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Merger-Driven Listing Dynamics

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Abstract

Stock-market effectiveness in attracting and retaining firms under public ownership depends not only on stand-alone firms' net listing benefits but also on gains from merging with a public acquirer. Using a novel merger-adjusted listing count, we show that the dramatic (≈50%) post-1996 U.S. listing decline—often attributed to declining listing benefits—is reversed as the "missing" firms de facto continue existing inside their public acquirers. Our merger adjustment also eliminates the U.S. listing gap, pointing instead to a distinct U.S. listing advantage: providing access to a well-functioning market for complex merger transactions.

I. Introduction

The dramatic (≈50%) post-1996 decrease in the number of firms listed on the three major U.S. stock exchanges has prompted substantial interest in the major drivers of listing dynamics. Naturally, much attention has been given to the similar-

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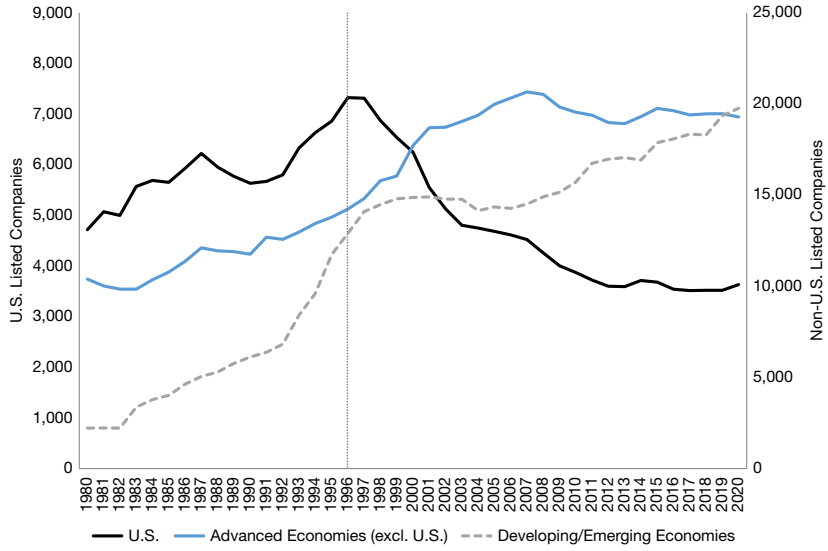
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FIGURE 1

Aggregate Stock Exchange Listing Counts Around the World (1980–2020)

Figure 1, which updates Figure 1 in Doidge et al. (2017), shows the total number of domestic listed firms in 74 of the 100 countries with highest gross domestic product (GDP) in 2020 according to the International Monetary Fund (IMF). The 74 countries represented 96% of the world GDP in 2020. The IMF classifies 33 of the countries as advanced economies and 41 as developing or emerging economies. The U.S. listing count is from CRSP and consists of firms with common stock listed on NYSE, AMEX, or Nasdaq. Non-U.S. listing counts are found using data from WDI, WFE, CEIC, and stock exchange homepages. Investment companies, mutual funds, real estate investment trusts, and other collective investment vehicles are excluded. See Appendix A for further details on the data selection. The vertical dotted line in 1996 marks the year of the U.S. listing peak.



sized reduction in initial public offerings (IPOs), the majority of which took place on the Nasdaq exchange throughout the 1990s (Fama and French (2004), Eckbo and Norli (2005)). Gao, Ritter, and Zhu (2013) carefully consider several potential drivers of this reduction, including increased costs of investment banking services and the 2002 Sarbanes Oxley Act (SOX). While they conclude that these cost increases are unlikely explanations, they suggest that many high-technology start-ups may have chosen to rapidly scale up through a sellout (merger) rather than undertaking an IPO.[1] Moreover, Doidge, Karolyi, and Stulz (2017) point to a positive trend in aggregate international listings (illustrated in Figure 1 (extended

[1]For some firms, an IPO poses a greater risk of publicly disclosing valuable private information. Also, 2 decades of increased funding from private equity and other financial institutions has enabled young firms to delay going public and hence increased the age firms undertaking IPOs. For analyses of the decision to go public, see, for example, Poulsen and Stegemoller (2008), Da Rin, Hellman, and Puri (2013), Doidge, Karolyi, and Stulz (2013), Dambra, Casares Field, and Gustafson (2015), Ewens and Farre-Mensa (2020), Kwon, Lowry, and Qian (2020), and Dathan and Xiong (2022). The sharp decline in IPOs has also caused concern among U.S. financial market regulators: "[When]…our most exciting young companies…raise private capital rather than go public, retail investors are left out of a significant part of the Nation's economic growth." U.S. Securities and Exchange Commission (SEC) Commissioner Robert J. Jackson Jr., *The Middle-Market IPO Tax*, 2018.

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to 2020)) and estimate a significant "U.S. listing gap." They conclude that the listing gap, which they label as the number of "missing" listed firms relative to an international trend line, not only exists but "is consistent with a decrease in the net benefits of a listing for U.S. firms" (abstract).

In this article, we make several contributions to our understanding of the listing dynamics in Figure 1. Perhaps most important, we show that i) the U.S. listing decline need not be driven by lower net listing benefits, and ii) firms are "missing" from the U.S. stock market only if one disregards target firms acquired by already listed companies. The logic behind i) is that listing dynamics are affected by *both* changes in net listing benefits and expected gains from merger transactions, where the latter can be substantial in magnitude.[2] Hence, before drawing inferences about potential changes in net listing benefits one must account for listing changes caused by mergers. While others also point to merger activity involving public firms when discussing the post-peak listing decline (Gao et al. (2013)) and the U.S. listing gap (Doidge et al. (2017), Lattanzio, Megginson, and Sanati (2023)), our analysis is the first to directly link the merger channel to the listing dynamics at the firm level.

By integrating merger activity directly into the listing dynamics, we are in effect refocusing the listing debate toward a broader issue that cannot be addressed by the actual listing count itself: the ability of stock markets to attract and retain firms under public ownership—arguably a fundamental objective of any public market. Since the listing count only tracks the number of stand-alone listed firms, it does not accurately gauge this broader issue. Specifically, because targets give up their stand-alone status, they are either ignored by the actual listing count (when the target is private) or, in the case of public targets, even treated as having *left* the stock exchange.

In reality, these former stand-alone public companies continue under public ownership—likely deriving some of the parent company's listing benefits (access to public debt and equity, "acquisition currency," improved managerial incentives, etc.)—while the private targets further expand the investment opportunities available to public-equity investors. We solve this measurement problem by simply treating a stand-alone listed company as a nexus of the firm itself and its de facto consolidated targets since going public. Our merger adjustment therefore adds the targets of listed acquirers to the actual listing count.[3]

We present our main findings in four steps. In the first, we focus exclusively on the U.S. and examine whether the 1996 listing peak in Figure 1 survives our merger adjustment of the actual listing count. Here, we document that mergers involving

[2]Alexandridis, Antypas, and Travlos (2017) and Dessaint, Eckbo, and Golubov (2024) document positive average bidder and target abnormal returns over the past 4 decades. Target offer premiums in deals where both the bidder and the target are public firms average 40% (Betton, Eckbo, Thompson, and Thorburn (2014)). We return to the issue of time-series changes in synergy gains, in particular during the merger wave of the 1990s, in Section V.

[3]For internal consistency, when a listed firms leaves the exchange, this merger adjustment requires lowering the listing count by 1 plus the sum of its targets. As detailed in Section II, our size-based selection of private targets produces "listable" firms both in terms of value and age relative to the median listed firm. For example, the average private target is about the same size and only slightly younger than the median listed firm in the same industry and acquisition year.

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U.S. public acquirers are nearly as important as IPOs in impacting listing dynamics – both in number and value. More specifically, over the period 1980–2020, U.S. listed companies on average acquire one public or private target firm, bringing the annual average number of companies from 5,108 to 10,907 after adding the targets. Moreover, while IPOs brought in 10,567 firms valued at $6 trillion over the same period, the total transaction value of the acquisition targets was nearly $13 trillion—twice that of the IPOs.

We also show that, despite the nearly 50% decline in the number of listed companies after 1996, the net firm-value inflow—inflows minus outflows using the full anatomy of listing changes—is *higher* in the post-peak period than between 1980 and 1996 ($1.7 trillion vs. $1.2 trillion, respectively). This illustrates how much the listing count itself underestimates the actual flow of firms into the three major U.S. stock exchanges. Indeed, our merger adjustment reverses almost the entire post-1996 listing decline; there is no merger-adjusted listing peak. That is, accounting for acquisitions by public firms of other public companies and of private targets—some of which might otherwise have chosen to go public themselves—is sufficient to eliminate the listing decline.

In the second step of our analysis, we use our merger-adjusted listing series to revisit the U.S. listing gap estimated by Doidge et al. (2017). With 1990 as their base year, they find that the U.S. listing count per capita falls significantly below an international trend line, 1996–2012. In our replication of their econometric analysis (detailed in Appendix B), as many as 3,289 U.S. listed firms are "missing" in year 2012 (their last period). However, when we replace their dependent variable with our merger-adjusted listing series, which adds target firms of listed acquirers around the world, the listing-gap estimates become statistically insignificant in all years, 1991–2020.

While Doidge et al. (2017) interpret their significantly negative listing gap estimates as pointing to a relative decrease in U.S. net listing benefits (which are unobservable to the econometrician), our evidence points to a more direct channel: expected gains from mergers involving public acquirers, which may easily dominate changes in net listing benefits as the main source of the post-1996 U.S. listing decline. This observation is particularly important for the listing debate as the extraordinary ability of the U.S. stock market to retain firms under public ownership through mergers may point to a relative listing *advantage*.

In the third step of our analysis, we further examine the effectiveness of the merger channel following listing peaks around the world. We begin by demonstrating that the smoothly rising trend lines in Figure 1 actually hide a large number of country-specific listing peaks that occur at different points in time over the sample period. Surprisingly, as much as four-fifths of the 74 countries represented in Figure 1 experience a listing peak followed by a total decline that averages nearly 50%—much like in the U.S. after 1996.

The fact that a "U.S. style" listing peak is the rule rather than the exception internationally allows us to use our merger-adjusted listing series in new cross-country tests of whether the merger channel, during the post-peak period of listing decline, works to retain targets under public ownership more strongly in the U.S. than elsewhere. We find that this is indeed the case: Following listing peaks,

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public firms on foreign exchanges exit their respective stock markets—instead of being retained under public ownership by a public acquirer—significantly more often than in the U.S. This evidence further points to what we argue is a merger-driven U.S. listing advantage: Providing access to a legal and regulatory system that promotes relatively cost-efficient complex corporate control transactions involving public companies.[4]

Finally, our interpretation of the merger channel as a relative U.S. listing advantage raises the question of the likely value and productivity of this channel. We therefore round off our analysis by providing two pieces of performance evidence that are also original to this article. First, estimating what John, Kadyrzhanova, and Lee (2024) label a "synergy wave," which is based on the frequency of merger transactions with a positive combined bidder and target wealth effect, we find that the merger activity that drove much of the post-1996 listing decline was predominantly value increasing. Second, presumably with the help of their respective targets, firms that remain listed after 1996 have maintained or even improved on the pre-1996 contribution to aggregate U.S. employment and GDP and expanded R&D and patenting activity.

In sum, as our evidence shows, accounting for the underlying merger channel is critical for our understanding of the forces driving U.S. listing dynamics.

II. Is There a Merger-Adjusted U.S. Listing Peak?

In this section, we first explain and then apply our merger adjustment procedure to U.S. listed companies. As stated above, our procedure views a public standalone company as a nexus of the initial firm itself (at the time of the IPO) and its subsequently consolidated "listable" targets. As explained below, while public targets are, of course, all "listable" firms, we impose a minimum size threshold for private targets to also be counted in this nexus, based on the size of listed firms in the same year and industry.[5]

All variable definitions are summarized in Table 1. Our data sources for the full U.S. listing anatomy, which includes both foreign and domestic target firms, are from CRSP and Refinitiv's SDC Platinum M&A database (SDC). These data sources, as well as other sources used to identify listing dynamics of foreign stock exchanges, are fully described in Appendix A (Tables A1 and A2).

[4]See, for example, Coffee (1984), Bebchuk, Cohen, and Ferrell (2009), and Coates (2018) for discussions legal rules and regulations governing U.S. transactions in the market for corporate control. La Porta, Lopezde-Silanes, Shleifer, and Vishny (1997), Levine (1997), and Demirguc-Kunt and Maksimovic (1998) present evidence of the high degree of minority shareholder protection afforded by the U.S. legal system. Eckbo, Makaew, and Thorburn (2018) and Eckbo, Malenko, and Thorburn (2020) discuss how complex merger transactions in the U.S., where the two transacting parties swap their respective stocks in the presence of 2-sided information asymmetries ("paying for a used car with another used car") are resolved.

[5]While all our targets self-select a sellout to a public acquirer, some may also have considered the alternative of doing an IPO instead. We do not address this interesting choice here, as it is not required by our merger-adjustment procedure. While the literature cited in footnote 1 above provides substantial evidence on the choice between undertaking an IPO or a sellout, to our knowledge it does not also condition on whether the acquirer is a private or a public company.

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TABLE 1

Variable Definitions

Table 1 provides the definitions of variables representing actual and merger-adjusted new lists and delists.

Definition	Data Sources (Further Details in Appendix A.1)
Panel A. New Lists	
IPO Initial public offering on NYSE, AMEX, or Nasdaq	Matched to IPO data from SDC and Jay Ritter's web page, counting U.S. operating companies only
SPIN Divisional spin-off from a U.S. public company	Identified in CRSP (distribution code 3763) and SDC (acquirer name "shareholders"). Spin-off parent confirmed as U.S. public using CRSP. Includes equity carve-outs (for cash)
$MISC_{New}$ Relist, uplist, CRSP reorganization (when a merger of equals results in the creation of a new firm), CRSP form change (to U.S. common stock and/or U.S. incorporation, and also when a SPAC acquisition is completed), or unidentified new list	Relists, reorganizations, and form changes are identified in CRSP. Remaining new lists are classified as uplists, and verified when possible using OTC data from WRDS, SDC (by identifying "follow-on" listings that occur simultaneously with a new listing), and manually
$MERGE_{Private\text{-}to\text{-}Public}$ Private-to-public merger: Acquisition in which a U.S. public company acquires a non-public corporation (foreign, private, or OTC firm). Does not include SPAC acquisitions, since SPACs (with other investment vehicles) are not counted as "public"	Mergers are completed transactions that are identified in SDC using the deal forms "merger," "acquisition," and "acquisition of remaining-, partial- and majority interest," and result in 100% ownership. Targets must have a greater market value than the first percentile of same-industry (using Fama–French 12 industry definitions) public firms that remain listed 1 year later. Percentiles are determined using data from CRSP
N_{it} Acquisition tracking index: For internal consistency, when continually adding the targets of a given public acquirer (firm i) to the merger-adjusted listing count $L_{A,t}$, we also lower $L_{A,t}$ by the same number of targets whenever the acquirer leaves the stock exchange for reasons other than being acquired by another public company. Over time, N_{it} is updated by 1 if target j is private and by $N_{j,t-1}+1$ if target j is public. For new lists, acquisition tracking index only comes into effect when firm relists (under $MISC_{New}$ above)	Cumulated over time for the sample of public firms in CRSP by tracking firm acquisitions, exits, and re-entries into U.S. stock exchanges using the other variables in this table
Panel B. Delists	
$MERGE_{Public\text{-}to\text{-}Public}$ Public-to-public merger: Merger between 2 publicly listed U.S. companies	Merger delistings are identified in CRSP using acquiring PERMCO and PERMNO (delisting codes 200–399). Acquirer identity is found in SDC, CRSP, and manually with web searches
$MERGE_{Public\text{-}to\text{-}Private}$ Public-to-private merger: Merger in which a U.S. public firm is acquired by a foreign, private, or OTC firm	Same as above
$MISC_{Del}$ Delist due to cause, voluntarily, or for unknown reasons	Cause delists are identified in CRSP using delisting codes 400–569 and 574–999, and voluntary delists with codes 570–573. Unknown delistings are not marked in CRSP by a delisting code, but occur when the firm leaves the CRSP sample of U.S. public firms for more than 2 weeks for reasons other than trading suspensions
$DIVEST_{Subsidiary\text{-}to\text{-}Private}$ Subsidiary-to-private divestiture: Acquisition of a U.S. public-owned subsidiary by a private, foreign, or OTC firm	Takeovers are identified in SDC (excludes deals with acquirer name "shareholders"). Minimum target size threshold is calculated using CRSP and is the same as that of $MERGE_{Private\text{-}to\text{-}Public}$. Subsidiary parent is confirmed as U.S. public using CRSP. The subsidiary itself must not be publicly listed
N_{it} Acquisition tracking index, as defined in Panel A of this table. Over time, N_{it} is updated by 1 if target j is private and by $N_{j,t-1}+1$ if target j is public. For delists, however, the acquisition tracking index comes into effect when a firm delists via $MERGE_{Public\text{-}to\text{-}Private}$ or $MISC_{Del}$	Cumulated over time for the sample of public firms in CRSP by tracking firm acquisitions, exits, and re-entries into U.S. stock exchanges using the other variables in this table

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A. Motivating the Merger-Adjustment Procedure

When addressing the question of whether there is a merger-adjusted listing peak in the U.S., it is necessary to break down the actual listing count into its components before adding the merger adjustments. This section therefore lays out the full anatomy of the listing changes and the associated merger adjustments. In our notation, L_t is the level of the actual listing count in year t, while $L_{A,t}$ is the level of the merger-adjusted count. Beginning with the actual count at year-end 1980 (the base year for our U.S.-specific analysis), the actual and merger-adjusted listing series in year t are constructed as follows:

$$(1) \qquad L_t = L_{1980} + \sum_{\tau=1981}^{t} \Delta L_\tau$$

$$L_{A,t} = L_{1980} + \sum_{\tau=1981}^{t} \Delta L_{A,\tau},$$

where ΔL_τ and $\Delta L_{A,\tau}$ are the annual changes in the two listing counts, respectively. Beginning with the actual listing count change, it is computed as follows:

$$(2) \qquad \begin{aligned} \Delta L_\tau &= \text{NEWLISTS}_\tau - \text{DELISTS}_\tau \\ \text{NEWLISTS}_\tau &= \text{IPO}_\tau + \text{SPIN}_\tau + \text{MISC}_{\text{New},\tau} \\ \text{DELISTS}_\tau &= \text{MERGE}_{\text{Public-to-Public},\tau} + \text{MERGE}_{\text{Public-to-Private},\tau} \\ &\quad + \text{MISC}_{\text{Del},\tau}, \end{aligned}$$

where each of the components in NEWLISTS_τ and DELISTS_τ cumulates all the respective transactions over year τ. The component IPO_τ sums all initial public offerings, SPIN_τ are all public-company divisional spinoffs into new public companies, and $\text{MISC}_{\text{New},\tau}$ represents all remaining (miscellaneous) new lists. The latter group includes new lists without raising capital—in particular, uplists from smaller exchanges and over-the-counter markets—relistings following leveraged buyouts and emergence from bankruptcy, and firms that change status from foreign-domiciled to U.S.-domiciled.

