2005)
83	Book/market-zero return trading days	Ali et al. (2003)	113	Forecast revision-cash flow duration	Jiang and Lee (2005)
84	Growth in ltnoa	Fairfield et al. (2003)	114	Forecast revision-volatility	Jiang and Lee (2005)
85	Forecast revision-analyst coverage	Gleason and Lee (2003)	115	Information uncertainty	Jiang and Lee (2005)
86	Change in analyst forecast-accrual	Barth and Hutton (2004)	116	Momentum-cash flow duration	Jiang and Lee (2005)
87	Book/Market-accruals	Bartov and Kim (2004)	117	Momentum-total volatility	Jiang and Lee (2005)
88	Cash flow duration	Dechow et al. (2004)	118	G-Score	Mohanram (2005)
89	Operating cash flow/market cap	Desai et al. (2004)	119	Delta long-term debt	Richardson et al. (2005)
90	Unexpected r&d increases	Eberhardt et al. (2004)	120	Delta shareholder equity	Richardson et al. (2005)

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<b>ID</b>	<b>Description</b>	<b>Paper</b>	<b>ID</b>	<b>Description</b>	<b>Paper</b>
121	Delta capex	Anderson and Garcia-Feijoo (2006)	151	Momentum-costs of goods sold	Sagi and Seasholes (2007)
122	High frequency idiosyncratic risk	Ang et al. (2006b)	152	Momentum-revenue volatility	Sagi and Seasholes (2007)
123	Downside beta	Ang et al. (2006a)	153	Low frequency idiosyncratic volatility	Bali and Cakici (2008)
124	Short-term reversal-turnover	Avramov et al. (2006)	154	Idiosyncratic volatility-Liq./size/price	Bali and Cakici (2008)
125	Short-term reversal-liquidity	Avramov et al. (2006)	155	Distress risk	Campbell et al. (2008)
126	Total xfn	Bradshaw et al. (2006)	156	Asset growth	Cooper et al. (2008)
127	Industry-enhanced accruals	Chan et al. (2006)	157	Long-term seasonality	Heston and Sadka (2008)
128	Momentum-long-term reversal	Chan and Kot (2006)	158	Medium-term seasonality	Heston and Sadka (2008)
129	Share issuance (5-year)	Daniel and Titman (2006)	159	Medium-term seasonal reversal	Heston and Sadka (2008)
130	Analyst earnings surprise (book value)	Doyle et al. (2006)	160	Long-term seasonal reversal	Heston and Sadka (2008)
131	Analyst earnings surprise (price)	Doyle et al. (2006)	161	Delta pp&e-delta inventory	Lyandres et al. (2008)
132	Pension funding status	Franzoni and Marin (2006)	162	Share issuance (1-year)	Pontiff and Woodgate (2008)
133	IPO- r&d	Guo et al. (2006)	163	Change in analyst coverage	Scherbina (2008)
134	Industry Herfindahl index	Hou and Robinson (2006)	164	Asset turnover	Soliman (2008)
135	Revenue surprises	Jegadeesh and Livnat (2006)	165	Delta asset turnover	Soliman (2008)
136	Turnover-adjusted zero return days	Liu (2006)	166	Delta profit margin	Soliman (2008)
137	Firm age-momentum	Zhang (2006)	167	Net working capital changes	Soliman (2008)
138	Forecast revision-cash flow variance	Zhang (2006)	168	Noncurrent operating assets changes	Soliman (2008)
139	Momentum-cash flow variance	Zhang (2006)	169	Profit margin	Soliman (2008)
140	Momentum-forecast dispersion	Zhang (2006)	170	Earnings consistency	Alwathainani (2009)
141	Momentum-idiosyncratic volatility	Zhang (2006)	171	Idiosyncratic risk global FF3 model	Ang et al. (2009)
142	Payout yield	Boudoukh et al. (2007)	172	PEAD-liquidity	Chordia et al. (2009)
143	Idiosyncratic return momentum	Jr. and Prinsky (2007)	173	Friday earnings surprises	DellaVigna and Pollet (2009)
144	Market-leading industries (negative)	Hong et al. (2007)	174	Distracting earnings surprises	Hirshleifer et al. (2009)
145	Market-leading industries (positive)	Hong et al. (2007)	175	Industry-based sin stocks	Hong and Kacperczyk (2009)
146	Industry lead-lag effect (earnings)	Hou (2007)	176	Cash-flow volatility	Huang (2009)
147	Industry lead-lag effect (returns)	Hou (2007)	177	(Non-)lottery stocks	Kumar (2009)
148	Leverage component of book/price	Penman and Richardson (2007)	178	Capital expenditure- pp&e	Polk and Sapienza (2009)
149	Enterprise component of book/price	Penman and Richardson (2007)	179	Profitability	Balakrishnan et al. (2010)
150	Momentum-Sharpe ratio	Rachev et al. (2007)	180	Expected skewness	Boyer et al. (2010)