DELISTS_t includes public-to-public and public-to-private mergers, where the subscript indicates the direction of the flow of the target firm, and miscellaneous other reasons. $\text{MERGE}_{\text{Public-to-Public},\tau}$ denotes a public target acquired by another public company, while $\text{MERGE}_{\text{Public-to-Private},\tau}$ denotes a public target acquired by a private firm. The private acquirer may be U.S.-domiciled or a foreign company.[6] The miscellaneous other delistings, $\text{MISC}_{\text{Del},\tau}$, includes delistings that are voluntary, for cause, or for unknown reasons. A delisting for cause occurs when a firm fails to uphold certain exchange-listing requirements, such as when the firm files for bankruptcy or its stock falls below a minimum price.

Next, the change in the merger-adjusted listing count in year τ is computed as follows:

[6]In the empirical analysis, we designate an acquirer or target as "private" even if it trades over-the-counter or on a minor exchange in the U.S., or on a public exchange in a foreign country.

$$
\begin{aligned}
\Delta L_{A,\tau} &= \text{NEWLISTS}_{A,\tau} - \text{DELISTS}_{A,\tau} \\
\text{NEWLISTS}_{A,\tau} &= \text{IPO}_t + \text{MERGE}_{\text{Private-to-Public},\tau} + \text{MISC}^{N}_{\text{New},\tau} \\
\text{DELISTS}_{A,\tau} &= \text{MERGE}^{N}_{\text{Public-to-Private},\tau} + \text{DIVEST}_{\text{Subsidiary-to-Private},\tau} \\
&\quad + \text{MISC}^{N}_{\text{Del},\tau},
\end{aligned} \tag{3}
$$

where, again, each of the components in $\text{NEWLISTS}_{A,\tau}$ and $\text{DELISTS}_{A,\tau}$ cumulates all the respective transactions over year τ. However, while $\text{NEWLISTS}_{A,\tau}$ is affected by IPO_τ in the same way as NEWLISTS_τ, it adds $\text{MERGE}_{\text{Private-to-Public},\tau}$ and excludes SPIN_τ. $\text{MERGE}_{\text{Private-to-Public},\tau}$, which is not part of NEWLISTS_τ, enumerates transactions in which a public company is acquiring a non-public (private or foreign) firm. SPIN_τ is excluded since a divisional spinoff into a separate public firm does not change corporate resources under public ownership. Comparing the actual and adjusted delists, $\text{DELISTS}_{A,\tau}$ is not lowered by $\text{MERGE}_{\text{Public-to-Public},\tau}$. However, $\text{DIVEST}_{\text{Subsidiary-to-Private},\tau}$ now subtracts from the listing count when the subsidiary of a public parent is sold to a private firm.

The superscript N in equation (3), refers to the acquisition tracking index N_{it} in equation (4) below. For internal consistency, as we continually add the targets of a given public acquirer (firm i) to $L_{A,t}$, we must also lower the merger-adjusted count by the same number of targets whenever that acquirer leaves the stock exchange for reasons other than being acquired by another public company. Beginning in 1980, N_{it} is updated by 1 if target j is a private firm and by $N_{j,t-1}+1$ if target j is a public company:

$$
N_{it} = \begin{cases} N_{i,t-1} + 1 & \text{if target } j \text{ acquired in period } t \text{ is a private firm} \\ N_{i,t-1} + 1 + N_{j,t-1} & \text{if target } j \text{ acquired in period } t \text{ is a public firm} \end{cases} \tag{4}
$$

where $N_{j,t-1}+1$ is the value of the public target's acquisition index (where the +1 is the target itself). We reiterate that N_{it} is used to adjust L_A when a public company leaves the stock exchange for reasons *other* than being acquired by another public company. The one exception is when a firm with $N_{it} > 0$ relists after having exited the exchange, which is covered by $\text{MISC}^{N}_{\text{New},\tau}$.

B. Selection of Private-to-Public Targets

We impose a minimum size threshold for a private target (and subsidiary) to be included in the above merger adjustment. The threshold in year t is the year-end 1st percentile of the market capitalization of all publicly listed firms in the target's Fama–French-12 industry. To avoid a downward bias due to financial distress, we require the firms used to identify this size threshold to also be listed in year $t+1$ (empirically, dropping the 1-year survivorship requirement has only a negligible impact on the size threshold). As it turns out, our size-based private-to-public target selection produces target firms that are on average the same size as the median listed firm within the same year and industry (a relative size ratio of 1.02). In other words, from a size perspective, N_{it} records what might be described as "listable" private targets inside the public acquirer's own portfolio of consolidated companies.

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FIGURE 2

Transactions Differentiating Actual and Merger-Adjusted Listing Counts

Figure 2 shows the annual count of the transactions that differentiate the unadjusted, public-to-public merger-adjusted, and merger-adjusted listing counts. All variables are defined in Table 1 and equations (1)–(4) in the text. Also shown are the total outflows (net of relistings) from the acquisition index N_{it} in equation (4) when public firms leave the exchange. The dark-shaded area restricts N_{it} to public targets only, while the lighter-shaded area also includes private targets. The vertical dotted line indicates the date of the U.S. listing peak. Sample period 12/31/1980–12/31/2020. Data are from CRSP and SDC.

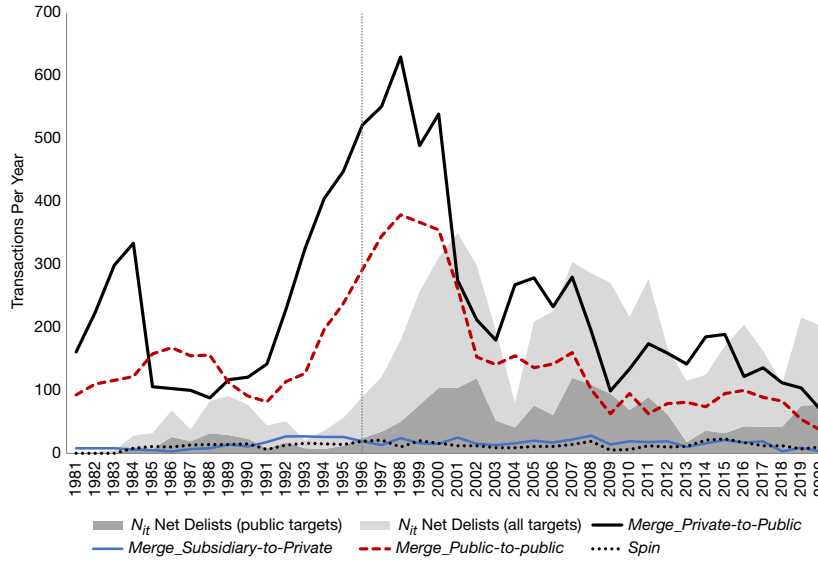


Figure 2 shows the large number of post-1996 merger transactions that qualify as drivers of the wedge between the actual and merger-adjusted U.S. listing counts L_t and $L_{A,t}$. Of these, the most numerous are $\text{MERGE}_{\text{Private-to-Public}}$ and $\text{MERGE}_{\text{Public-to-Public}}$. Also shown are the total outflows (net of relistings) from the acquisition index N_{it} when public firms leave the exchange. The dark-shaded area restricts N_{it} to public targets only, while the lighter-shaded area also includes private targets. As shown, N_{it} is substantial and, naturally, lags both $\text{MERGE}_{\text{Private-to-Public}}$ and $\text{MERGE}_{\text{Public-to-Public}}$.

While not part of the selection process for private targets, the resulting age since incorporation (birth) is also interesting. The year of incorporation is identified using data from Capital IQ as well as from the Field-Ritter data set of company founding dates, and is limited to U.S. targets.[7] On average, a private target of a public company is somewhat younger than the median listed firm in its industry and acquisition year, at a relative age ratio of 0.85.

It is also interesting to compare the ages of our private-to-public targets to IPOs. As shown in the Supplementary Material, private targets are typically about 50% older than IPOs with a median (average) age of 12 (23) years versus 8 (16) years for IPOs, respectively. Also, IPO firms tend to be older after the listing peak than before it, with the annual median listing age averaging 7 in years 1981–1996 and

[7]As used in Field and Karpoff (2002) and Loughran and Ritter (2004). Available at Jay Ritter's website: https://site.warrington.ufl.edu/ritter/ipo-data/. See also Ritter (2022).

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10 in years 1997–2020. This finding is also consistent with evidence from Gao et al. (2013), who show that firms undertaking IPOs have become larger since 2000. Notably, the age trend has been reversed since the peak of 15-year median IPO age in 2009, and is back to 7 years in 2020 – the same level as at the listing peak in 1996.

C. Merger-Adjusted Listing Dynamics

Is there a merger-adjusted U.S. listing peak? Using the above merger-adjustment procedure and selection of private-to-public targets, we are in a position to answer this question. Table 2 summarizes the total number of transactions driving the unadjusted (L_t) and full merger-adjusted ($L_{A,t}$) listing counts over both the total sample period and the post-peak period (1996–2020), with the annual counts of the different transaction types tabulated in Tables A1 and A2.

Focusing first on the actual listing series in Table 2, over the 1980–2020 period, the values of NEWLISTS and DELISTS sum to 17,837 and 18,919, respectively, for a net decline ΔL(1980–2020) of −1,083 listed firms. This net decline is the result of the 10,567 IPOs (59% of NEWLISTS) and the 6,792 miscellaneous additional new listings being offset by 18,919 delistings. The delistings are due to 10,063 acquisitions of public targets (of which roughly two-thirds involve public acquirers) plus 8,856 other delistings, of which 7,063 or 70% are due to cause. Over the post-1996 period, NEWLISTS amounts to 7,004 and DELISTS to 10,696, which results in a much larger net decline ΔL(1996–2020) of −3,692 listed firms by 2020. This decline is primarily caused by a reduction in IPOs to 4,190 over the post-peak period, as well as the continued high merger activity involving public targets (3,734 public-to-public and 2,511 public-to-private transactions).[8]

Turning to the merger-adjusted series in Table 2, ΔL_A(1980–2020) totals 7,479 listed firms. This increase, which contrasts with the decline ΔL(1980–2020) of −1,083 companies, is the difference between NEWLISTS$_A$ (28,021 firms) and DELISTS$_A$ (20,542 firms). For NEWLISTS$_A$, the main addition comes from 9,481 private-to-public mergers – amounting to as much as 90% of the number of IPOs. In the post-1996 period, the merger adjustment almost entirely eliminates the 1996 listing peak: ΔL_A (1996–2020) amounts to −84 firms only. In other words, while the actual listing in 2020 is down by 50% from the 1996 level, the adjusted count is down by less than 1%.

Figure 3 illustrates the actual listing count (the lowest curve) and the full merger-adjusted listing count (the top curve), annually from 1980 to 2020. It also adds a third series: the public-to-public merger-adjusted count (the middle dashed curve). This series singles out the effect of public target transactions on the listing dynamics. This involves adjusting equation (3) by excluding $\text{MERGE}_{\text{Private-to-Public}}$ from the new lists and $\text{DIVEST}_{\text{Subsidiary-to-Private}}$ from the delists, and using the acquisition index N_{it} to track public targets only. The purpose of this separation is to highlight the impact of mergers between listed firms alone, without involving

[8]As much as 28% of NEWLISTS are uplists from minor exchanges and over-the-counter (OTC) markets. Also, of the public-to-private transactions where the acquirer is a U.S. private firm, leveraged buyouts account for roughly one-third of the transactions, 1980–2020. For surveys of LBO activity, see, for example, Eckbo and Thorburn (2013) and Eckbo, Phillips, and Sorensen (2023).

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TABLE 2

Summary of Actual and Merger-Adjusted Changes in the U.S. Listing Count (1980–2020)

Table 2 presents the actual and merger-adjusted listing counts, L_t and $L_{A,t}$, which are defined in Table 1 and equations (1)–(4) in the text. The listing changes, ΔL_τ and $\Delta L_{A,\tau}$, cover the sample period indicated by the headings. IPO counts initial public offerings, SPIN counts spinoffs, $MISC_{New}$ counts miscellaneous new listings, and $MISC_{Del}$ counts miscellaneous delists. The subscript in MERGE indicates the direction of the change in the target's public/private status: In $MERGE_{Public\text{-}to\text{-}Public}$ and $MERGE_{Public\text{-}to\text{-}Private}$, a public target merges with a public or a private acquirer, respectively, while a private target merges with a public acquirer in $MERGE_{Private\text{-}to\text{-}Public}$. In Panel B, the acquisition index N_{it} tracks all public and private targets. The annual distribution of all variables in this table is found in Table A1 for Panel A and Table A2 for Panel B.

Panel A. Changes in the Actual Listing Count L

Panel A1. Total Sample Period: 12/31/1980–12/31/2020

$$\Delta L = -1{,}083 \begin{cases} 17{,}837\,\text{NEWLISTS} = 10{,}587\,\text{IPO} + 458\,\text{SPIN} + 6{,}792\,\text{MISC}_{\text{New}} \\ 18{,}919\,\text{DELISTS} = 6{,}144\,\text{MERGE}_{\text{Public-to-Public}} + 3{,}919\,\text{MERGE}_{\text{Public-to-Private}} + 8{,}856\,\text{MISC}_{\text{Del}} \end{cases}$$

Panel A2. Post-Peak Period: 12/31/1996–12/31/2020

$$\Delta L = -3{,}692 \begin{cases} 7{,}004\,\text{NEWLISTS} = 4{,}190\,\text{IPO} + 293\,\text{Spin} + 2{,}521\,\text{MISC}_{\text{New}} \\ 10{,}696\,\text{DELISTS} = 3{,}734\,\text{MERGE}_{\text{Public-to-Public}} + 2{,}511\,\text{MERGE}_{\text{Public-to-Private}} + 4{,}451\,\text{MISC}_{\text{Del}} \end{cases}$$

Panel B. Changes in the Merger-Adjusted Listing Count L_A

Panel B1. Total Sample Period: 12/31/1980–12/31/2020

$$\Delta L_A = +7{,}479 \begin{cases} 28{,}021\,\text{NEWLISTS}_A = 10{,}587\,\text{IPO} + 9{,}481\,\text{MERGE}_{\text{Private-to-Public}} + 7{,}953\,\text{MISC}^N_{\text{New}} \\ 20{,}542\,\text{DELISTS}_A = 7{,}900\,\text{MERGE}^N_{\text{Public-to-Private}} + 613\,\text{DIVEST}_{\text{Subsidiary-to-Private}} + 12{,}029\,\text{MISC}^N_{\text{Del}} \end{cases}$$

Panel B2. Post-Peak Period: 12/31/1996–12/31/2020

$$\Delta L_A = -84 \begin{cases} 13{,}369\,\text{NEWLISTS}_A = 4{,}190\,\text{IPO} + 5{,}756\,\text{MERGE}_{\text{Private-to-Public}} + 3{,}423\,\text{MISC}^N_{\text{New}} \\ 13{,}453\,\text{DELISTS}_A = 5{,}955\,\text{MERGE}^N_{\text{Public-to-Private}} + 392\,\text{DIVEST}_{\text{Subsidiary-to-Private}} + 7{,}106\,\text{MISC}^N_{\text{Del}} \end{cases}$$

private targets. Doing so allows us to separately assess the effects of merger activity within public markets (retentive reallocation of firms) versus acquisitions that bring new firms into public markets (attraction of firms) on the listing dynamics. Moreover, the public-to-public merger adjustment also does not require defining a "listable" size threshold as for private targets and is less likely to be affected by any underreporting of M&A transactions in our data (see Section III.D for further discussion).

As Figure 3 shows, the elimination of the listing peak caused by the merger adjustment has two main components. First, the public-to-public merger-adjusted curve shows that backfilling targets in 3,734 public-to-public mergers after 1996 (while only tracking public targets in N_{it}), restores as much as two-thirds of the post-peak decline. Second, the remaining third comes from the inflows of private targets net of subsidiary divestitures (with N_{it} including private targets as well).