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<b>ID</b>		<b>Description</b>	<b>Paper</b>	<b>ID</b>	<b>Description</b>	<b>Paper</b>
181	Sustainable growth	Lockwood and Prombutr (2010)	211	Moving 200 day average-volatility	Han et al. (2013)	
182	Long-term reversal-idio. volatility	McLean (2010)	212	Expected dividend	Hartzmark and Solomon (2013)	
183	Customer-supplier relationship	Menzly and Ozbas (2010)	213	Value-firm size	Israel and Moskowitz (2013)	
184	Real estate holdings	Tuzel (2010)	214	Gross profitability	Novy-Marx (2013)	
185	Maximum daily return	Bali et al. (2011)	215	Shock in Amihud illiquidity	Bali et al. (2014)	
186	Minimum daily return	Bali et al. (2011)	216	Shock in bid/ask spread	Bali et al. (2014)	
187	Residual momentum	Blitz et al. (2011)	217	Employee growth rate	Belo et al. (2014)	
188	Percent operating accruals	Hafzalla et al. (2011)	218	Jackpot probability	Conrad et al. (2014)	
189	Percent total accruals	Hafzalla et al. (2011)	219	Continuous information arrival	Da et al. (2014)	
190	Asset growth-idiosyncratic volatility	Lipson et al. (2011)	220	Absolute lagged return shock	Lu et al. (2014)	
191	Enterprise multiple	Loughran and McDonald (2011)	221	Negative return shock	Lu et al. (2014)	
192	Operating leverage	Novy-Marx (2011)	222	Positive return shock	Lu et al. (2014)	
193	Tax expense surprise	Thomas and Zhang (2011)	223	Momentum-asset growth	Nyberg and Pöyry (2014)	
194	Inventory growth	Belo and Lin (2012)	224	Asset liquidity	Ortiz-Molina and Phillips (2014)	
195	Bid-ask spread	Corwin and Schultz (2012)	225	Short term reversal-earnings	So and Wang (2014)	
196	Short-term reversal-large stocks	de Groot et al. (2012)	226	Operating profits-assets	Ball et al. (2015)	
197	Time-series momentum	Moskowitz et al. (2012)	227	Financial institutions size (macap)	Gandhi and Lustig (2015)	
198	Lagged momentum	Novy-Marx (2012)	228	Financial institutions size (assets)	Gandhi and Lustig (2015)	
199	Lagged industry momentum	Novy-Marx (2012)	229	Short term reversal-industry	Hameed and Mian (2015)	
200	Lagged momentum-large firms	Novy-Marx (2012)	230	Industry short-term reversal-no news	Hameed and Mian (2015)	
201	Style lagged momentum	Novy-Marx (2012)	231	Industry short-term reversal-size	Hameed and Mian (2015)	
202	Cashes-assets	Palazzo (2012)				
203	Neg. price shock-analyst rec.	Savor (2012)				
204	Pos. price shock-analyst rec.	Savor (2012)				
205	High frequency book/market	Asness and Frazzini (2013)				
206	Short-term residual reversal	Blitz et al. (2013)				
207	Productivity of cash	Rao et al. (2013)				
208	Analyst forecast revision-no. analysts	Čzaja et al. (2013)				
209	Organization capital	Eisfeldt and Papanikolaou (2003)				
210	Moving 100 day average-volatility	Han et al. (2013)				

Table 2: Descriptive statistics and anomalies on a country-by-country basis

In column *MSCI group*, DM/EM/FM denote developed/emerging/frontier markets, respectively. *Start year* is  $\max[1980, \text{first country year with non-missing anomaly return}]$ . *Total number of firms* refers to all stocks that meet the data screens outlined in Section 2.1. *Equally (value-) weighted returns* denote the average unconditional monthly long/short anomaly portfolio return with equally weighted (value-weighted) stocks. T-statistics are reported in parentheses. Standard errors are clustered by month. Two-tailed statistical significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively.

Country	MSCI group	Total anomaly months	Total number of anomalies	Start year	Number of firms	Equally weighted long/short return	Value-weighted long/short return
Australia	DM	69,598	206	1980	2,504	0.791*** (11.31)	0.640*** (8.88)
Austria	DM	43,480	151	1986	166	0.415*** (5.78)	0.252*** (3.50)
Belgium	DM	53,519	172	1980	221	0.491*** (6.99)	0.318*** (4.00)
Brazil	EM	22,909	111	1994	246	0.398*** (3.19)	0.268** (2.08)
Canada	DM	75,905	216	1980	2,857	0.599*** (7.82)	0.468*** (5.43)
Chile	EM	42,660	162	1989	251	0.340*** (5.06)	0.326*** (4.64)
China	EM	36,092	151	1992	2,814	0.169** (2.58)	0.140* (1.86)
Denmark	DM	60,553	192	1982	298	0.590*** (8.78)	0.501*** (6.45)
Finland	DM	42,263	159	1988	196	0.480*** (5.11)	0.374*** (3.10)
France	DM	79,093	218	1980	1,512	0.495*** (7.78)	0.334*** (5.21)
Germany	DM	77,551	215	1980	1,300	0.531*** (7.48)	0.431*** (6.18)
Greece	EM/DM	47,795	174	1988	394	0.466*** (4.29)	0.583*** (4.18)
Hongkong	DM	54,976	180	1980	204	0.321*** (3.16)	0.354*** (3.62)
India	EM	46,183	177	1990	3,360	0.606*** (6.98)	0.457*** (4.27)
Indonesia	EM	46,291	174	1990	539	0.475*** (4.43)	0.480*** (4.18)
Ireland	DM	25,055	101	1987	98	0.520*** (4.18)	0.466*** (3.60)
Israel	EM/DM	34,260	133	1986	674	0.503*** (6.23)	0.466*** (4.62)
Italy	DM	67,778	204	1980	512	0.446*** (7.01)	0.298*** (4.31)
Japan	DM	84,345	227	1980	4,786	0.200*** (3.94)	0.184*** (3.29)
Korea	EM	63,258	201	1984	2,606	0.520*** (5.13)	0.395*** (4.20)
Malaysia	EM	65,324	201	1984	1,131	0.423*** (4.83)	0.363*** (4.28)
Mexico	EM	42,827	165	1988	219	0.448*** (5.14)	0.407*** (4.99)
Netherlands	DM	64,534	192	1980	254	0.575*** (7.80)	0.292*** (3.46)
New Zealand	DM	30,388	124	1988	234	0.663*** (9.09)	0.369*** (4.60)
Norway	DM	55,850	188	1982	399	0.589*** (6.05)	0.449*** (4.06)
Pakistan	EM/FM	33,679	144	1992	274	0.410*** (3.39)	0.467*** (4.10)
Philippines	EM	37,495	152	1990	253	0.371*** (2.90)	0.266** (2.00)
Poland	EM	23,775	118	1995	697	0.553*** (6.39)	0.405*** (3.99)
Portugal	EM/DM	34,065	122	1988	137	0.542*** (5.54)	0.469*** (5.24)
Singapore	DM	61,657	191	1983	889	0.464*** (5.33)	0.385*** (4.37)
South Africa	EM	62,759	192	1980	758	0.771*** (12.86)	0.595*** (8.01)
Spain	DM	55,873	189	1987	239	0.411*** (4.80)	0.379*** (4.50)
Sweden	DM	59,501	196	1982	792	0.693*** (6.25)	0.494*** (4.44)
Switzerland	DM	68,210	202	1980	412	0.462*** (7.46)	0.315*** (4.79)
Taiwan	EM	48,700	182	1987	2,097	0.286*** (3.92)	0.182** (2.28)
Thailand	EM	53,253	187	1987	812	0.435*** (3.60)	0.433*** (3.57)
Turkey	EM	44,033	165	1988	422	0.218*** (2.70)	0.081 (0.83)
UK	DM	85,924	229	1980	3,260	0.603*** (12.35)	0.389*** (6.55)
USA	DM	95,051	231	1980	20,026	0.582*** (8.99)	0.380*** (5.90)

Table 3: Long/short returns and different country universes, calendar periods, and event periods

The results displayed in this table are based on the data shown in Table 2.  $N$  denotes the number of anomaly months. In Panel A, *Americas* consists of Argentina, Brazil, Canada, Chile, Mexico, and the United States, *Asia* consists of China, India, Indonesia, Korea, Malaysia, Pakistan, Philippines, Taiwan, and Thailand, *Pacific* consists of Australia, Hong Kong, Japan, New Zealand, and Singapore, and *Europe/Middle East/Africa* is based on all other countries displayed in Table 2. In Panel C, *in-sample* refers to available long/short country anomaly months between max[January 1980, first month of original sample period] and the last month of the original sample period. *Post-sample (Post-publication)* periods start in the first month after the end of the original sample (the month of the publication). In all panels, t-statistics are reported in parentheses. Standard errors in specifications 1-11 and 15-17 (12-14 and 18-20) are clustered by both country and month (month). Two-tailed statistical significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively.