Yet another perspective on the magnitude of the merger adjustment is seen by inspecting year 2020 in Figure 3 (and enumerated in Tables A1 and A2). In 2020, the total merger-adjusted listing count is 12,195, while the actual count is 3,633. The difference of 8,562 firms are targets of public acquirers that operate under the ownership of their respective acquirers. Of these targets, about half were publicly traded before the merger. While all of these 8,519 firms have de facto entered into or remained under public ownership through the merger channel, none are included in the actual listing count.

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FIGURE 3

Actual and Merger-Adjusted U.S. Listing Counts (1980–2020)

Figure 3 plots the annual levels of the actual (L_t) and merger-adjusted ($L_{A,t}$) listing counts aggregated across the three major U.S. stock exchanges (NYSE, AMEX, and Nasdaq). As explained in Table 1 and equations (1)–(4) in the text, beginning the count at year-end 1980 (the base year for the U.S.-specific analysis), the actual and merger-adjusted listing series in year t are constructed as follows:

$$L_t = L_{1980} + \sum_{\tau=1981}^{t} \Delta L_\tau$$

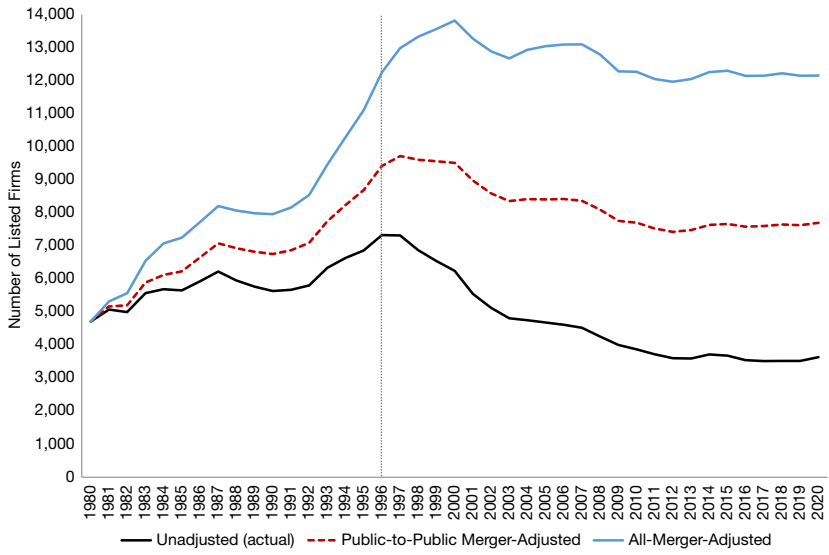
$$L_{A,t} = L_{1980} + \sum_{\tau=1981}^{t} \Delta L_{A,\tau},$$

where ΔL_τ and $\Delta L_{A,\tau}$ are the annual changes in the two listing counts, respectively, as follows:

$$\Delta L_\tau = \begin{cases} \text{NEWLISTS}_\tau(+): \ \text{IPO}_\tau + \text{SPIN}_\tau + \text{MISC}_{\text{New},\tau} \\ \text{DELISTS}_\tau(-): \ \text{MERGE}_{\text{Public-to-Public},\tau} + \text{MERGE}_{\text{Public-to-Private}_\tau} + \text{MISC}_{\text{Del},\tau} \end{cases}$$

$$\Delta L_{A,\tau} = \begin{cases} \text{NEWLISTS}_{A,\tau}(+): \ \text{IPO}_\tau + \text{MERGE}_{\text{Private-to-Public},\tau} + \text{MISC}^N_{\text{New},\tau} \\ \text{DELISTS}_{A,\tau}(-): \ \text{MERGE}^N_{\text{Public-to-Private},\tau} + \text{DIVEST}_{\text{Subsidiary-to-Private},\tau} + \text{MISC}^N_{\text{Del},\tau} \end{cases}.$$

Each of the components in NEWLISTS and DELISTS cumulates all the respective transactions over year τ. The superscript N refers to the acquisition tracking index N_{it} in equation (4). The lowest curve in the figure is the actual annual listing count: L_t, while the 2 top curves plot the merger-adjusted listing count $L_{A,t}$. In the dotted curve in the middle, $L_{A,t}$ adjusts for U.S. public targets only, while the top curve also adjusts for private targets (all foreign targets are counted as private, whether or not they are publicly traded in a foreign market). Data are from CRSP and SDC.



In sum, while the actual listing count is a useful metric for examining changes in the size of stand-alone listed companies, it substantially underestimates the actual number of firms that flow into and are retained by public acquirers.

D. Transaction Values of Inflows and Outflows

While the merger adjustment is primarily used to adjust firm counts, it also has other informative applications. In particular, by isolating transactions that result in inflows or outflows of firms from public markets, it also becomes possible to track corresponding firm value flows, which cannot be inferred from changes in aggregate market capitalization alone.

FIGURE 4

Inflows and Outflows of Firm Value Classified by (De)listing Channel

Figure 4 shows the annual values of firm inflows (merger-adjusted new lists) and outflows (merger-adjusted delists) in U.S. public markets from 12/31/1980 to 12/31/2020. As explained by Table 1 and equations (1)–(4) in the text, the transactions underlying the merger-adjusted listing count are the following:

$$\Delta V_A = \begin{cases} \text{NEWLISTS}_A: & \text{IPO} + \text{MERGE}_{\text{Private-to-Public}} + \text{MISC}_{\text{New}} \\ \text{DELISTS}_A: & \text{MERGE}_{\text{Public-to-Private}} + \text{DIVEST}_{\text{Subsidiary-to-Private}} + \text{MISC}_{\text{Del}} \end{cases}.$$

The bars and the right axis show annual values for each channel in 2020 USD billion of transactions causing inflows and outflows into and out of U.S. public markets, while the left axis and solid line show the cumulative net new listing value in 2020 USD trillion ($V_{A,t}$). The new lists and delists in Table 1 that have an effect on the actual, but not merger-adjusted, listing count are not included. Data from CRSP and SDC.

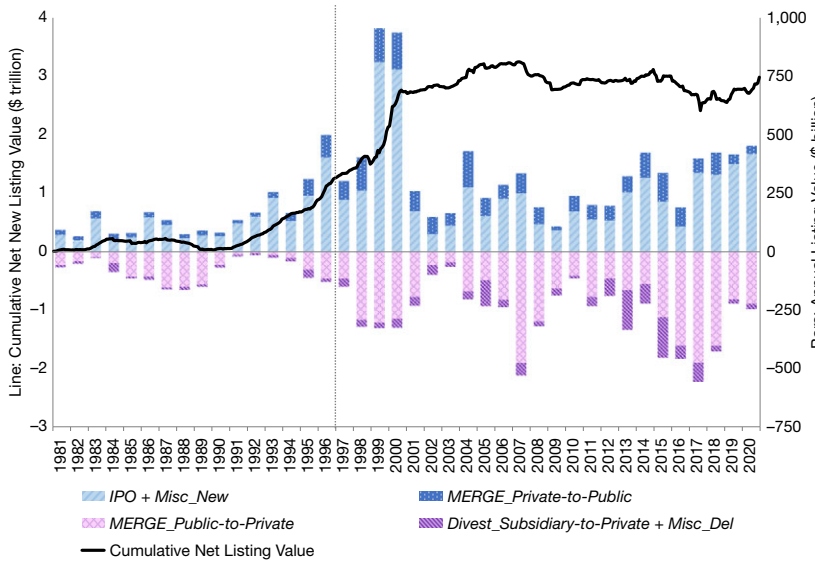


Figure 4 shows the contribution of each of the listing-change channels in terms of annual transaction value (inflation-adjusted to 2020). Let $V_{A,t}$ denote the net inflow (inflow minus outflow) in year t. Since the market value of a public firm that delists directly accounts for any *value*-implications of the firm's acquisition history, $V_{A,t}$ is constructed using $\text{MERGE}_{\text{Public-to-Private}}$ and not $\text{MERGE}^{N}_{\text{Public-to-Private}}$ (there is no need to track N). Over the period of 1980 to 2020, total inflow amounts to $\text{NEWLISTS}_A = 11.1$ trillion, while total outflow is $\text{DELISTS}_A = 8.2$ trillion. The difference of $2.9 trillion is also shown in the left-side vertical axis for the solid curve in Figure 4. Notably, $1.2 trillion of the net inflow is added between 1980 and 1996 and the remaining $1.7 trillion is added *after* the listing peak, which is also consistent with the lack of a merger-adjusted listing peak.

While we noted above that the number of private-to-public acquisitions is as much as 90% of the number of IPOs, switching to dollar values changes this picture because the average private-to-public target is smaller than the average IPO firm. In terms of dollar values, $\text{MERGE}_{\text{Private-to-Public}}$ constitutes 28% of $\text{IPO} + \text{MERGE}_{\text{Private-to-Public}}$ ($2.5/8.7 trillion). Also interesting, on the delist side, $\text{MERGE}_{\text{Public-to-Private}}$ accounts for as much as 80% ($6.6/8.2 trillion) of the total transaction value of delisting outflows. Moreover, while not shown, the value of

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$MERGE_{Public\text{-}to\text{-}Public}$ (which reflects the reshuffling of assets already on the exchange) is 1.6 times that of $MERGE_{Public\text{-}to\text{-}Private}$ ($10.7 trillion vs. $6.6 trillion).

Beyond the substantial ($10.7 trillion) transaction value of public-to-public mergers, it is also interesting to note that the $2.9 trillion net transaction-value inflow shown in Figure 4 represents no more than 8% of the total market-value increase of $34.9 trillion on NYSE, AMEX, and Nasdaq from 1980 to 2020 (computed using CRSP, not shown in the figure). This means that as much as 92% of the total market-value increase during this period is generated on the stock exchange: a combination of organic growth (internal investments and revaluation of assets in place) and synergies generated by public-to-public merger activity. To our knowledge, this evidence is also new to the literature—made possible by our measurement of the complete anatomy of transactions causing listing changes.[9]

Having studied the full anatomy of the actual and merger-adjusted U.S. listing changes using detailed data from CRSP and SDC, we next turn an international comparison of listing dynamics.

III. Is There a Merger-Adjusted U.S. Listing Gap?

As shown by Doidge et al. (2017), the actual U.S. listing count has developed a listing gap relative to an international listing trend line estimated from 1990. In this section, we revisit their listing gap estimation using our merger-adjusted listing series, with 1990 as the base (comparison) year for all countries. Our evidence above suggests that inferences about a relative U.S. listing gap may well differ when adjusted for merger activity. To address this issue, we replace the actual listing count for all countries with our merger-adjusted count as the dependent variable in the listing gap estimation. Rather than correlate aggregate merger activity with the actual listing dynamics, this replacement allows us to draw direct inferences about the impact of merger activity. We first describe the econometric specification of our listing-gap regression, and then present the gap-parameter estimates.

A. Country Selection and Data Sources

As detailed in Appendix A.3, we start the country selection process with the 100 countries and territories with highest GDP as of 2020 per the IMF. Of these 100, 26 are excluded due to insufficient data, leaving a final sample of 74 countries. Using the IMF's classification, 33 of these 74 countries are advanced economies, representing 59% of global GDP. The remaining 41 countries are classified as developing and emerging economies, and represent 37% of world GDP.

The non-U.S. listing counts are identified from the World Bank's World Development Indicators (WDI), World Federation of Exchanges (WFE), ISI Emerging Market Group's CEIC database (CEIC), and individual stock exchange homepages. We count the number of listings on a country's major stock exchanges and only count cross-listed firms once (in the country where they are incorporated).

[9] In the Supplementary Material, we break down net listing value inflows by industry. We find that the net firm value inflow over the total sample period of 1981 to 2020 is largest in the high-tech industries. Moreover, roughly half of the net high-tech inflow occurs in business services and electronics, while the industry with the largest net outflow is chemicals and allied products (mostly pharmaceuticals).

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Finally, we identify public-to-public and private-to-public (including cross-border) mergers for each country using SDC. To maximize SDC's data coverage of international mergers, we limit the sample to 1990–2020 when applying our merger adjustment.

While the above data sources track a country's aggregate listing count and the number of mergers, it does not provide information on the identity of each listed company. Hence, when a foreign listing count decreases by 1 for reasons other than a public-to-public acquisition, that country's merger-adjusted listing count is also lowered by 1 ($N_{it}=0$), while it is lowered by $1+N_{it}\geq 1$ when a U.S. listed firm exits. By setting $N_{it}=0$ across foreign stock markets, we overstate foreign merger-adjusted listing counts in the comparison with the U.S. below. We later illustrate the magnitude of this difference, which implies a relative U.S. listing penalty, Section III.D when discussing the robustness of our results.

B. Econometric Listing-Gap Specification

The U.S. listing gap in year t is defined as the difference between two conditional expected listing counts. The first difference is the expected number of U.S. listings in year t relative to the base year 1990. Let D_{US} denote a dummy variable with a value of 1 if the country is the U.S., and 0 otherwise. The first difference is then

$$E(Y_{it}|D_{\text{US}}=1,\text{year}=t)-E(Y_{it}|D_{\text{US}}=1,\text{year}=1990). \tag{5}$$

The second difference is between the expected number of listings in a non-U.S. country in year t and that in 1990:

$$E(Y_{it}|D_{\text{US}}=0,\text{year}=t)-E(Y_{it}|D_{\text{US}}=0,\text{year}=1990). \tag{6}$$

We estimate the listing gap parameter (the two differences in conditional means) across a total of 30 years and N countries using the following panel regression:

$$\begin{aligned}\ln(Y_{it})=\alpha+\delta_i+\tau_t+\beta D_{\text{US}}+\Gamma(D_{\text{US}}\times\tau_t)+\lambda X_{it}\\ +\varepsilon_{it},t=1990,..,2020,i=1,..,N.\end{aligned} \tag{7}$$

The dependent variable Y_{it} is country i's listing count (L) per capita (POP) or per GDP in year t, and δ_i and τ_t are country and year fixed effects, respectively. X_{it} is a vector of three country-specific control variables: country i's anti-self-dealing index (Djankov, Porta, Lopez-de-Silanes, and Shleifer (2008)), log(GDP/Pop), and annual GDP growth.

Hence, ignoring the country-specific parameters λ_i and δ_i (since these cancel out in the difference below), the gap-parameter in year t is:

$$\begin{aligned}&\{E(Y_{it}|D_{\text{US}}=1,\text{year}=t)-E(Y_{it}|D_{\text{US}}=1,\text{year}=1990)\}-\\ &\{E(Y_{it}|D_{\text{US}}=0,\text{year}=t)-E(Y_{it}|D_{\text{US}}=0,\text{year}=1990)\}\\ &\qquad=\{(\alpha+\tau_t+\beta+\gamma_t)-(\alpha+\beta)\}-\{(\alpha+\tau_t)-\alpha\}\\ &\qquad=\gamma_t,\end{aligned} \tag{8}$$

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where γ_t – the annual parameter in the vector Γ – captures the U.S.-specific residual in year t. Since the dependent variable in equation (7) is a logarithm, γ_t represents the proportional difference in the scaled U.S. listing count in year t relative 1990 (the base year) from the value predicted based on the international sample of countries.

For a given γ_t, we then compute the U.S. listing gap in year t (expressed as the number of firms) as follows:

$$(9)\quad \text{US gap, year } t: \begin{cases} Y_{\text{US},1990} \times \text{POP}_{\text{US},t} \times (e^{\gamma_t} - 1) & \text{for } L \text{ scaled by population} \\ Y_{\text{US},1990} \times \text{GDP}_{\text{US},t} \times (e^{\gamma_t} - 1) & \text{for } L \text{ scaled by GDP} \end{cases}.$$

In other words, computing the U.S. listing gap for year t in terms of the total number of firms involves multiplying three items: the U.S. listing count per capita or GDP in 1990, the corresponding population or GDP scaling variable in year t, and the antilogarithm of γ_t minus 1.[10]

To clearly show the marginal impact of our novel listing count adjustment, we fix the right-hand-side of equation (7) and gradually develop the following three listing gap measures:

$$(10)\quad \text{Gap} \begin{cases} \text{G1}: & Y_{it} \text{ is unadjusted (the actual listing gap).} \\ \text{G2}: & Y_{it} \text{ is public-to-public merger-adjusted only;} \\ & N_{it} = 0 \text{ for non-U.S.countries} \\ \text{G3}: & Y_{it} \text{ is merger-adjusted, with } N_{it} = 0 \text{ for non-U.S.countries.} \end{cases}$$

In G1, the numerator of the dependent variable Y_{it} is the actual (unadjusted) listing count for all countries. For the U.S., G2 adjusts the actual listing count for public-to-public mergers and spinoffs and, therefore, the acquisition index N_{it} tracks public targets only. Moreover, for the U.S., G3 fully tracks inflows and outflows of all firms—both public and private—to and from U.S. public markets using the full equation (3) and an acquisition index N_{it} in equation (4) that tracks both public and private targets.

C. U.S. Listing Gap Estimates

Figure 5 plots the annual U.S. listing gap estimates for all three gap definitions G1–G3 in equation (10) using the full set of 74 countries. A complete set of annual coefficient estimates for the gaps, each with four different regression specifications, is listed in Table 3. In the discussion below, we primarily focus on the regression specification with the listing count scaled by population and including country fixed effects (columns 2, 6, and 10). Table 3 also reports three alternative regression specifications: i) the dependent variable scaled by population and without country-fixed effects, ii) the dependent variable scaled by GDP and with country-fixed effects, and iii) the dependent variable scaled by GDP but without country fixed effects (the GDP-based listing gap estimates with country fixed effects are graphically illustrated in the Supplementary Material).

[10]Our econometric specification of the U.S. listing gap differs somewhat from that of Doidge et al. (2017). We provide a detailed explanation of the econometric differences in Appendix B.

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FIGURE 5

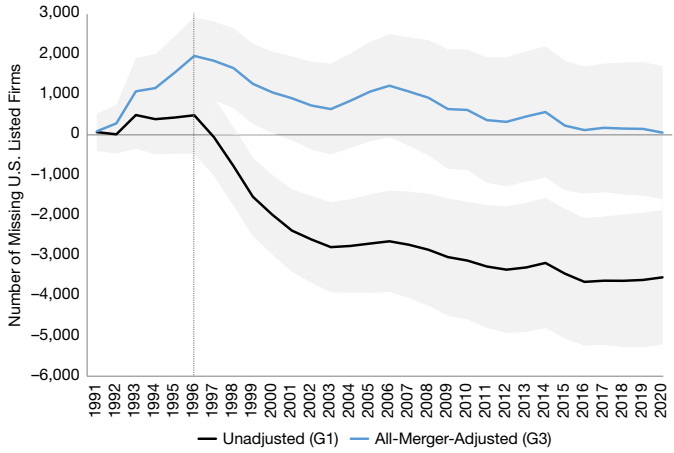
Population-Scaled Unadjusted and Merger-Adjusted U.S. Listing Gaps

Figure 5 shows the unadjusted (G1, black line) and two merger-adjusted U.S. listing gaps, estimated as follows:

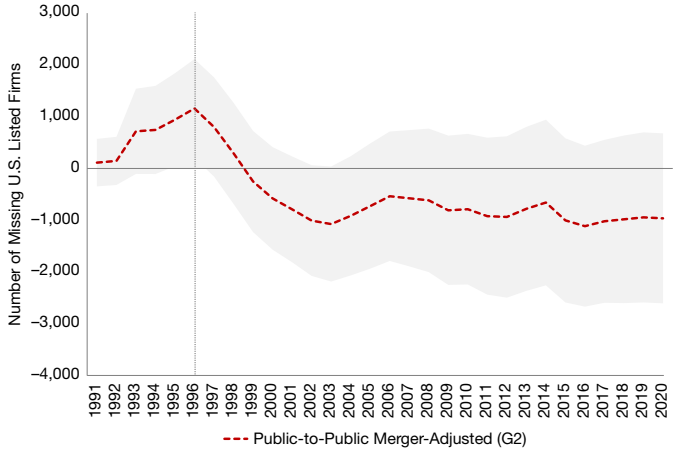
$$\ln(L/\text{POP}_{it}) = \alpha + \delta_i + \tau_t + \beta D_{\text{US}} + \Gamma(D_{\text{US}} \times \tau_t) + \lambda X_{it} + \varepsilon_{it}, t = 1990, .., 2020, i = 1, .., N.$$

$\ln(L/\text{POP}_{it})$ is the natural logarithm of the unadjusted or merger-adjusted listing count of country i in year t, scaled per capita and specified as follows. The merger adjustment is explained in Table 1 and equations (1)–(4). In Graph A, the listing count is adjusted by adding 1 to the listing count for each public- and minimum-sized private-to-public merger (G3, blue line). In Graph B, the listing count is adjusted by adding back 1 for each domestic public-to-public merger (G2, broken red line). Additionally, the U.S. merger-adjusted listing series tracks net firm outflows via the acquisition index N_{it}, as well as spinoffs and subsidiary divestitures. Listing gaps G1, G2, and G3 are defined in equation (10). δ_i and τ_t are country and year fixed effects, respectively. D_{US} is a dummy variable that takes a value of 1 if country i is the U.S., and 0 otherwise, and X_{it} is a vector of three country-specific control variables: country i's anti-self-dealing index, log(GDP/capita), and GDP growth. Standard errors are clustered at the country level. The U.S. listing gap in year t is computed as $L/\text{POP}_{\text{US},1990} \times \text{GDP}_{\text{US},t} \times (e^{\gamma_t} - 1)$, where γ_t is the annual parameter in the vector Γ. The sample consists of 74 countries and covers 1990–2020. U.S. listing data are from CRSP, non-U.S. listing data are from WDI, WFE, CEIC, and exchange homepages, and merger data are from SDC. The vertical dotted line indicates the year of the U.S. listing peak. The shaded gray area displays 90% confidence intervals.

Graph A. Unadjusted and Merger-Adjusted Listing Gaps (G1, G3)



Graph B. Public-to-Public Merger-Adjusted Listing Gap (G2)



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TABLE 3

Estimates of U.S. Unadjusted and Merger-Adjusted Listing Gaps, All Countries (1990–2020)

Table 3 reports coefficient estimates from the following regression specification:

$$\ln(Y_{it}) = \alpha + \delta_i + \tau_t + \beta D_{US} + \Gamma(D_{US} \times \tau_t) + \lambda X_{it} + \varepsilon_{it}, t = 1990, .., 2020, i = 1, .., N,$$

where the dependent variable for country i in year t (Y_{it}) varies by column: actual listing count (G1) per capita (1–2) or per GDP (3–4), public-to-public merger-adjusted listing count (G2) per capita (5–6) or per GDP (7–8), or all-merger-adjusted listing count (G3) per capita (9–10) or per GDP (11–12). G1, G2, and G3 are defined in equation (10). δ_i and τ_t are country and year-fixed effects, respectively. Country-fixed effects are only included in even-numbered columns below. D_{US} is a dummy variable taking a value of 1 if the country is the U.S., and 0 otherwise, and X_{it} is a set of country-specific control variables (anti-self-dealing index, log(GDP/capita) and GDP growth) in year t. For each year t after 1990, the size of the U.S. listing gap is computed as $Y_{US,1990} \times POP_{US,t} \times (e^{\gamma_t} - 1)$ or $Y_{US,1990} \times GDP_{US,t} \times (e^{\gamma_t} - 1)$ (depending on the Y_{it} scaling variable), where γ_t is the annual parameter in the vector Γ. The regressions are run on the full sample of 74 countries. U.S. listing count data are from CRSP, foreign listing count data are from WDI, WFE, CEIC, and exchange homepages, and merger data are from SDC. The merger-adjusted listing count is defined in Table 1 and equations (1)–(4) in the text. A constant is included but not shown. Parentheses display country-clustered standard errors. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Y_{it}: Unadjusted Listing Count (G1)				Y_{it}: Public-to-Public Merger-Adjusted Listing Count (G2)				Y_{it}: All-Merger-Adjusted Listing Count (G3)			
	Per Capita		Per GDP		Per Capita		Per GDP		Per Capita		Per GDP	
Regressors	1	2	3	4	5	6	7	8	9	10	11	12
ANTI_SELF_DEAL_INDEX	1.375***		1.180**		1.425***		1.242**		1.489***		1.340***	
	(0.479)		(0.510)		(0.472)		(0.501)		(0.454)		(0.472)	
ln(GDP/POP)	0.634***	0.299**			0.652***	0.282**			0.717***	0.146		
	(0.085)	(0.135)			(0.084)	(0.135)			(0.084)	(0.143)		
GDP_GROWTH	−0.003	−0.001	0.004	−0.004***	−0.004	−0.001	0.003	−0.004***	−0.005	0.000	0.000	−0.004***
	(0.003)	(0.001)	(0.004)	(0.001)	(0.003)	(0.001)	(0.004)	(0.001)	(0.003)	(0.001)	(0.004)	(0.001)
US_DUMMY	−0.401**		−0.695***		−0.434**		−0.712***		−0.533***		−0.758***	
	(0.181)		(0.187)		(0.179)		(0.185)		(0.173)		(0.179)	
US_1991_DUMMY	0.043	0.012	−0.027	0.074	0.059	0.019	−0.009	0.083	0.084	0.015	0.029	0.091
	(0.054)	(0.050)	(0.060)	(0.060)	(0.053)	(0.048)	(0.058)	(0.059)	(0.051)	(0.046)	(0.055)	(0.057)
US_1992_DUMMY	0.068	0.002	0.009	0.060	0.098*	0.025	0.042	0.084*	0.151***	0.047	0.105*	0.118**
	(0.058)	(0.049)	(0.062)	(0.050)	(0.057)	(0.048)	(0.061)	(0.049)	(0.056)	(0.048)	(0.059)	(0.050)
US_1993_DUMMY	0.162*	0.080	0.010	0.118	0.209**	0.114	0.061	0.154*	0.297***	0.168*	0.177*	0.215***
	(0.092)	(0.085)	(0.107)	(0.079)	(0.092)	(0.084)	(0.105)	(0.079)	(0.090)	(0.084)	(0.099)	(0.079)
US_1994_DUMMY	0.034	0.063	−0.143	0.072	0.103	0.117	−0.074	0.129	0.196**	0.177**	0.052	0.191**
	(0.099)	(0.088)	(0.116)	(0.091)	(0.096)	(0.086)	(0.115)	(0.090)	(0.097)	(0.086)	(0.114)	(0.092)
US_1995_DUMMY	0.069	0.069	−0.035	0.127	0.151	0.144	0.052	0.205**	0.274***	0.228**	0.193*	0.299***
	(0.097)	(0.091)	(0.111)	(0.092)	(0.098)	(0.090)	(0.111)	(0.092)	(0.100)	(0.090)	(0.112)	(0.095)

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TABLE 3 (continued)

Estimates of U.S. Unadjusted and Merger-Adjusted Listing Gaps, All Countries (1990–2020)

	Y_{it}: Unadjusted Listing Count (G1)				Y_{it}: Public-to-Public Merger-Adjusted Listing Count (G2)				Y_{it}: All-Merger-Adjusted Listing Count (G3)			
	Per Capita		Per GDP		Per Capita		Per GDP		Per Capita		Per GDP	
Regressors	1	2	3	4	5	6	7	8	9	10	11	12
US_1996_DUMMY	0.182	0.076	−0.008	0.144	0.296**	0.173*	0.113	0.243**	0.457***	0.278***	0.308**	0.361***
	(0.116)	(0.095)	(0.136)	(0.094)	(0.117)	(0.094)	(0.136)	(0.095)	(0.118)	(0.096)	(0.135)	(0.099)
US_1997_DUMMY	0.086	−0.009	−0.183	0.040	0.237*	0.122	−0.023	0.173*	0.432***	0.260***	0.222	0.321***
	(0.131)	(0.094)	(0.162)	(0.097)	(0.132)	(0.094)	(0.162)	(0.098)	(0.134)	(0.095)	(0.159)	(0.103)
US_1998_DUMMY	−0.047	−0.131	−0.364**	−0.151	0.150	0.046	−0.155	0.028	0.380***	0.235**	0.133	0.214*
	(0.135)	(0.095)	(0.163)	(0.105)	(0.136)	(0.094)	(0.163)	(0.106)	(0.139)	(0.096)	(0.162)	(0.111)
US_1999_DUMMY	−0.232*	−0.277***	−0.562***	−0.343***	0.027	−0.040	−0.303*	−0.115	0.273*	0.183*	0.005	0.093
	(0.138)	(0.093)	(0.168)	(0.106)	(0.142)	(0.093)	(0.169)	(0.107)	(0.146)	(0.095)	(0.167)	(0.113)
US_2000_DUMMY	−0.355**	−0.369***	−0.697***	−0.458***	−0.050	−0.093	−0.400**	−0.200*	0.208	0.153	−0.076	0.026
	(0.141)	(0.094)	(0.174)	(0.105)	(0.144)	(0.094)	(0.172)	(0.107)	(0.149)	(0.096)	(0.170)	(0.113)
US_2001_DUMMY	−0.502***	−0.456***	−0.844***	−0.576***	−0.147	−0.128	−0.494***	−0.264**	0.114	0.132	−0.167	−0.030
	(0.139)	(0.096)	(0.170)	(0.108)	(0.142)	(0.096)	(0.170)	(0.108)	(0.148)	(0.097)	(0.169)	(0.115)
US_2002_DUMMY	−0.556***	−0.504***	−0.851***	−0.639***	−0.198	−0.165*	−0.491***	−0.303***	0.067	0.107	−0.170	−0.057
	(0.131)	(0.100)	(0.152)	(0.109)	(0.132)	(0.099)	(0.152)	(0.109)	(0.138)	(0.101)	(0.152)	(0.115)
US_2003_DUMMY	−0.580***	−0.547***	−0.769***	−0.632***	−0.194	−0.176*	−0.387***	−0.265**	0.073	0.093	−0.084	−0.013
	(0.123)	(0.103)	(0.138)	(0.109)	(0.123)	(0.102)	(0.138)	(0.109)	(0.128)	(0.104)	(0.139)	(0.114)
US_2004_DUMMY	−0.485***	−0.532***	−0.676***	−0.549***	−0.116	−0.146	−0.300**	−0.164	0.170	0.120	0.021	0.098
	(0.127)	(0.105)	(0.146)	(0.110)	(0.128)	(0.105)	(0.146)	(0.111)	(0.134)	(0.107)	(0.147)	(0.116)
US_2005_DUMMY	−0.452***	−0.511***	−0.657***	−0.482***	−0.041	−0.113	−0.237	−0.081	0.258*	0.149	0.098	0.186
	(0.135)	(0.110)	(0.158)	(0.114)	(0.136)	(0.109)	(0.158)	(0.114)	(0.142)	(0.111)	(0.159)	(0.119)
US_2006_DUMMY	−0.421***	−0.491***	−0.595***	−0.423***	0.003	−0.081	−0.163	−0.008	0.295**	0.166	0.160	0.252**
	(0.137)	(0.112)	(0.159)	(0.116)	(0.139)	(0.112)	(0.159)	(0.116)	(0.146)	(0.114)	(0.162)	(0.123)
US_2007_DUMMY	−0.433***	−0.506***	−0.513***	−0.376***	0.001	−0.086	−0.075	0.051	0.290**	0.147	0.228	0.309**
	(0.136)	(0.117)	(0.151)	(0.119)	(0.137)	(0.116)	(0.152)	(0.119)	(0.143)	(0.119)	(0.155)	(0.125)
US_2008_DUMMY	−0.421***	−0.529***	−0.479***	−0.321***	0.037	−0.091	−0.020	0.127	0.334**	0.126	0.289*	0.385***
	(0.138)	(0.122)	(0.152)	(0.119)	(0.139)	(0.121)	(0.153)	(0.120)	(0.145)	(0.125)	(0.158)	(0.127)
US_2009_DUMMY	−0.429***	−0.569***	−0.620***	−0.351***	0.054	−0.116	−0.131	0.111	0.368**	0.096	0.217	0.365***
	(0.158)	(0.126)	(0.185)	(0.122)	(0.161)	(0.125)	(0.186)	(0.122)	(0.168)	(0.129)	(0.190)	(0.131)

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TABLE 3 (continued)

Estimates of U.S. Unadjusted and Merger-Adjusted Listing Gaps, All Countries (1990–2020)

	Y_{it}: Unadjusted Listing Count (G1)				Y_{it}: Public-to-Public Merger-Adjusted Listing Count (G2)				Y_{it}: All-Merger-Adjusted Listing Count (G3)			
	Per Capita		Per GDP		Per Capita		Per GDP		Per Capita		Per GDP	
Regressors	1	2	3	4	5	6	7	8	9	10	11	12
US_2010_DUMMY	−0.451***	−0.585***	−0.542***	−0.365***	0.041	−0.116	−0.047	0.111	0.334**	0.087	0.262	0.358***
	(0.144)	(0.126)	(0.164)	(0.123)	(0.145)	(0.125)	(0.165)	(0.124)	(0.153)	(0.129)	(0.169)	(0.132)
US_2011_DUMMY	−0.447***	−0.617***	−0.499***	−0.342***	0.055	−0.137	0.005	0.146	0.345**	0.053	0.305*	0.389***
	(0.144)	(0.130)	(0.162)	(0.126)	(0.146)	(0.130)	(0.163)	(0.126)	(0.152)	(0.133)	(0.167)	(0.135)
US_2012_DUMMY	−0.448***	−0.631***	−0.594***	−0.343***	0.073	−0.139	−0.068	0.158	0.373**	0.046	0.258	0.398***
	(0.158)	(0.134)	(0.187)	(0.128)	(0.160)	(0.132)	(0.188)	(0.129)	(0.168)	(0.136)	(0.192)	(0.138)
US_2013_DUMMY	−0.436***	−0.611***	−0.547***	−0.332**	0.088	−0.113	−0.020	0.175	0.370**	0.063	0.283	0.404***
	(0.155)	(0.135)	(0.177)	(0.131)	(0.156)	(0.134)	(0.179)	(0.131)	(0.164)	(0.136)	(0.183)	(0.139)
US_2014_DUMMY	−0.387**	−0.577***	−0.528***	−0.307**	0.094	−0.093	−0.046	0.186	0.372**	0.077	0.258	0.409***
	(0.156)	(0.136)	(0.180)	(0.131)	(0.162)	(0.134)	(0.187)	(0.131)	(0.170)	(0.137)	(0.191)	(0.140)
US_2015_DUMMY	−0.464***	−0.638***	−0.718***	−0.431***	0.029	−0.146	−0.222	0.069	0.306	0.032	0.102	0.287**
	(0.171)	(0.134)	(0.205)	(0.134)	(0.178)	(0.132)	(0.213)	(0.134)	(0.186)	(0.134)	(0.215)	(0.144)
US_2016_DUMMY	−0.567***	−0.686***	−0.760***	−0.527***	−0.028	−0.162	−0.215	0.002	0.224	0.017	0.072	0.212
	(0.152)	(0.131)	(0.174)	(0.133)	(0.160)	(0.128)	(0.183)	(0.134)	(0.169)	(0.130)	(0.188)	(0.143)
US_2017_DUMMY	−0.531***	−0.672***	−0.681***	−0.511***	−0.017	−0.147	−0.165	0.021	0.221	0.023	0.101	0.223
	(0.149)	(0.131)	(0.171)	(0.133)	(0.154)	(0.129)	(0.177)	(0.134)	(0.162)	(0.131)	(0.181)	(0.143)
US_2018_DUMMY	−0.511***	−0.667***	−0.674***	−0.495***	0.007	−0.140	−0.153	0.041	0.239	0.021	0.109	0.235
	(0.153)	(0.134)	(0.175)	(0.135)	(0.158)	(0.132)	(0.181)	(0.136)	(0.166)	(0.134)	(0.185)	(0.145)
US_2019_DUMMY	−0.530***	−0.657***	−0.742***	−0.493***	0.015	−0.133	−0.189	0.036	0.239	0.019	0.074	0.221
	(0.162)	(0.136)	(0.189)	(0.137)	(0.165)	(0.133)	(0.190)	(0.137)	(0.173)	(0.135)	(0.194)	(0.146)
US_2020_DUMMY	−0.506***	−0.636***	−0.706***	−0.497***	0.015	−0.135	−0.178	0.009	0.219	0.007	0.063	0.178
	(0.163)	(0.135)	(0.189)	(0.136)	(0.165)	(0.133)	(0.191)	(0.137)	(0.174)	(0.134)	(0.195)	(0.146)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
R^2	0.490	0.933	0.151	0.892	0.503	0.935	0.140	0.888	0.553	0.938	0.133	0.867
No. of obs.	1,775	2,057	1,775	2,057	1,791	2,079	1,791	2,079	1,791	2,079	1,791	2,079