ID	Specification	N	Equally weighted returns	Value weighted returns
Panel A: Different country universes				
(1)	World	2,096,462	0.493*** (10.63)	0.383*** (8.27)
(2)	International markets (without USA)	2,001,411	0.489*** (10.51)	0.384*** (8.26)
(3)	MSCI developed markets	1,375,098	0.523*** (9.86)	0.394*** (7.45)
(4)	MSCI emerging or frontier markets	721,364	0.437*** (8.29)	0.362*** (7.27)
(5)	Americas	279,352	0.514*** (8.05)	0.391*** (7.65)
(6)	Asia	430,275	0.422*** (7.68)	0.359*** (6.61)
(7)	Europe	1,085,871	0.525*** (10.39)	0.392*** (7.34)
(8)	Pacific	300,964	0.460*** (3.60)	0.380*** (3.91)
Panel B: Different calendar periods				
(9)	International markets: 1980-1991	238,310	0.361*** (6.02)	0.306*** (5.45)
(10)	International markets: 1992-2003	831,475	0.485*** (5.99)	0.411*** (5.09)
(11)	International markets: 2004-2015	931,626	0.525*** (9.10)	0.379*** (5.89)
(12)	USA: 1980-1991	28,961	0.769*** (10.47)	0.488*** (6.29)
(13)	USA: 1992-2003	32,845	0.706*** (4.67)	0.502*** (3.57)
(14)	USA: 2004-2015	33,245	0.297*** (3.49)	0.164* (1.67)
Panel C: Different event periods				
(15)	International markets: In-sample	928,553	0.422*** (8.65)	0.364*** (7.78)
(16)	International markets: Post-sample	318,010	0.518*** (8.83)	0.410*** (6.85)
(17)	International markets: Post-publication	754,848	0.559*** (9.19)	0.396*** (6.00)
(18)	USA: In-sample	51,931	0.764*** (11.59)	0.518*** (7.68)
(19)	USA: Post-sample	11,732	0.501*** (5.42)	0.330*** (3.44)
(20)	USA: Post-publication	31,388	0.313*** (3.55)	0.169* (1.92)

Table 4: Anomalies and publication effects: Country-level results

The table shows the main findings obtained from country-level regressions of pooled long/short anomaly returns on dummies for post-sample and post-publication periods. The post-sample dummy is one if anomaly month  $t$  is after the end of the original sample but still pre-publication and zero otherwise. The post-publication dummy is one if  $t$  is equal to or larger than the month of the publication and zero otherwise. *Equally (value-) weighted returns* denote the average monthly long/short equally weighted (value-weighted) anomaly portfolio return. All regressions include anomaly fixed effects. T-statistics are reported in parentheses. Standard errors are clustered by month. Two-tailed statistical significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively.

Country	Equally weighted long/short returns				Value-weighted long/short returns			
	Post-sample		Post-publication		Post-sample		Post-publication	
USA	-0.265***	(-3.29)	-0.442***	(-4.29)	-0.175**	(-2.00)	-0.315***	(-2.82)
Australia	0.047	(0.43)	0.065	(0.42)	-0.093	(-0.84)	0.069	(0.41)
Austria	0.138	(1.29)	0.022	(0.15)	0.123	(1.00)	-0.073	(-0.46)
Belgium	0.015	(0.17)	-0.028	(-0.22)	0.090	(0.64)	-0.063	(-0.36)
Brazil	0.281	(1.47)	0.647**	(2.52)	0.265	(0.96)	0.316	(1.11)
Canada	-0.019	(-0.15)	0.024	(0.15)	0.006	(0.05)	-0.117	(-0.65)
Chile	-0.053	(-0.53)	0.047	(0.30)	-0.106	(-0.97)	-0.028	(-0.17)
China	0.121	(1.19)	-0.167	(-1.20)	0.042	(0.37)	-0.299*	(-1.88)
Denmark	0.043	(0.45)	0.192	(1.50)	-0.094	(-0.79)	0.167	(1.06)
Finland	0.107	(0.90)	0.132	(0.71)	-0.198	(-1.13)	-0.252	(-1.01)
France	-0.016	(-0.17)	-0.030	(-0.31)	-0.041	(-0.38)	-0.132	(-1.26)
Germany	0.274***	(3.37)	0.303***	(3.44)	0.239**	(2.01)	0.101	(0.95)
Greece	0.421***	(2.72)	0.318	(1.39)	0.575***	(2.95)	0.699**	(2.13)
Hongkong	-0.244*	(-1.75)	-0.226	(-1.10)	-0.291**	(-2.08)	-0.171	(-0.90)
India	-0.038	(-0.29)	0.199	(1.11)	-0.120	(-0.72)	-0.010	(-0.04)
Indonesia	0.062	(0.36)	0.060	(0.29)	-0.085	(-0.45)	-0.115	(-0.49)
Ireland	0.162	(0.66)	0.623*	(1.96)	0.173	(0.55)	0.257	(0.76)
Israel	-0.064	(-0.55)	0.119	(0.70)	-0.044	(-0.24)	0.099	(0.46)
Italy	0.190**	(2.16)	0.085	(0.69)	0.173	(1.62)	0.063	(0.49)
Japan	0.075	(1.04)	0.055	(0.53)	0.043	(0.50)	-0.007	(-0.06)
Korea	0.379***	(2.90)	0.197	(1.08)	0.312**	(2.31)	0.146	(0.86)
Malaysia	0.300***	(2.85)	0.508***	(3.15)	0.205*	(1.90)	0.298*	(1.82)
Mexico	-0.135	(-0.96)	0.170	(0.92)	-0.195	(-1.29)	0.018	(0.10)
Netherlands	0.066	(0.62)	0.105	(0.79)	-0.107	(-0.76)	-0.137	(-0.96)
New Zealand	0.065	(0.56)	0.040	(0.25)	0.174	(1.32)	0.029	(0.17)
Norway	0.069	(0.52)	0.298*	(1.69)	0.056	(0.38)	0.011	(0.06)
Pakistan	-0.098	(-0.57)	0.221	(0.95)	0.031	(0.16)	0.396*	(1.70)
Philippines	-0.052	(-0.26)	0.168	(0.60)	-0.149	(-0.70)	0.094	(0.31)
Poland	-0.128	(-0.85)	0.082	(0.44)	0.007	(0.04)	0.069	(0.32)
Portugal	0.242	(1.62)	0.334	(1.63)	0.001	(0.01)	0.288	(1.39)
Singapore	0.335***	(2.80)	0.451***	(2.62)	0.255**	(1.98)	0.331*	(1.92)
South Africa	0.243**	(2.27)	0.085	(0.76)	0.108	(0.87)	-0.003	(-0.02)
Spain	-0.111	(-0.83)	-0.007	(-0.03)	0.026	(0.17)	0.110	(0.58)
Sweden	0.119	(1.00)	0.193	(1.23)	-0.032	(-0.23)	-0.113	(-0.65)
Switzerland	0.150	(1.51)	0.097	(0.91)	-0.069	(-0.54)	-0.059	(-0.52)
Taiwan	0.258**	(2.07)	0.347**	(2.32)	0.278**	(2.02)	0.355**	(2.12)
Thailand	0.244*	(1.77)	0.171	(0.76)	0.194	(1.10)	0.000	(-0.00)
Turkey	0.085	(0.55)	0.213	(1.26)	0.196	(0.99)	0.137	(0.61)
UK	0.152**	(2.16)	0.169*	(1.70)	0.029	(0.33)	0.055	(0.42)



Table 5: Anomalies and publication effects: Aggregate results

The table shows the main findings obtained from regressions of pooled long/short country-level anomaly returns on dummies for post-sample and post-publication periods. The post-sample dummy is one if anomaly month  $t$  is after the end of the original sample but still pre-publication and zero otherwise. The post-publication dummy is one if  $t$  is equal to or larger than the month of the publication and zero otherwise. *Equally (value-) weighted returns* denote the average monthly long/short equally weighted (value-weighted) anomaly portfolio return. All regressions include fixed effects for (country, anomaly) pairs. In the context of *international markets*, *all* refers to all countries (excluding the U.S.) displayed in Table 2. *Developed only* refers to countries that have been classified as MSCI developed markets during the whole sample period. *Large only* refers to countries with more than 60,000 eligible anomaly months, as displayed in Table 2. *High in-sample (ew)* (*High in-sample (vw)*) refers to the ten international markets with the highest equally weighted (value-weighted) average strategy return during the in-sample period. Panels A and C show regression coefficients, whereas panels B and D translate these coefficients into relative changes in anomaly profitability with respect to the magnitude of the average in-sample anomaly return. T-statistics are reported in parentheses. Standard errors are clustered by month. Two-tailed statistical significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively.

Country universe	USA	(1)	(2)	(3)	(4)	(5)
		All	Developed only	Large markets only	High in-sample (ew)	High in-sample (vw)
		Panel A: Regression coefficients, equally weighted long/short returns				
Post-sample	-0.265*** (-3.29)	0.102** (2.37)	0.081 (1.56)	0.154*** (3.14)	0.037 (0.68)	0.055 (0.94)
Post-publication	-0.442*** (-4.29)	0.153** (2.12)	0.117 (1.52)	0.159** (2.23)	0.088 (1.13)	0.134 (1.50)
N	95,051	2,001,411	1,216,053	986,489	568,933	519,012
		Panel B: Implied relative changes in anomaly profitability, equally weighted long/short returns				
Post-sample	-36%	24%	17%	33%	6%	10%
Post-publication	-60%	36%	24%	34%	14%	23%
		Panel C: Regression coefficients, value-weighted long/short returns				
Post-sample	-0.175** (-2.00)	0.05 (0.97)	0.02 (0.32)	0.066 (1.16)	-0.037 (-0.60)	-0.048 (-0.70)
Post-publication	-0.315*** (-2.82)	0.054 (0.67)	0.001 (0.01)	0.049 (0.62)	-0.03 (-0.35)	-0.012 (-0.12)
N	95,051	2,001,411	1,216,053	986,489	568,933	519,012
		Panel D: Implied relative changes in anomaly profitability, value-weighted long/short returns				
Post-sample	-36%	14%	5%	18%	-7%	-9%
Post-publication	-65%	15%	0%	13%	-6%	-2%

Table 6: Anomalies and publication effects: The impact of the return predictor universe

This table shows variations of the baseline analysis displayed in Table 5. In all panels, we condition on subsets of anomalies as described in the text. All regressions contain (country, anomaly) fixed effects. T-statistics are reported in parentheses. Standard errors are clustered by month. Two-tailed statistical significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively.