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We begin with the U.S. unadjusted listing gap (G1), which is shown as the solid black line in Graph A of Figure 5. The gray shaded area is the 90% confidence interval around the annual gap estimates (with standard errors clustered by country). The coefficient estimates corresponding to the black line are shown in column 2 of Table 3, where $\ln(Y_{it})$ is natural logarithm of the actual listing count scaled by population and including country fixed effects. Using equation (9), the estimate of γ_t in column 2 of Table 3, and population data from the IMF, the estimated G1-gap in year 2020 is $Y_{\text{US},1990} \times \text{POP}_{\text{US},2020} \times (e^{\gamma_t} - 1) = 22.78 \times 330.01 \times (e^{-0.636} - 1) = -3{,}538$ listed companies. In 2012, which is the final sample year in Doidge et al. (2017), $G1 = Y_{\text{US},1990} \times \text{POP}_{\text{US},2012} \times (e^{\gamma_t} - 1) = 22.57 \times 314.12 \times (e^{-0.631} - 1) = -3{,}348$ listed companies.

Doidge et al. (2017) instead report a listing-gap estimate of −5,436 listed firms for 2012. In terms of the regression parameters in our equation (7), their regression specification is equivalent to using $\gamma_t + \tau_t$ to estimate the listing gap G1 (see Appendix B for proof). In other words, the difference between our G1-gap for 2012 of 2,088 listed firms and the larger number reported by Doidge et al. (2017) emerges primarily because we subtract out the common component (the time trend τ_t) in the listing dynamic before computing G1. By netting out the time trend in the panel estimation, our gap estimate is restricted to the portion of the international time trend that is unique to the U.S. As shown in the Supplementary Material, the time trend parameter estimates of τ_t become negative and statistically significant after 2009, hence causing the gap estimates in Doidge et al. (2017) to have larger negative values.

Graph A of Figure 5 also shows the full merger-adjusted listing gap (G3), which is again computed using our main regression specification, this time with the γ_t coefficient estimates shown in column 10 of Table 3. Adjusting for both public-to-public and private-to-public merger activity causes G3 to be positive and statistically significant in years 1993–1999, and insignificant in all sample years thereafter. In year 2020, the estimated G3-gap is $Y_{\text{US},1990} \times \text{POP}_{\text{US},2020} \times (e^{\gamma_t} - 1) = 22.78 \times 330.01 \times (e^{0.005} - 1) = +38$ listed companies (a statistically insignificant listing surplus). The absence of a listing gap 1991–2020 holds across the three alternative regression specifications for G3.

The broken line in Graph B of Figure 5 shows G2, the public-to-public merger-adjusted listing gap, from 1991 to 2020. This broken line is based on the γ_t coefficient estimates shown in column 6 of Table 3. Recall that, while all countries are adjusted for public-to-public mergers, the acquisition index N_{it} (which, in G2, accumulates public targets only) is applied exclusively to U.S.-listed firms when these firms leave the exchange, which lowers the merger-adjusted U.S. listing count relative to other countries. Nevertheless, the estimates of G2 are statistically insignificant at conventional levels in all sample years 1991–2020. In year 2020, the estimated G2-gap is $Y_{\text{US},1990} \times \text{POP}_{\text{US},2020} \times (e^{\gamma_t} - 1) = 22.78 \times 330.01 \times (e^{-0.138} - 1) = -966$ listed companies. Also important, G2 is statistically insignificant across almost all years of the three alternative regression specifications in columns 5, 7, and 8 of Table 3.

In sum, we have shown that the merger-adjusted listing gap is statistically insignificant for both gap definitions G2 and G3. Importantly, since a public-to-public merger does not rely on the supply of private equity capital, it is not necessary

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to appeal to the contemporaneous growth in private equity funding or decline in IPOs to explain the actual U.S. listing gap G1. Rather, our evidence is consistent with the notion that the extraordinary propensity of U.S. stock exchanges to effectuate large merger transactions between public companies is sufficient to explain G1. Since these transactions require a high level of capital market functionality in terms of contracting technology and legal protection of minority shareholders, they may provide U.S. listed firms with a comparative advantage in terms of realizing scale economies through external growth strategies.

D. Robustness Issues

In this section, we examine several robustness issues. The first is whether the statistical insignificance shown for the merger-adjusted listing gap (G2 and G3) also holds for the subsample of 28 advanced economies. Table 4 shows the parameter estimates restricted to this subsample. Note first that the unadjusted gap G1 is now somewhat larger in size and remains significant at the 1% level or higher. Moreover, the merger-adjusted gaps G2 and G3 are also larger (more negative) than for the full sample of 74 countries. Most important, G2 and G3 remain insignificantly different from zero in nearly all years up through 2020. In other words, the merger-adjusted U.S. listing gap is statistically insignificant also when measured relative to the subgroup of other advanced economies, which contain the most internationally competitive stock exchanges.

Second, we address SDC as a source of merger data, which may be more comprehensive for the U.S. than for some foreign exchanges. While not tabulated, we re-estimate equation (7) after artificially multiplying the annual number of public-to-public mergers outside of the U.S. The result of this experiment is that most estimates of G2 and G3 remain statistically insignificant even after *quintupling* non-U.S. public-to-public mergers. Furthermore, when we in addition nearly triple the foreign private-to-public acquisitions (which include cross-border mergers), the all-merger-adjusted gap G3 continues to be similarly insignificant. We conclude from this that our main finding of a statistically insignificant merger-adjusted U.S. listing gap is robust to any reasonable level of missing data on foreign mergers in SDC.

Third, as discussed above, since our data sources on the international listing counts do not track the names of the listed firms, we set the acquisition tracking index to zero ($N_{it} = 0$) for non-U.S. countries. It is worth pointing out that this differential treatment of N_{it} substantially penalizes the U.S. merger adjustment. Specifically, for U.S. listed firms that exit the stock exchange over the period of 1991 to 2020, the tracking index amounts to $\sum_{i=1}^{N}\sum_{t=1991}^{2020} N_{it} = 4{,}459$ additional delists.[11] With 1990 as base year, this penalty lowers the 2020 merger-adjusted U.S. listing count by as much as 42% (from 10,700 firms when $N_{it} = 0$ to 6,241 firms). Our finding of a statistically insignificant merger-adjusted listing gap withstands this U.S.-specific penalty.

[11]Breaking the total of 4,459 firms into public and private targets, respectively, this treatment effectively cancels out as much as 21% (1,286 of 6,144) of public-to-public mergers and 33% (3,173 of 9,481) of private-to-public mergers.

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TABLE 4

Estimates of U.S. Unadjusted and Merger-Adjusted Listing Gaps, Advanced Economies (1990–2020)

Table 4 reports coefficient estimates from the following regression specification:

$$\ln(Y_{it}) = \alpha + \delta_i + \tau_t + \beta D_{US} + \Gamma(D_{US} \times \tau_t) + \lambda X_{it} + \varepsilon_{it}, t = 1990, .., 2020, i = 1, .., N,$$

where the dependent variable for country i in year t (Y_{it}) varies by column: actual listing count (G1) per capita (1–2) or per GDP (3–4), public-to-public merger-adjusted listing count (G2) per capita (5–6) or per GDP (7–8), or all-merger-adjusted listing count (G3) per capita (9–10) or per GDP (11–12). G1, G2, and G3 are defined in equation (10). δ_i and τ_t are country and year-fixed effects, respectively. Country-fixed effects are only included in even-numbered columns below. D_{US} is a dummy variable taking a value of 1 if the country is the U.S., and 0 otherwise, and X_{it} is a set of country-specific control variables (anti-self-dealing index, log(GDP/capita), and GDP growth) in year t. For each year t after 1990, the size of the U.S. listing gap is computed as $Y_{US,1990} \times POP_{US,t} \times (e^{\gamma_t} - 1)$ or $Y_{US,1990} \times GDP_{US,t} \times (e^{\gamma_t} - 1)$ (depending on the Y_{it} scaling variable), where γ_t is the annual parameter in the vector Γ. The regressions are run on the subsample of 33 advanced economies. U.S. listing count data are from CRSP, foreign listing count data are from WDI, WFE, CEIC, and exchange homepages, and merger data are from SDC. The merger-adjusted listing counts are defined in Table 1 and equations (1)–(4) in the text. A constant is included but not shown. Parentheses display country-clustered standard errors. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Y_{it}: Unadjusted Listing Count (G1)				Y_{it}: Public-to-Public Merger-Adjusted Listing Count (G2)				Y_{it}: All-Merger-Adjusted Listing Count (G3)			
	Per Capita		Per GDP		Per Capita		Per GDP		Per Capita		Per GDP	
Regressors	1	2	3	4	5	6	7	8	9	10	11	12
ANTI_SELF_DEAL_INDEX	2.063***		1.997***		2.089***		2.024***		2.128***		2.089***	
	(0.549)		(0.561)		(0.534)		(0.549)		(0.484)		(0.497)	
ln(GDP/POP)	0.644**	−0.107			0.668**	−0.173			0.802***	−0.338*		
	(0.262)	(0.174)			(0.259)	(0.180)			(0.249)	(0.180)		
GDP_GROWTH	0.003	0.001	0.006	−0.002	0.002	0.002	0.005	−0.002	0.000	0.003*	0.002	−0.001
	(0.007)	(0.002)	(0.008)	(0.002)	(0.007)	(0.002)	(0.008)	(0.002)	(0.007)	(0.002)	(0.007)	(0.002)
US_DUMMY	−0.431**		−0.478**		−0.452**		−0.493**		−0.518**		−0.543***	
	(0.209)		(0.206)		(0.209)		(0.206)		(0.206)		(0.197)	
US_1991_DUMMY	−0.068	−0.073	−0.090	−0.010	−0.050	−0.072	−0.072	−0.005	−0.014	−0.079	−0.028	−0.003
	(0.086)	(0.046)	(0.091)	(0.039)	(0.085)	(0.046)	(0.092)	(0.039)	(0.080)	(0.048)	(0.086)	(0.041)
US_1992_DUMMY	−0.030	−0.051	−0.047	0.040	0.003	−0.038	−0.014	0.058	0.066	−0.027	0.056	0.083*
	(0.092)	(0.056)	(0.097)	(0.045)	(0.092)	(0.055)	(0.099)	(0.045)	(0.087)	(0.055)	(0.093)	(0.047)
US_1993_DUMMY	−0.072	−0.011	−0.153	0.017	−0.020	0.014	−0.099	0.043	0.081	0.053	0.034	0.087
	(0.167)	(0.068)	(0.180)	(0.068)	(0.166)	(0.068)	(0.183)	(0.069)	(0.154)	(0.068)	(0.170)	(0.076)
US_1994_DUMMY	−0.027	0.013	−0.084	0.005	0.038	0.063	−0.017	0.054	0.143	0.135	0.110	0.126
	(0.104)	(0.086)	(0.104)	(0.088)	(0.103)	(0.085)	(0.105)	(0.088)	(0.096)	(0.082)	(0.100)	(0.093)
US_1995_DUMMY	0.097	0.034	0.102	0.122	0.181**	0.105	0.185**	0.198**	0.314***	0.201**	0.316***	0.306***
	(0.081)	(0.087)	(0.081)	(0.092)	(0.081)	(0.086)	(0.081)	(0.094)	(0.081)	(0.084)	(0.083)	(0.098)

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TABLE 4 (continued)

Estimates of U.S. Unadjusted and Merger-Adjusted Listing Gaps, Advanced Economies (1990–2020)

	Y_{it}: Unadjusted Listing Count (G1)				Y_{it}: Public-to-Public Merger-Adjusted Listing Count (G2)				Y_{it}: All-Merger-Adjusted Listing Count (G3)			
	Per Capita		Per GDP		Per Capita		Per GDP		Per Capita		Per GDP	
Regressors	1	2	3	4	5	6	7	8	9	10	11	12
US_1996_DUMMY	0.056	−0.028	−0.028	0.019	0.172	0.058	0.091	0.108	0.334**	0.159	0.286	0.216
	(0.149)	(0.101)	(0.182)	(0.120)	(0.150)	(0.101)	(0.185)	(0.123)	(0.150)	(0.101)	(0.179)	(0.135)
US_1997_DUMMY	−0.060	−0.084	−0.199	−0.107	0.094	0.036	−0.040	0.011	0.286	0.167	0.206	0.138
	(0.214)	(0.104)	(0.247)	(0.126)	(0.215)	(0.104)	(0.252)	(0.130)	(0.209)	(0.107)	(0.243)	(0.144)
US_1998_DUMMY	−0.214	−0.200*	−0.368	−0.296**	−0.017	−0.026	−0.163	−0.129	0.199	0.155	0.112	0.038
	(0.197)	(0.099)	(0.230)	(0.123)	(0.199)	(0.099)	(0.235)	(0.126)	(0.197)	(0.105)	(0.229)	(0.139)
US_1999_DUMMY	−0.346*	−0.302***	−0.519**	−0.476***	−0.112	−0.083	−0.276	−0.268**	0.106	0.126	0.008	−0.086
	(0.188)	(0.100)	(0.231)	(0.124)	(0.189)	(0.100)	(0.235)	(0.127)	(0.187)	(0.106)	(0.226)	(0.141)
US_2000_DUMMY	−0.521**	−0.411***	−0.733***	−0.654***	−0.247	−0.152	−0.448*	−0.410***	−0.023	0.072	−0.143	−0.222
	(0.222)	(0.104)	(0.257)	(0.117)	(0.223)	(0.103)	(0.263)	(0.119)	(0.218)	(0.110)	(0.255)	(0.136)
US_2001_DUMMY	−0.643***	−0.517***	−0.850***	−0.800***	−0.325	−0.205*	−0.521**	−0.505***	−0.111	0.031	−0.228	−0.311**
	(0.194)	(0.110)	(0.228)	(0.117)	(0.195)	(0.109)	(0.232)	(0.117)	(0.194)	(0.114)	(0.228)	(0.129)
US_2002_DUMMY	−0.645***	−0.572***	−0.801***	−0.812***	−0.307**	−0.232*	−0.454**	−0.486***	−0.096	0.012	−0.184	−0.277**
	(0.141)	(0.116)	(0.180)	(0.121)	(0.143)	(0.115)	(0.182)	(0.121)	(0.151)	(0.117)	(0.181)	(0.129)
US_2003_DUMMY	−0.589***	−0.639***	−0.665***	−0.747***	−0.225*	−0.273**	−0.296*	−0.386***	−0.012	−0.036	−0.054	−0.165
	(0.117)	(0.120)	(0.148)	(0.126)	(0.117)	(0.118)	(0.146)	(0.125)	(0.127)	(0.118)	(0.148)	(0.129)
US_2004_DUMMY	−0.492***	−0.667***	−0.524***	−0.632***	−0.170	−0.290**	−0.233	−0.279**	0.072	−0.072	0.034	−0.059
	(0.147)	(0.122)	(0.154)	(0.128)	(0.144)	(0.119)	(0.175)	(0.128)	(0.152)	(0.118)	(0.177)	(0.133)
US_2005_DUMMY	−0.521***	−0.624***	−0.609***	−0.574***	−0.116	−0.246*	−0.200	−0.193	0.138	−0.044	0.088	0.017
	(0.177)	(0.132)	(0.201)	(0.134)	(0.180)	(0.128)	(0.204)	(0.133)	(0.187)	(0.127)	(0.207)	(0.139)
US_2006_DUMMY	−0.488**	−0.615***	−0.562***	−0.537***	−0.073	−0.227*	−0.144	−0.144	0.167	−0.044	0.125	0.051
	(0.180)	(0.132)	(0.200)	(0.139)	(0.183)	(0.129)	(0.204)	(0.138)	(0.192)	(0.127)	(0.210)	(0.144)
US_2007_DUMMY	−0.465***	−0.689***	−0.466**	−0.509***	−0.043	−0.292**	−0.045	−0.100	0.184	−0.123	0.183	0.096
	(0.169)	(0.129)	(0.172)	(0.140)	(0.171)	(0.125)	(0.175)	(0.140)	(0.179)	(0.121)	(0.182)	(0.144)
US_2008_DUMMY	−0.482**	−0.756***	−0.471**	−0.476***	−0.038	−0.349**	−0.029	−0.051	0.200	−0.206	0.206	0.134
	(0.186)	(0.133)	(0.185)	(0.140)	(0.189)	(0.129)	(0.189)	(0.139)	(0.199)	(0.124)	(0.198)	(0.145)
US_2009_DUMMY	−0.617**	−0.797***	−0.686**	−0.562***	−0.147	−0.379***	−0.215	−0.130	0.097	−0.259*	0.056	0.026
	(0.237)	(0.137)	(0.268)	(0.141)	(0.243)	(0.132)	(0.276)	(0.140)	(0.251)	(0.128)	(0.278)	(0.148)