	Equally weighted returns		Value-weighted return	
	USA	Developed	USA	Developed
Panel A: Event-based anomalies				
Post-sample	-0.243*** (-3.95)	0.0998** (2.35)	-0.181** (-2.27)	0.051 (0.96)
Post-publication	-0.448*** (-6.32)	0.014 (0.26)	-0.277*** (-2.95)	-0.063 (-0.98)
N	24,900	270,312	24,900	270,312
Panel B: Fundamental-based anomalies				
Post-sample	-0.089 (-0.77)	0.158** (2.45)	-0.006 (-0.05)	0.09 (1.36)
Post-publication	-0.346*** (-3.41)	0.245*** (3.75)	-0.163 (-1.59)	0.088 (1.26)
N	22,673	276,604	22,673	276,604
Panel C: Market-based anomalies				
Post-sample	-0.382*** (-2.76)	0.043 (0.57)	-0.321** (-2.13)	-0.035 (-0.35)
Post-publication	-0.432*** (-2.73)	0.126 (1.13)	-0.385** (-2.25)	0.035 (0.26)
N	31,093	459,629	31,093	459,629
Panel D: Valuation-based anomalies				
Post-sample	-0.308 (-1.51)	0.036 (0.32)	-0.093 (-0.36)	0.001 (0.01)
Post-publication	-0.566*** (-3.86)	0.076 (0.70)	-0.454*** (-2.71)	-0.088 (-0.68)
N	16,385	209,508	16,385	209,508
Panel E: Original set of anomalies (as in McLean and Pontiff (2016))				
Post-sample	-0.166** (-2.08)	0.0962* (1.79)	-0.082 (-1.00)	-0.009 (-0.15)
Post-publication	-0.371*** (-4.04)	0.157** (2.27)	-0.224** (-2.29)	0.013 (0.18)
N	33,519	451,885	33,519	451,885
Panel F: Alternative set of anomalies				
Post-sample	-0.318*** (-3.31)	0.074 (1.25)	-0.226** (-2.05)	0.037 (0.49)
Post-publication	-0.484*** (-3.98)	0.092 (1.04)	-0.370*** (-2.73)	-0.009 (-0.08)
N	61,532	764,168	61,532	764,168

Table 7: Anomalies and publication effects: The impact of in-sample profitability

This table shows variations of the baseline analysis displayed in Table 5. In Panel A (B), we interact the post-sample dummy and the post-publication dummy with the in-sample mean equally weighted (value-weighted) return generated by the return predictor during the original sample period in developed markets (including the U.S.). In Panel C (D), we replicate the analysis, but rely on the in-sample t-statistic instead of on the in-sample return. In Panel E (F), we only use anomalies that produce an in-sample monthly mean long/short return of 100 bp based on equally-weighted (value-weighted) stocks. In Panel G (H), we condition on strategies that had higher equally (value-weighted) in-sample returns in developed markets (excluding the U.S.) than in the U.S. stock market. All regressions contain fixed effects for (country, anomaly) pairs. T-statistics are reported in parentheses. Standard errors are clustered by month. Two-tailed statistical significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively.

	Equally weighted returns		Value-weighted returns	
	USA	Developed	USA	Developed
Panel A: Interaction effect with in-sample profitability (equally weighted)				
Post-sample	0.054 (0.64)	0.112* (1.93)	0.059 (0.59)	0.115* (1.73)
Post-publication	-0.097 (-1.21)	0.176*** (3.06)	-0.075 (-0.77)	0.092 (1.35)
Post-sample*mean	-0.622*** (-2.71)	-0.063 (-0.42)	-0.458* (-1.83)	-0.192 (-1.08)
Post-publication*mean	-0.679*** (-2.86)	-0.118 (-0.65)	-0.474 (-1.60)	-0.183 (-0.78)
N	95,051	1,216,053	95,051	1,216,053
Panel B: Interaction effect with in-sample profitability (value-weighted)				
Post-sample	-0.016 (-0.20)	0.131** (2.26)	0.054 (0.62)	0.138** (2.19)
Post-publication	-0.175** (-2.45)	0.145*** (2.76)	-0.061 (-0.76)	0.087 (1.52)
Post-sample*mean	-0.614** (-2.50)	-0.125 (-0.69)	-0.566** (-2.13)	-0.299 (-1.42)
Post-publication*mean	-0.674*** (-2.74)	-0.070 (-0.36)	-0.644** (-2.18)	-0.219 (-0.87)
N	95,051	1,216,053	95,051	1,216,053

[Continued overleaf]