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TABLE 4 (continued)

Estimates of U.S. Unadjusted and Merger-Adjusted Listing Gaps, Advanced Economies (1990–2020)

	Y_{it}: Unadjusted Listing Count (G1)				Y_{it}: Public-to-Public Merger-Adjusted Listing Count (G2)				Y_{it}: All-Merger-Adjusted Listing Count (G3)			
	Per Capita		Per GDP		Per Capita		Per GDP		Per Capita		Per GDP	
Regressors	1	2	3	4	5	6	7	8	9	10	11	12
US_2010_DUMMY	−0.592***	−0.793***	−0.629***	−0.578***	−0.117	−0.357**	−0.153	−0.128	0.098	−0.238*	0.077	0.022
	(0.200)	(0.138)	(0.223)	(0.143)	(0.205)	(0.133)	(0.228)	(0.142)	(0.217)	(0.127)	(0.234)	(0.149)
US_2011_DUMMY	−0.556***	−0.814***	−0.552***	−0.544***	−0.075	−0.370**	−0.071	−0.083	0.129	−0.261*	0.131	0.067
	(0.190)	(0.143)	(0.192)	(0.146)	(0.194)	(0.138)	(0.196)	(0.145)	(0.204)	(0.130)	(0.205)	(0.151)
US_2012_DUMMY	−0.649**	−0.829***	−0.715**	−0.598***	−0.144	−0.375**	−0.210	−0.130	0.066	−0.284**	0.026	−0.005
	(0.236)	(0.147)	(0.265)	(0.147)	(0.242)	(0.142)	(0.272)	(0.145)	(0.250)	(0.136)	(0.275)	(0.154)
US_2013_DUMMY	−0.594***	−0.789***	−0.635***	−0.575***	−0.093	−0.327**	−0.134	−0.101	0.086	−0.243*	0.062	0.015
	(0.207)	(0.152)	(0.228)	(0.154)	(0.212)	(0.146)	(0.233)	(0.152)	(0.221)	(0.138)	(0.239)	(0.158)
US_2014_DUMMY	−0.581**	−0.755***	−0.635**	−0.553***	−0.091	−0.306**	−0.144	−0.091	0.081	−0.231	0.049	0.014
	(0.217)	(0.154)	(0.241)	(0.158)	(0.222)	(0.148)	(0.247)	(0.156)	(0.232)	(0.139)	(0.253)	(0.162)
US_2015_DUMMY	−0.731**	−0.768***	−0.880***	−0.695***	−0.228	−0.310**	−0.371	−0.232	−0.062	−0.237	−0.147	−0.149
	(0.277)	(0.156)	(0.316)	(0.158)	(0.282)	(0.149)	(0.325)	(0.155)	(0.285)	(0.143)	(0.324)	(0.165)
US_2016_DUMMY	−0.782***	−0.789***	−0.878***	−0.763***	−0.207	−0.288*	−0.306	−0.257	−0.082	−0.208	−0.141	−0.173
	(0.194)	(0.156)	(0.223)	(0.158)	(0.208)	(0.149)	(0.239)	(0.156)	(0.218)	(0.144)	(0.246)	(0.163)
US_2017_DUMMY	−0.689***	−0.769***	−0.776***	−0.721***	−0.171	−0.273*	−0.254	−0.222	−0.061	−0.206	−0.111	−0.147
	(0.198)	(0.159)	(0.225)	(0.161)	(0.202)	(0.153)	(0.230)	(0.160)	(0.213)	(0.146)	(0.237)	(0.167)
US_2018_DUMMY	−0.673***	−0.764***	−0.754***	−0.690***	−0.153	−0.268	−0.230	−0.190	−0.053	−0.216	−0.099	−0.127
	(0.202)	(0.165)	(0.227)	(0.169)	(0.206)	(0.159)	(0.232)	(0.167)	(0.216)	(0.151)	(0.239)	(0.173)
US_2019_DUMMY	−0.705***	−0.747***	−0.827***	−0.706***	−0.187	−0.259	−0.304	−0.215	−0.095	−0.225	−0.165	−0.174
	(0.238)	(0.168)	(0.267)	(0.172)	(0.243)	(0.161)	(0.274)	(0.170)	(0.250)	(0.153)	(0.279)	(0.177)
US_2020_DUMMY	−0.657***	−0.698***	−0.771***	−0.681***	−0.167	−0.231	−0.275	−0.213	−0.103	−0.207	−0.168	−0.186
	(0.219)	(0.169)	(0.246)	(0.173)	(0.224)	(0.162)	(0.252)	(0.171)	(0.233)	(0.154)	(0.258)	(0.177)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
R^2	0.390	0.912	0.318	0.874	0.396	0.915	0.304	0.868	0.450	0.921	0.309	0.846
No. of obs.	927	975	927	975	930	979	930	979	930	979	930	979

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Fourth, we rerun our listing gap analysis using an alternative regression specification with the unscaled listing count as the dependent variable and controlling for population and GDP (instead of scaling the listing count directly). As shown in the Supplementary Material, doing so does not affect our main conclusions.

IV. The Uniqueness of the U.S. Post-Peak Listing Decline

In this section, we begin by providing evidence of a surprisingly high frequency of international listing peaks in calendar time. Conditional on observing a listing peak, we then compare these listing peaks in event time. We conclude by examining whether merger activity affects the post-peak rate of decline differently in the U.S. than in foreign stock markets.

A. High Frequency of International Listing Peaks

In our definition, a listing peak occurs if the country's unadjusted listing count is lower in 2020 than in a previous year during our sample period, where the listing peak year is the year with the highest listing count 1975–2019. Figure 6 shows that listing peaks are not only numerous, but also distributed throughout the sample period – a pattern common to both advanced and developing/emerging economies. For each of the 74 countries on the vertical axis, the figure shows in parentheses the year of the country's listing peak. Moreover, the bars (the horizontal axis) show each country's listing count in 2020 as a percent of its listing count at peak (going as far back as 1975 where applicable). Hence, a country that has not experienced a listing peak will have a bar at 100% (shaded light gray), while all countries with a bar less than 100% (shaded dark gray) are those that have experienced a peak. In Table 5, we also order countries according to listing-peak year and divide the sample into four non-overlapping categories: advanced/non-advanced countries with/without a peak. Columns 2 and 3 of Table 5 show the number of listed firms at peak and the listing count in 2020, while column 4 shows the total percent change in the listing count between the peak year and 2020, with the average annual percent change in column 5.

The international listing-peak information yields five important and surprising facts. First, experiencing a listing peak is the norm rather than the exception: Among the 33 advanced economies alone, as much as 82% (27 economies) exhibit a listing peak—5 before the U.S. and another 21 in 1996 or later.[12] A similar proportion of developing and emerging countries also experience a listing peak: 31 of 41 (76%). In sum, almost than four-fifths (58 of 74) of all sampled countries have fewer listed firms in 2020 than in the past.

Second, the total number of listing peaks is widely distributed across the period 1985–2019, with the greatest number of peaks in 1998. The average peak year for the advanced countries is 2000 with a standard deviation of 8 years. For the developing and emerging economies, the average peak year is 2001 with a

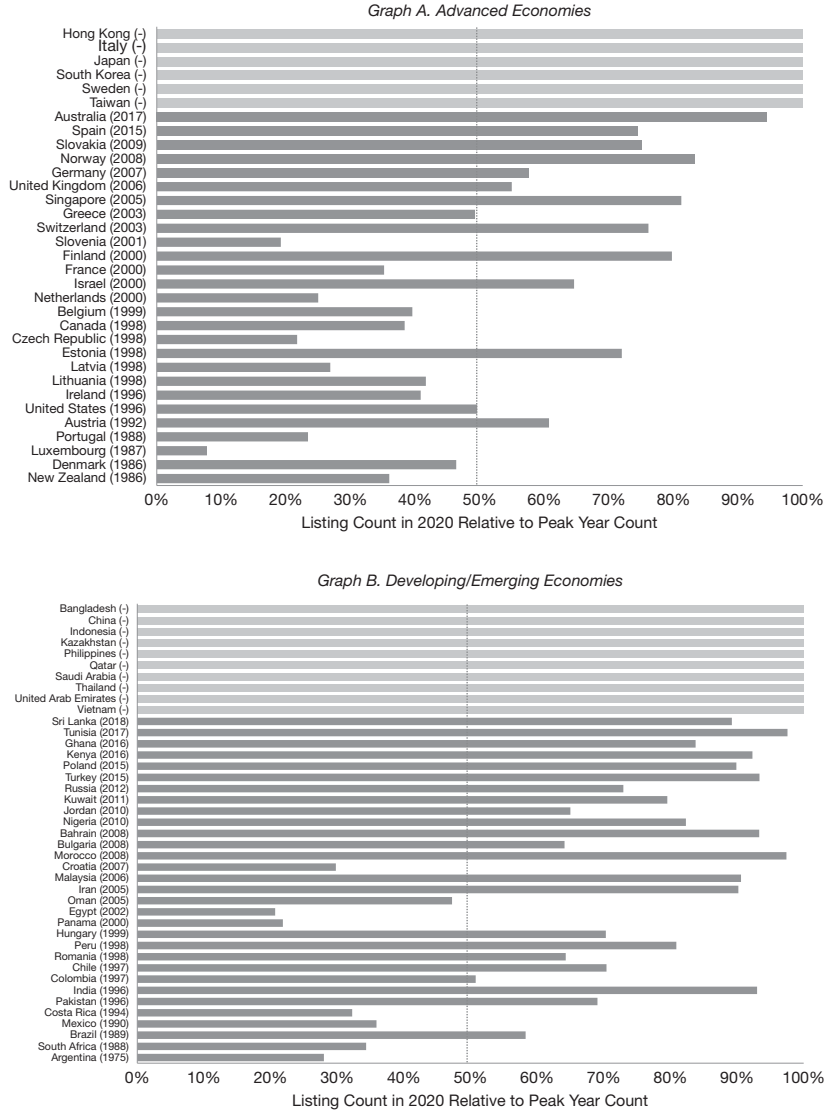
[12]The six advanced economies that have not peaked by 2020 are Hong Kong, Italy, Japan, South Korea, Sweden, and Taiwan. The earliest advanced economies to peak are Denmark and New Zealand in 1986 and the most recent is Australia in 2017. Among developing economies, the first country to peak is Argentina in 1975, while Sri Lanka peaks last in 2018.

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FIGURE 6

Country-Specific Listing Peak Years and Subsequent Listing Decline (1975–2020)

The bars in Figure 6 (the horizontal axis) show each country's listing count in 2020 as a percent of its listing count at peak. Light bars are countries that have not experienced a peak, and dark bars indicate countries that have peaked (have fewer listed firms in 2020 than at peak). Countries are sorted chronologically by listing peak year, which is shown in parentheses. In total, 74 countries are sampled: 33 advanced (Graph A) and 41 developing/emerging (Graph B). Data are from CRSP, WDI, WFE, CEIC, and stock exchange homepages. Advanced and developing/emerging economies are classified by the IMF. The vertical dotted line shows the U.S. decline of 50% from 1996 to 2020.



standard deviation of 10 years. The substantial international variation in the year of the listing peak is interesting as it suggests that these peaks are largely driven by country-specific factors rather than global macroeconomic shocks common to all countries. While identifying these factors goes beyond the purpose of this

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TABLE 5

International Listing Counts and Peak Years

Table 5 provides an overview of country-specific listing peaks, sorted by year of peak. A country's listing-peak year is defined as the year with the highest listing count between 1975 and 2019. Columns 4 and 5 show each country's change in listing count from the peak year to 2020. Advanced and developing/emerging economies are defined by the IMF. Data are from CRSP, WDI, WFE, CEIC, and stock exchange homepages.

Country	Peak Listing Year 1	Listing Count at Peak 2	2020 Listing Count 3	Change Since Peak (%) 4	Annual Change (%) 5
Panel A. Advanced Economies That Have Peaked					
Denmark	1986	274	127	−54	−1.6
New Zealand	1986	339	122	−64	−1.9
Luxembourg	1987	347	27	−92	−2.8
Portugal	1988	158	37	−77	−2.4
Austria	1992	112	68	−39	−1.4
Ireland	1996	93	38	−59	−2.5
United States	1996	7,325	3,633	−50	−2.1
Canada	1998	1,991	764	−62	−2.8
Czech Republic	1998	92	20	−78	−3.6
Estonia	1998	25	18	−28	−1.3
Latvia	1998	67	18	−73	−3.3
Lithuania	1998	60	25	−58	−2.7
Belgium	1999	278	110	−60	−2.9
Finland	2000	158	126	−20	−1.0
France	2000	1,185	417	−65	−3.2
Israel	2000	664	429	−35	−1.8
Netherlands	2000	392	98	−75	−3.8
Slovenia	2001	151	29	−81	−4.3
Greece	2003	339	167	−51	−3.0
Switzerland	2003	289	220	−24	−1.4
Singapore	2005	564	458	−19	−1.3
United Kingdom	2006	2,913	1,601	−45	−3.2
Germany	2007	761	438	−42	−3.3
Norway	2008	209	174	−17	−1.4
Slovakia	2009	16	12	−25	−2.3
Spain	2015	3,623	2,695	−26	−5.1
Australia	2017	2,013	1,901	−6	−1.9
Average (N = 27)	2000	905	510	−49	−2.5
Panel B. Advanced Economies That Have Not Peaked by 2020					
Hong Kong	–	–	2,360	–	–
Italy	–	–	374	–	–
Japan	–	–	2,808	–	–
South Korea	–	–	2,323	–	–
Sweden	–	–	335	–	–
Taiwan	–	–	948	–	–
Average (N = 6)	–	–	1,525	–	–
Panel C. Developing/Emerging Economies That Have Peaked					
Argentina	1975	321	91	−72	−1.6
South Africa	1988	754	259	−66	−2.1
Brazil	1989	592	345	−42	−1.3
Mexico	1990	390	140	−64	−2.1
Costa Rica	1994	31	10	−68	−2.6
India	1996	5,999	5,579	−7	−0.3
Pakistan	1996	782	540	−31	−1.3
Chile	1997	294	207	−30	−1.3
Colombia	1997	128	65	−49	−2.1
Peru	1998	246	199	−19	−0.9
Romania	1998	126	81	−36	−1.6
Hungary	1999	64	45	−30	−1.4
Panama	2000	151	33	−78	−3.9
Egypt	2002	1,150	238	−79	−4.4
Iran	2005	408	368	−10	−0.7
Oman	2005	235	111	−53	−3.5
Malaysia	2006	1,021	925	−9	−0.7
Croatia	2007	359	107	−70	−5.4
Bahrain	2008	45	42	−7	−0.6
Bulgaria	2008	404	259	−36	−3.0
Morocco	2008	77	75	−3	−0.2
Jordan	2010	277	180	−35	−3.5
Nigeria	2010	215	177	−18	−1.8
Kuwait	2011	215	171	−20	−2.3
Russia	2012	292	213	−27	−3.4
Poland	2015	872	784	−10	−2.0
Turkey	2015	392	366	−7	−1.3
Ghana	2016	37	31	−16	−4.1
Kenya	2016	65	60	−8	−1.9
Tunisia	2017	82	80	−2	−0.8
Sri Lanka	2018	297	265	−11	−5.4
Average (N = 31)	2003	526	389	−33	−2.2

(continued on next page)

TABLE 5 (continued)
International Listing Counts and Peak Years

Panel D. Developing/Emerging Economies That Have Not Peaked by 2020					
Bangladesh	–	–	628	–	–
China	–	–	4,186	–	–
Indonesia	–	–	716	–	–
Kazakhstan	–	–	97	–	–
Philippines	–	–	268	–	–
Qatar	–	–	48	–	–
Saudi Arabia	–	–	207	–	–
Thailand	–	–	744	–	–
United Arab Emirates	–	–	74	–	–
Vietnam	–	–	751	–	–
Average (N = 10)	–	–	772	–	–

article, we examine certain country-level macroeconomic variables in Section IV.D.

Third, just as the U.S. experiences a 50% post-peak decline in the listing count, the average decline across all advanced economies with a listing peak is 49%, with 15 advanced countries experiencing an even greater overall decline than in the U.S. Fourth, while the annual percent decline in the number of lists since the peak year is 2.1% for the U.S., the average rate of decline for advanced economies is slightly higher: 2.5%. More than half (16 of 27) of advanced countries experiencing a higher rate of decline than the U.S. Similar results hold for developing and emerging economies, with an average decline of 33% at an annual rate of 2.2%. Fifth, the earlier in the sample period that a country peaks, the lower is the 2020 listing count relative to the peak count. The correlation between number of years passed since the peak and the percent decline is 65%, which suggests that the post-peak listing decline tends to persist over time.