	Equally weighted returns		Value-weighted returns	
	USA	Developed	USA	Developed
Panel C: Interaction effect with in-sample t-stat (equally weighted)				
Post-sample	-0.036 (-0.42)	0.074 (1.37)	-0.004 (-0.04)	0.079 (1.25)
Post-publication	-0.164** (-2.04)	0.156** (2.35)	-0.126 (-1.46)	0.080 (1.16)
Post-sample*mean	-0.070** (-2.56)	0.003 (0.19)	-0.053* (-1.87)	-0.017 (-1.08)
Post-publication*mean	-0.089*** (-3.61)	-0.012 (-0.77)	-0.060* (-1.82)	-0.024 (-1.12)
N	95,051	1,216,053	95,051	1,216,053
Panel D: Interaction effect with in-sample t-stat (value-weighted)				
Post-sample	-0.075 (-1.05)	0.120** (2.50)	0.020 (0.24)	0.136** (2.52)
Post-publication	-0.221*** (-2.94)	0.126** (2.02)	-0.087 (-1.10)	0.087 (1.39)
Post-sample*mean	-0.094*** (-2.81)	-0.019 (-1.03)	-0.097*** (-2.66)	-0.056** (-2.49)
Post-publication*mean	-0.114*** (-3.29)	-0.004 (-0.17)	-0.119*** (-2.73)	-0.041 (-1.39)
N	95,051	1,216,053	95,051	1,216,053
Panel E: Anomalies with > 100 bp monthly in-sample return (equally weighted)				
Post-sample	-0.810** (-2.58)	0.035 (0.17)	-0.589* (-1.83)	-0.155 (-0.66)
Post-publication	-1.061*** (-3.14)	0.045 (0.18)	-0.729* (-1.82)	-0.140 (-0.45)
N	15,296	184,245	15,296	184,245
Panel F: Anomalies with > 100 bp monthly in-sample return (value-weighted)				
Post-sample	-1.123*** (-2.79)	-0.028 (-0.10)	-0.876** (-2.05)	-0.252 (-0.74)
Post-publication	-1.270*** (-2.84)	-0.034 (-0.10)	-1.039** (-2.00)	-0.181 (-0.42)
N	7,844	90,105	7,844	90,105
Panel G: In sample profitability developed markets > U.S. (equally weighted)				
Post-sample	0.082 (0.79)	-0.028 (-0.48)	-0.026 (-0.23)	-0.110* (-1.67)
Post-publication	-0.090 (-1.22)	-0.042 (-0.71)	-0.101 (-1.20)	-0.110 (-1.65)
N	21,457	271,906	21,457	271,906
Panel H: In sample profitability developed markets > U.S. (value-weighted)				
Post-sample	-0.239* (-1.94)	0.043 (0.66)	-0.041 (-0.32)	-0.075 (-0.93)
Post-publication	-0.430*** (-3.15)	0.062 (0.63)	-0.170 (-1.09)	-0.107 (-0.87)
N	37,903	482,714	37,903	482,714

Table 8: Anomalies and publication effects: The impact of time effects and asset pricing models

This table shows variations of the baseline analysis displayed in Table 5. In Panel A, we include a linear time trend which is 1/100 for January 1980 and increases by 1/100 in each sample month. In Panel C, we only consider (anomaly, country) combinations for which all three types of returns (in-sample, post-sample, post-publication) can be computed between January 1995 and December 2015. In Panel D (E), we rerun the baseline analysis, but rely on long/short returns that are adjusted for their exposure to the local market excess return (local Fama and French (1993) factors). All regressions include fixed effect for (country, anomaly) pairs. T-statistics are reported in parentheses. Standard errors are clustered by month. Two-tailed statistical significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively.

	Equally weighted returns		Value weighted return	
	USA	Developed	USA	Developed
Panel A: Linear time trend				
Post-sample	-0.153** (-2.26)	0.014 (0.28)	-0.147* (-1.86)	0.004 (0.06)
Post-publication	-0.251** (-2.18)	-0.006 (-0.07)	-0.266** (-2.06)	-0.029 (-0.30)
Time trend	-0.08 (-1.58)	0.061** (2.06)	-0.021 (-0.39)	0.015 (0.42)
N	95,051	1,216,053	95,051	1,216,053
Panel B: Month fixed effects				
Post-sample	-0.067 (-1.30)	0.042 (1.14)	-0.093 (-1.41)	0.033 (0.68)
Post-publication	-0.102* (-1.66)	0.072* (1.73)	-0.161** (-2.34)	0.051 (1.00)
N	95,051	1,216,053	95,051	1,216,053
Panel C: Sample start 1995				
Post-sample	-0.318** (-2.50)	0.025 (0.36)	-0.266* (-1.85)	-0.03 (-0.37)
Post-publication	-0.514** (-2.57)	0.011 (0.09)	-0.485** (-2.35)	-0.079 (-0.59)
N	45,240	748,401	45,240	748,401
Panel D: CAPM alphas				
Post-sample	-0.261*** (-3.79)	0.101** (2.58)	-0.177** (-2.42)	0.05 (1.05)
Post-publication	-0.408*** (-4.56)	0.140** (2.34)	-0.279*** (-2.95)	0.038 (0.54)
N	95,051	1,215,918	95,051	1,215,918
Panel E: Three-factor model alphas				
Post-sample	-0.199*** (-3.12)	0.107*** (2.97)	-0.141** (-2.07)	0.053 (1.20)
Post-publication	-0.365*** (-4.87)	0.125** (2.55)	-0.250*** (-3.17)	0.012 (0.21)
N	95,051	1,207,141	95,051	1,207,141