B. Rapid Post-Peak Rates of Listing Decline in Event Time

Conditional on experiencing a listing peak, Graph A of Figure 7 shows the average listing pattern over the 11-year event period (−5,5) centered on the peak year (year 0).[13] It reveals that the shapes of the three U.S., non-U.S. advanced, and developing/emerging listing patterns are surprisingly similar both in terms of the pre-peak incline and post-peak decline. Focusing first on the pre-peak runup period for advanced countries, the U.S. experiences a 24% runup over the (−10,0) period and a 29% runup over the shorter (−5,0) event period. For other advanced (developing/emerging) economies, the runup averages 65% (87%) over the (−10,0) period and 51% (40%) for the (−5,0) period. This shows that, as in the U.S., these pre-peak runups are on average large and concentrated in the (−5,0) event period for advanced and developing/emerging economies alike.

Turning to the post-peak event period, the actual U.S. listing count declines −24% over the (0,5) period and − 37% over the longer (0,10). For advanced (developing/emerging) economies, the decline over these two event periods average − 24% (−22%) and − 32% (−30%) and for the 11-year and 21-year event

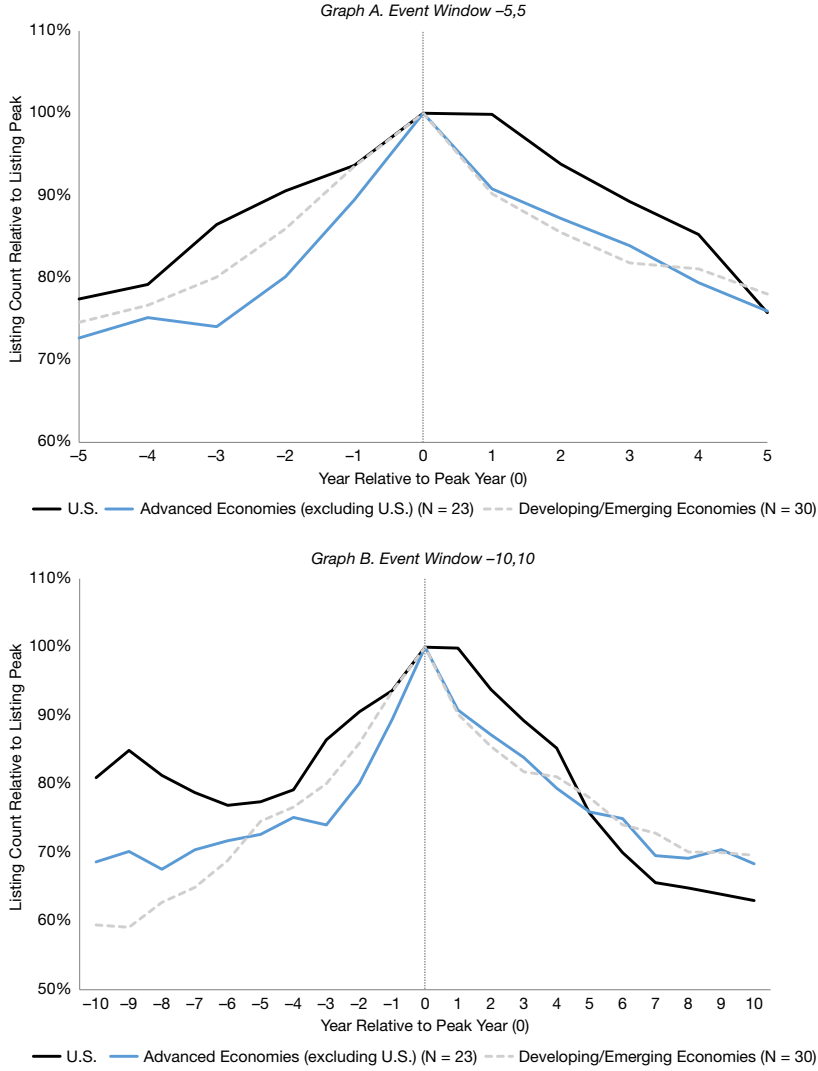
[13]The data behind Figure 7 are enumerated in the Supplementary Material.

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FIGURE 7

Listing Peaks in Event Time (1975–2020)

Conditional on experiencing a listing peak, Figure 7 plots the percent change in listing count over the 11-year event window (−5,5) centered on the peak year (year 0) in Graph A, and 21-year window (−10,10) in Graph B. Countries with listing peaks are drawn from the period 1975–2020. The percent change is relative to the country's listing count in year 0. The portfolios of 23 non-U.S. advanced and 30 developing/emerging economies are equal-weighted. Four countries are excluded due to outliers: Croatia, Czech Republic, Luxembourg, and Portugal. Economic development is classified by the IMF. Data are from CRSP, WDI, WFE, CEIC, and stock exchange home pages.



periods, respectively. This shows that the average annual rate of listing decline is also similar across the U.S. and other countries, and that the bulk of the decline occurs quickly – within the event period (0,5) for four-fifths of the countries. In sum, the (−5,5) event period catches the bulk of the listing runups and declines around the peaks.

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C. Merger-Adjusted Rates of Post-Peak Listing Decline

In this section, we present a cross-country analysis of the impact of mergers on the rate of post-peak listing decline that focuses on the (0,5) event window. We begin by illustrating international differences in merger propensities. Graph A of Figure 8 shows the international average annual merger rate per listed firm where at least one of the two parties to the transaction is a public company, while Graph B further restricts the mergers to deals between 2 public firms. In Graph A, a U.S. public firm has a 10.2% chance of being involved in an M&A transaction in average year 1990–2020, while this equivalent number is only 2.9% for non-U.S. advanced economies and 1.0% for developing and emerging economies.[14] For the public-to-public merger deals in Graph B, the annual U.S. merger propensity is 2.7% versus 0.3% (0.2%) in non-U.S. advanced (developing/emerging) economies. In sum, the U.S. likelihood of a merger is noticeably higher than the likelihood in any other country in our sample. Moreover, this difference is even more pronounced for the public-to-public mergers in Graph B. This also suggests that the effect of mergers on listing dynamics will be stronger in the U.S. than in other countries, which our analysis below confirms.

In Figure 9, we plot the public-to-public merger-adjusted (Graph A) and all-merger-adjusted (Graph B) event-time average listing patterns with the window (−5,5) around the peak year. Graph A shows that the public-to-public merger-adjusted listing count on average declines by 22% for non-U.S.-advanced and by 21% for developing and emerging economies in the 5 years following the listing peak. This contrasts with the U.S. public-to-public merger-adjusted series, which declines by 5% only. In other words, while the U.S. post-peak listing decline is to a great extent driven by a reallocation of corporate resources among public firms, declines elsewhere are far less attenuated by public-to-public mergers. Instead, these declines represent outflows of listed firms from public markets.

The all-merger-adjusted series in Graph B of Figure 9 also includes private-to-public mergers. This incremental adjustment reduces the decline in the non-U.S. advanced (developing/emerging) economies from an average of 22% to 10% (21% to 18%). This means that, internationally, targets entering public markets via private-to-public mergers significantly outnumber targets retained via public-to-public mergers. In the U.S., the addition of private-to-public mergers changes the adjusted listing count from a 5% decrease to a 13% increase. As Figure 8 suggests as well, this shows that the marginal impact of private-to-public mergers on the listing dynamics is also greater in the U.S. than elsewhere.

D. Testing the Uniqueness of the U.S. Post-Peak Listing Decline

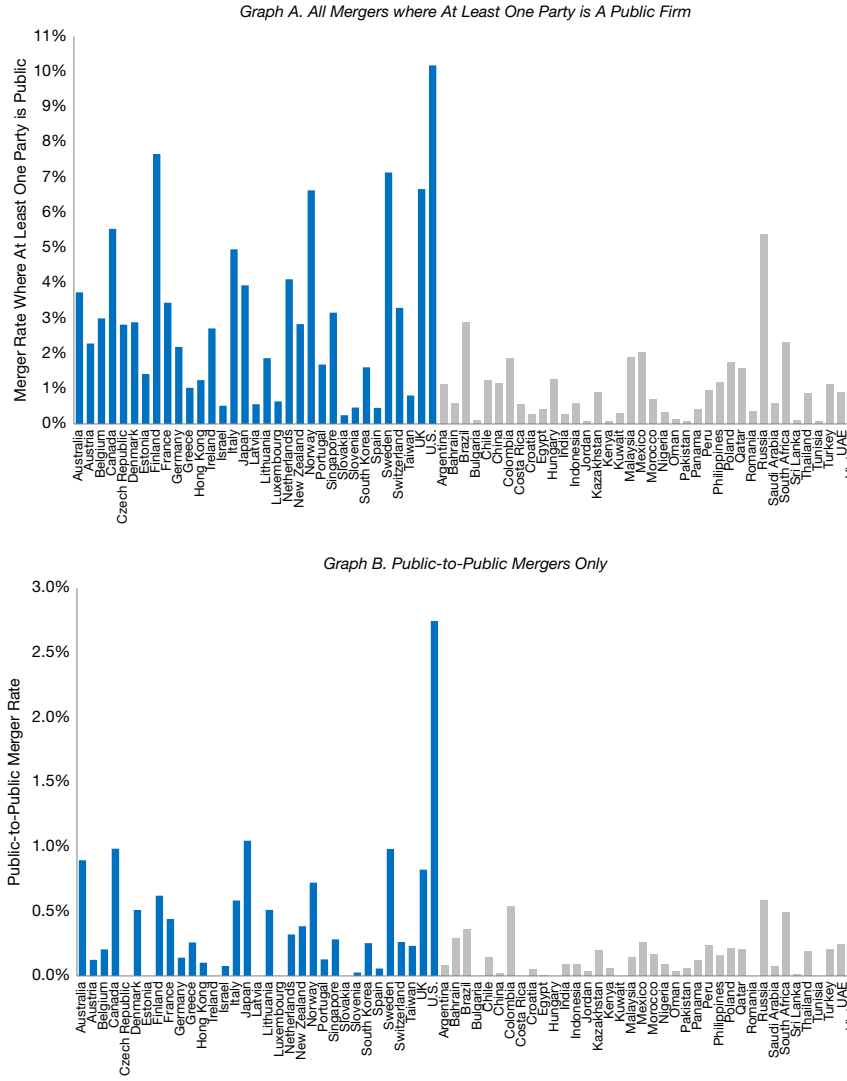
To formally test for the existence of a unique impact of U.S. merger activity on the post-peak rate of decline, let DECLINE_{Ti} denote the average annual rate of decline (in percent) in the number listed firms for country i in the $T = 5$ years (alternatively, $T = 3$) after that country's listing peak. DECLINE_{Ti} is either the

[14]This evidence is consistent with Doidge et al. (2017) who show that the U.S. merger delist rate is higher than for an aggregate of non-U.S. countries.

FIGURE 8

International Merger Rates (1990–2020)

Figure 8 shows the average annual merger likelihood for listed companies by country or territory. Graph A shows the likelihood for a listed company to be the target or acquirer in a completed merger. Graph B shows the likelihood for a listed company to be acquired by another domestic listed firm. Blue bars indicate advanced economies and gray bars indicate developing/emerging economies. Merger data are from SDC, listing counts are from CRSP, WDI, WFE, CEIC, and stock exchanges, and economic development status is classified by the IMF.



unadjusted listing count, the public-to-public merger-adjusted listing count, or the full merger-adjusted count. We run the following cross-sectional regression:

$$\text{DECLINE}_{Ti} = \alpha + \beta D_{\text{US}} + \lambda Z_{Ti} + \varepsilon_{Ti},\ i = 1, \ldots, N, \tag{11}$$

where D_{US} is a dummy taking a value of 1 if the country is the U.S. and 0 otherwise.

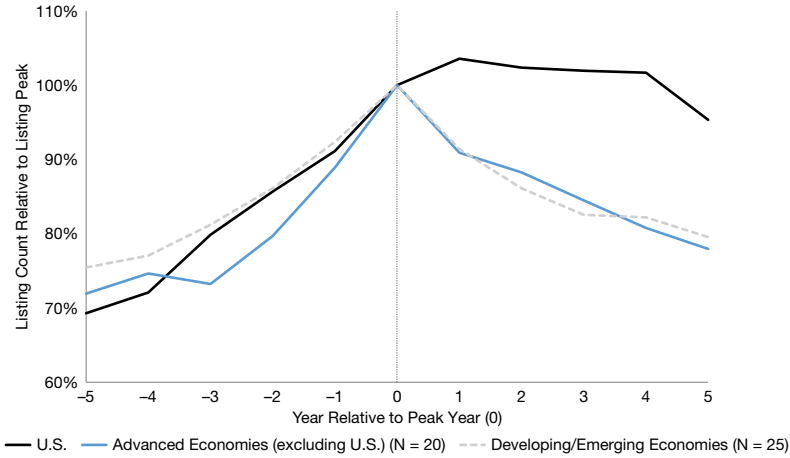
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FIGURE 9

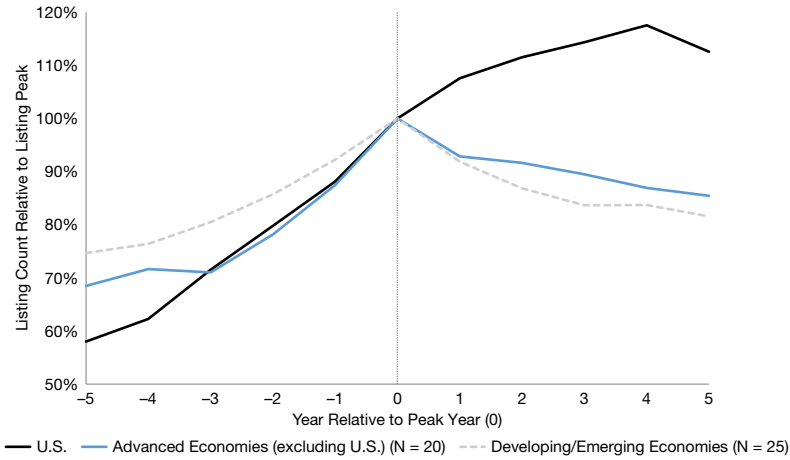
Merger-Adjusted Peaks in Event Time (1990–2020)

For countries with a listing peak, Graph A of Figure 9 plots the percent change in public-to-public merger-adjusted listing count over the 11-year event window (−5,5) centered on the peak year (year 0). Graph B plots the all-merger-adjusted listing count during the same event window. The merger adjustment is explained in Table 1 and equations (1)–(4). The countries in this event-period sample are required to have a peak in 1995 or later to allow for full event-period data coverage. Croatia and Czech Republic are excluded due to outliers. The percent change is relative to the country's adjusted listing count in year 0.

Graph A. Public-to-Public Merger-Adjusted Listing Counts in Event Time



Graph B. All-Merger-Adjusted Listing Counts in Event Time



The vector Z_{Ti} is a set of pre-peak country-specific control variables using data from the World Bank and IMF, and is intended to control for economic conditions prior to the listing peak. Each variable is computed as the annual T-period average prior to the listing-peak year of country *i*. The pre-peak growth variables are LISTING_COUNT_RUNUP (the percent growth in the unadjusted listing count) and GDP_GROWTH. The GDP-scaled variables are TRADE (the sum of exports and imports) and FDI_NET_INFLOWS (foreign direct investment). Finally, population-scaled variables are PATENT_APPLICATIONS and GDP. The patent

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TABLE 6

Determinants of Actual and Merger-Adjusted Post-Peak Rate of Listing Decline

Table 6 shows coefficient estimates from the following regression specification:

$$\text{DECLINE}_i = \alpha + \beta D_{\text{US}} + \lambda Z_i + \varepsilon_i,\ i = 1, \ldots, N,$$

where DECLINE_i is the average annual rate (percent) of decline in listed firms for country i in the 5 years (columns 1–2, 5–6, 9–10) or 3 years (columns 3–4, 7–8, 11–12) after that country's listing peak. The merger-adjusted listing count is defined in Table 1 and equations (1)–(4) in the text. DECLINE_i is calculated from the unadjusted listing count in columns 1–4, the public-to-public merger-adjusted listing count in columns 5–8, and the full merger-adjusted listing count in columns 9–12. D_{US} is a dummy taking a value of 1 if the country is the U.S., and 0 otherwise. Z_i is a set of pre-peak country-specific control variables. Each is an annual average value from the 5 or 3 years (depending on the sample) before the listing peak in country i. Pre-peak growth variables are LISTING_COUNT_RUNUP (percent growth in unadjusted listing count) and GDP_GROWTH. GDP-scaled variables are TRADE (exports plus imports) and FDI_NET_INFLOWS (foreign direct investment). Finally, population-scaled variables are PATENT_APPLICATIONS (filed by domestic firms and residents) and GDP. The sample starts with the full list of countries that experience a peak between 1975 and 2019 (45 countries). Several countries are dropped due to missing data. Additionally, Croatia, Czech Republic, Luxembourg, and Portugal are excluded due to outliers. Odd-numbered columns use all available countries and even-numbered columns only sample advanced economies. U.S. listing count data are from CRSP, foreign listing count data are from WDI, WFE, CEIC, and exchange homepages, and merger data are from SDC. Control variables are from the World Bank and IMF. Advanced economies are classified by the IMF. Parentheses display robust standard errors. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	DECLINE_i: Unadjusted				DECLINE_i: Public-to-Public				DECLINE_i: All-Merger-Adj.			
	Listing Count				Merger-Adj. Listing Count				Listing Count			
Event Time:	±5 Years		±3 Years		±5 Years		±3 Years		±5 Years		±3 Years	
Sampled Countries:	All	Adv.	All	Adv.	All	Adv.	All	Adv.	All	Adv.	All	Adv.
Regressors	1	2	3	4	5	6	7	8	9	10	11	12
CONSTANT	0.037**	0.066***	0.048***	0.084***	0.035**	0.061***	0.045***	0.076***	0.039**	0.058**	0.047***	0.073***
	(0.014)	(0.016)	(0.015)	(0.025)	(0.014)	(0.014)	(0.015)	(0.021)	(0.015)	(0.019)	(0.014)	(0.018)
D_{US}	0.013	0.009	−0.014	−0.007	−0.022**	−0.026**	−0.049***	−0.042***	−0.036***	−0.041**	−0.068***	−0.064***
	(0.009)	(0.009)	(0.011)	(0.012)	(0.009)	(0.009)	(0.010)	(0.012)	(0.012)	(0.013)	(0.010)	(0.011)
Pre-Peak Growth Variables												
LISTING_COUNT_RUNUP	0.054	0.081	−0.003	−0.055	0.052	0.075	0.000	−0.043	0.031	0.034	−0.001	−0.028
	(0.046)	(0.051)	(0.033)	(0.048)	(0.045)	(0.049)	(0.033)	(0.046)	(0.056)	(0.068)	(0.029)	(0.038)
GDP_GROWTH	−0.001	−0.001	0.000	−0.000	−0.001	−0.001	0.000	−0.000	−0.001	−0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
GDP-Scaled Variables												
TRADE	0.000	−0.000	0.000	−0.000	0.000	−0.000	0.000	−0.000	−0.000	−0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FDI_NET_INFLOWS	0.001	0.007	−0.001	0.005	0.001	0.005	−0.001	0.003	0.001	−0.000	−0.001	−0.000
	(0.001)	(0.005)	(0.002)	(0.007)	(0.001)	(0.004)	(0.002)	(0.006)	(0.002)	(0.005)	(0.002)	(0.005)