Table 9: Anomalies and publication effects: The impact of limits to arbitrage

Panel A compares firm characteristics of stocks contained in U.S. anomaly portfolios with the pooled developed market sample. Characteristics are first averaged per (country, anomaly, month) and then by (country, month). *Firm size* is expressed in million USD. *Fraction zero return* shows the fraction of firm days with a return of zero. *Idio vola* is the standard deviation of the residual obtained from regressing monthly firm-level excess returns on a local CAPM model over the previous 60 months. We require at least 24 valid observations. Panel B quantifies downside risk in anomaly portfolios. The table shows the 5th percentile and the 1st percentile of the distribution of pooled monthly long/short returns of (anomaly, country) combinations. In Panel C, we replicate the baseline analysis (see Tables 4 and 5), but construct anomalies only with firms whose market capitalization is larger than the NYSE median. *Large developed* markets consist of Australia, Canada, France, Germany, Japan, and the United Kingdom. Regressions in Panel C include include fixed effect for (country, anomaly) pairs. T-statistics are reported in parentheses. Standard errors are clustered by month. Two-tailed statistical significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively.

Panel A: Average firm characteristics in anomaly portfolios (Post-publication period)					
Country universe	Firm Size	Fraction zero return	Turnover	Bid/ask spread	Idio. vola
USA	2,025	0.06	0.13	0.015	0.146
Developed	1,609	0.28	0.05	0.013	0.125

  

Panel B: Downside risk in anomaly portfolios (Post-publication period)					
Country universe	N	Equally weighted returns		Value-weighted returns	
		5th percentile	1st percentile	5th percentile	1st percentile
USA	31,388	-5.25%	-12.41%	-6.53%	-13.84%
Developed	452,516	-7.18%	-14.12%	-9.96%	-19.09%

  

Panel C: Replicating the baseline analysis with the largest firms in the largest developed markets					
Country universe	N	Equally weighted return		Value-weighted return	
		Post-sample	Post-publication	Post-sample	Post-publication
USA	94,445	-0.085 (-1.17)	-0.162* (-1.90)	-0.096 (-1.32)	-0.169* (-1.86)
Large developed	349,333	-0.044 (-0.88)	-0.076 (-1.08)	-0.061 (-1.18)	-0.072 (-1.00)

  

Panel D: Relative changes in profitability, conditioning on the largest firms in the largest developed markets					
Country universe	N	Equally weighted return		Value-weighted return	
		Post-sample	Post-publication	Post-sample	Post-publication
USA	94,445	-29%	-56%	-36%	-64%
Large developed	349,333	-16%	-27%	-23%	-28%

Table 10: Anomalies and publication effects: Testing for time-varying quantitative arbitrage trading

Panels A and B test for increased market integration following anomaly publication. In Panels A and B, *long leg* (*short leg*) refers to the the rolling 36 month correlation (with at least 12 valid observations) between the returns of the long (short) leg of a given U.S. anomaly portfolio and the returns of the long (short) leg of the corresponding anomaly portfolio in a given developed market. *Control stocks* refers to the correlation between the U.S. stocks contained in the third anomaly quintile and the stocks contained in the third anomaly quintile in a given developed market. We exclude “binary” anomalies, i.e. anomalies that do not have a third quintile. In Panel C, we replicate the U.S. baseline analysis from Table 4, but set the sample end to December 2003. More specifically, we condition on the 84 anomalies that have in-sample, post-sample, and post-publication returns during the period from January 1980 to December 2003. T-statistics are reported in parentheses. Standard errors are clustered by month. Two-tailed statistical significance at the 10%, 5%, and 1% level is indicated by \*, \*\*, and \*\*\*, respectively.

Panel A: Anomaly correlation, equally weighted return			
Event time	In-sample	Post-sample	Post-publication
N	480,906	159,254	409,647
Control stocks	0.451	0.544	0.585
Long leg	0.436	0.526	0.572
Short leg	0.434	0.535	0.582
Panel B: Anomaly correlation, value-weighted return			
Event time	In-sample	Post-sample	Post-publication
N	480,906	159,254	409,647
Control stocks	0.431	0.510	0.561
Long leg	0.412	0.488	0.536
Short leg	0.407	0.499	0.550
Panel C: U.S. baseline analysis with 2003 as sample end (N=23,247)			
Equally weighted returns		Value-weighted returns	
Post-sample	Post-publication	Post-sample	Post-sample
-0.036	-0.152	0.023	0.001
(-0.36)	(-0.51)	(0.21)	(0.00)