(continued on next page)

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TABLE 6 (continued)

Determinants of Actual and Merger-Adjusted Post-Peak Rate of Listing Decline

	$DECLINE_i$: Unadjusted				$DECLINE_i$: Public-to-Public				$DECLINE_i$: All-Merger-Adj.			
	Listing Count				Merger-Adj. Listing Count				Listing Count			
Event Time:	±5 Years		±3 Years		±5 Years		±3 Years		±5 Years		±3 Years	
Sampled Countries:	All	Adv.	All	Adv.	All	Adv.	All	Adv.	All	Adv.	All	Adv.
Regressors	1	2	3	4	5	6	7	8	9	10	11	12
Population-Scaled Variables												
PATENT_APPLICATIONS	−42.484	−56.537	−25.328	−41.370	−42.241	−56.212	−28.794	−42.922	−64.222	−78.406	−50.286	−63.089
	(26.046)	(38.165)	(45.646)	(55.951)	(27.253)	(41.474)	(42.428)	(53.336)	(41.504)	(50.980)	(41.629)	(48.308)
GDP	0.000	−0.000	0.000	−0.000	0.000	−0.000	0.000	−0.000	−0.000	−0.000	−0.000	−0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R^2	0.079	0.468	0.025	0.134	0.103	0.570	0.076	0.275	0.175	0.607	0.212	0.521
N	30	15	35	17	30	15	35	17	30	15	35	17

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applications are restricted to those filed by domestic firms and residents. We use patents to measure innovation activity because they are more consistently recorded across countries than are data on R&D expenditures.

The regression results are reported in Table 6. Odd-numbered columns use all available countries, while the even-numbered columns are based on advanced economies only. In columns 1–4, the dependent variable is the rate of decline of the unadjusted listing count. Note first that D_{US} is insignificant in column 1 (all countries) and in column 2 (advanced economies). This implies that the U.S.-specific 5-year average annual rate of post-peak decline is statistically indistinguishable from other countries. The same holds for columns 3 and 4, in the 3-year post-peak period.

Columns 5–8 of Table 6 show the regression results when DECLINE_{Ti} is the post-peak annual average rate of decline of the public-to-public merger-adjusted listing series. Most important, D_{US} now receives a negative and statistically significant coefficient estimate, implying a significantly slower rate of post-peak decline in the merger-adjusted listing series. The coefficient on D_{US} is estimated at -2.2 to -2.6 percentage points for the 5-year event window and from -4.2 to -4.9 for the 3-year window. Importantly, the fact that the merger adjustment *lowers* the coefficient estimate of D_{US} when going from columns 1–4 to columns 5–8, means that there is a U.S.-specific effect of public-to-public mergers that reduces the speed at which listed firms leave the stock exchange. Between columns 1–4 and columns 5–8, the U.S.-specific effect of public-to-public merger activity decelerates the speed of decline by 3.5 pps, relative to other countries.

It is worth reemphasizing the above interpretation of the coefficient estimates on D_{US}. These estimates show that U.S. public-to-public merger activity reallocates target firms *within* the stock exchange to a greater extent than in other countries. This interpretation follows because, when going from, say, column 1 to column 5, we are only changing the dependent variable DECLINE_{Ti}. As a result, the significant decline in the coefficient estimate on D_{US} means that public-to-public merger activity slows down the post-peak rate of decline relative to other countries.

In columns 9–12, DECLINE_{Ti} is measured using the full merger-adjusted listing count series. Again focusing on D_{US} and the total sample of countries, recall that the full merger adjustment adds private-to-public acquisitions to the listing count. The marginal decline in the coefficient estimate for D_{US} by 1.4 pps to 2.2 pps when going from columns 5–8 to 9–12 is evidence that the U.S.-specific effect of private-to-public acquisitions is smaller than the case is for public-to-public mergers. Furthermore, it confirms that what distinguishes the post-peak U.S. merger activity is less an inflow of private targets than the effective retention of listed targets through public-to-public mergers. This result is also noticeable by comparing Graphs A and B of Figure 9, which shows a somewhat similar private-to-public effect on U.S. and non-U.S. advanced, but a noticeably different public-to-public effect.

Finally, in the Supplementary Material, we also test to determine whether role of post-peak merger activity documented above for the U.S. is unique. We estimate country-by-country regressions where we replace the U.S. dummy D_{US} in equation (11) with a dummy for each respective non-U.S. country. In the sample of advanced economies, this replacement fails to produce a significantly negative country

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dummy when using the merger-adjusted listing series (columns 5–12) for all non-U.S. countries with insignificant or positive unadjusted dummy estimates (columns 1–4). This reinforces the notion that the significant effect of merger activity on the rate of post-peak listing decline is uniquely strong in the U.S. – primarily due to public-to-public mergers.

V. Post-Peak Economic Activity of U.S. Listed Firms

We end our analysis by addressing, in this section, three questions of relevance for how to interpret the underlying economic relevance of our U.S. merger-adjustment: What triggered the merger wave of the 1990s? Did this merger wave increase shareholder value? Did the post-1996 listing decline slow economic activity of listed firms? As to the first question, the most powerful answer in the literature is given by Harford (2005). He shows that 6 of 11 industry-specific deregulatory events between 1981 and 1996 took place after 1990. The resulting increase in product market competition appears to have triggered several rival firms to merge with the objective of lowering operating costs. Also important, the evidence in Harford (2005) and other studies rejects the alternative notion that the merger wave of the 1990s was "market driven" (bidder opportunism) in the vernacular of Shleifer and Vishny (2003).[15]

Graph A of Figure 10 addresses the question concerning shareholder wealth effects of the merger wave. Using Fama–French-49 industries, it addresses whether the industry-specific merger waves involving public-to-public mergers were "synergistic" in the sense of increasing the combined market values of bidder and target firms. We follow John et al. (2024) and classify an industry year as experiencing a "synergy wave" if the number of deals with positive combined bidder and target wealth effect (CWE) is 1 standard deviation above the time-series industry median. We restrict the sample to mergers between listed firms and calculate CWE as the value-weighted average of the bidder and target's 7-day cumulative abnormal return, CAR(−3,3), where day 0 is the first public announcement of the merger given by SDC.[16] As Graph A shows, synergistic merger waves occur to a higher degree during the second half of the 1990s than during any other period, 1980–2020. This evidence supports the hypothesis that the merger activity that drove much of the post-1996 U.S. listing decline predominantly increased the combined value of the merging firms.

Graph B of Figure 10 addresses the third question concerning the post-1996 economic activity of listed firms. It shows the time series from 1982 to 2018 of the

[15]See also Rhodes-Kropf, Robinson, and Viswanathan (2005), Phillips and Zhdanov (2013), and Eckbo et al. (2018) for evidence on how U.S. merger waves correlate with the relative market-to-book ratios (M/B) of bidder and target firms. Eckbo et al. (2018) show that, conditional on a merger transaction where the bidder is a listed company, the method of payment for the target is significantly more likely to include bidder shares *the better informed* the target is about the bidder's true value, which directly contradicts the bidder opportunism hypothesis.

[16]CAR is the difference between the realized and the value-weighted market returns from CRSP. The pre-announcement market value of the bidder and the target is measured 1 month before the deal announcements. Due to missing data, the sample consists of 3,923 public-to-public mergers, or around two-thirds of all of the public-to-public mergers in our sample.

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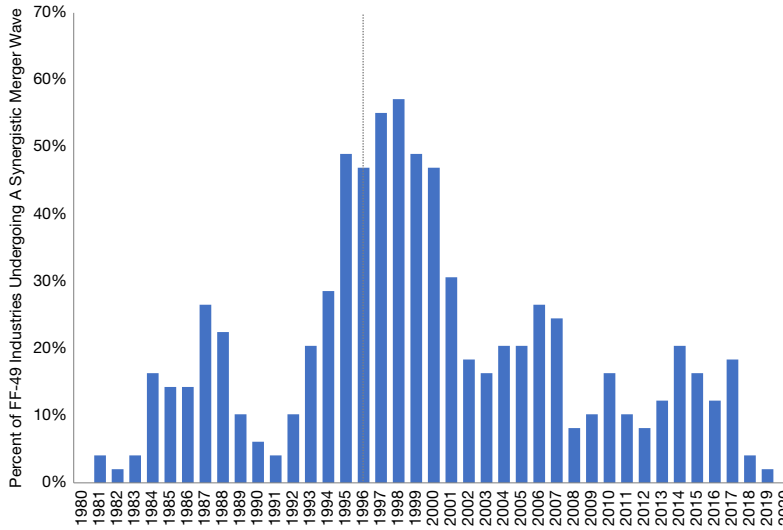
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FIGURE 10

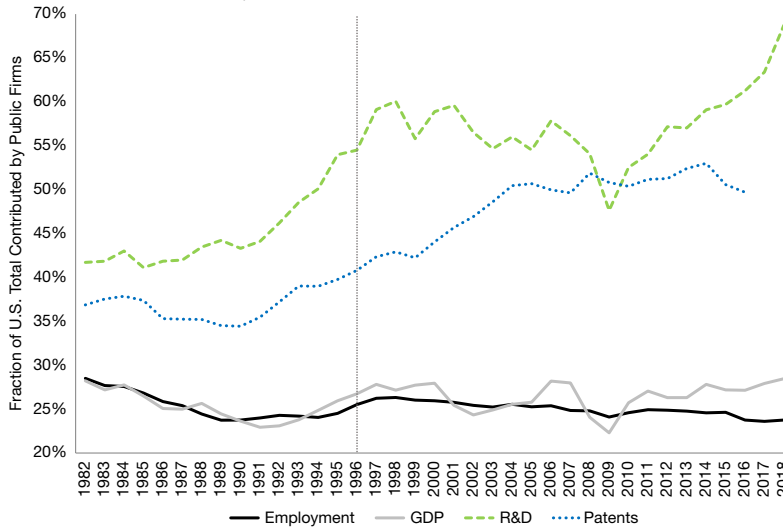
"Synergistic" Merger Waves and Economic Contribution of Listed Firms

Graph A of Figure 10 shows the share of industry years undergoing a synergistic merger wave for our sample of public-to-public mergers, 1980–2020, using Fama–French 49 industries. Following John et al. (2024), industry years are considered to undergo a synergy wave if the number of deals with positive bidder and target combined wealth effect (CWE) in that year is 1 standard deviation above the industry time-series median. CWE is the value-weighted average CAR for the event period (−3,3), where (0) is the announcement date. CARs are calculated as the difference between the realized and value-weighted market return. Pre-announcement market value of the bidder and target is measured 1 month before the deal announcement. Both acquirer and target must be U.S. public firms, with the bidder holding less than 50% of target shares before announcement and seeking to hold at least 50% after the transaction. Graph B shows the time series of public firms' percent contribution to aggregate U.S. employment, GDP, R&D spending, and patents, with data from the BEA, BLS, Compustat, GCPD, IMF, OECD, and USPTO. Construction and data series are detailed in Appendix A.2.

Graph A. Share of Industry-Years with Synergistic Public-to-Public Merger Waves



Graph B. Contribution of Listed Firms to Economic Activities



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annual percent contribution of U.S. domestic listed firms to aggregate labor employment, GDP, R&D spending, and patents. As detailed in Appendix A.2, we generate the figure using data from the Bureau of Economic Analysis, Bureau of Labor Statistics, Compustat, IMF, OECD, University of Virginia Darden Global Corporate Patent Dataset, and U.S. Patent and Trademark Office. We follow Schlingemann and Stulz (2022) and measure GDP (employment) as the sum of value added (employment) generated both domestically and by majority-owned foreign affiliates. While they do not study patents and R&D, we adjust R&D for foreign affiliates in a similar fashion.[17]

As shown in Graph B, notwithstanding the post-1996 drop in the actual listing count, there is little evidence that the remaining listed firms contribute less to the macroeconomic time series. Specifically, in the post-1996 period, the ratio of U.S. workers employed by public firms is 25.5% in 1996 and 23.8% in 2018 (the last year of information on foreign affiliates in BEA), while the value added by public firms to U.S. GDP is 26.7% in 1996 and 28.5% in 2018. Also important, there is a substantial increase in innovation activity of U.S. listed firms as a fraction of all U.S. entities (public and private firms, governmental agencies, universities, and individuals): R&D spending increases from 54.5% to 68.7% (1996–2018), while granted patents relative to all entities increases from 40.8% to 49.7% (1996–2016). We conclude from Graph B that the post-1996 merger-driven listing decline in important ways has increased rather than decreased the contribution of listed firms to the U.S. economy.

VI. Conclusion

In principle, the two main channels driving stock market listing declines are i) a lowering of net listing benefits and ii) positive expected synergy gains from mergers involving public acquirers. The first channel is fully covered by the listing count as it lowers the number of IPOs and may cause stock market exits by already listed firms. However, as the listing count only reacts to changes in the number of stand-alone listed firms, it cannot be used to gauge how the second channel works to both retain public targets within the exchange and attract private targets into public ownership, albeit under the umbrella of the public parent. Public-to-public mergers even *lowers* the listing count despite the fact that the target remains under public ownership inside the stock exchange. The impact of private-to-public mergers is more subtle: Although the target enters public ownership, the merger transaction indirectly attenuates the listing count as it effectively removes the same firm from entering the stock market as a stand-alone company, whether through an IPO or a direct listing.

The current debate over the dramatic (near-50%) post-1996 U.S. listing decline focuses primarily on channel i) above, however, without reaching a consensus on the sources of the putative decline in net listing benefits (Gao et al. (2013)). Moreover, Doidge et al. (2017) rely on this channel when they suggest that

[17]With a sample period that starts in 1973, Schlingemann and Stulz (2022) show that the proportion of U.S. employment and GDP attributable to listed firms declines prior to the early 1990s for then to increase. The late-period increase in GDP is confirmed below as well.

U.S. stock markets have developed a significant listing gap relative to the prediction based on an international stock-exchange listing trend line. However, since attributing the U.S. listing decline to lower net listing benefits requires ignoring the often considerable total value-gains created by the merger channel (including large target offer premiums and post-merger sharing in some of the parent's own listing benefits), this debate cannot be settled without a quantitative assessment of the merger-driven listing dynamics, which is what this article offers.

Our firm-level merger adjustment simply implements the principle that any listed company may be viewed as a portfolio of itself and the public and private target firms it has acquired over time. Publicly listed targets are retained inside their respective public acquirers, while private targets enter the public ownership umbrella of their public parents. Hence, our merger adjustment involves successively cumulating the targets of each listed firm and then adding this cumulation to the annual listing count (while subtracting it if the firm leaves the exchange for reasons other than being acquired by another listed company). This merger adjustment quantifies the merger channel in a consistent manner, and it helps us gauge the ability of a stock market to attract and retain firms under public ownership.

Using the full anatomy of U.S. lists and delists over the period of 1980 to 2020, we first show that targets of public acquirers exceed stock market entries via IPOs both in number and transaction value. Accounting for these targets eliminates the post-1996 decline in the U.S. – a result that for the most part is driven by mergers involving public targets (public-to-public mergers). This finding alone suggests that much of the post-1996 listing decline is driven by expected synergy gains from mergers – without necessarily pointing to a concomitant decline in U.S. net listing benefits.

We then turn to an international comparison of merger-driven listing dynamics, which points to a unique ability of U.S. stock markets to attract and retain firms under public ownership. This inference is based on two specific results. First, our merger adjustment eliminates the statistical significance of the U.S. listing gap proposed by Doidge et al. (2017) (updated here to 2020). In reality, a substantial number of what Doidge et al. (2017)'s listing-gap measure classifies as firms "missing" from the three major U.S. stock markets remain on the stock exchange – albeit under the ownership umbrella of their public parents.

To further establish whether the nature of the merger channel is unique to the U.S. market for corporate control, we first show that as much as four-fifths of countries experience listing peaks followed by a "U.S.-style" decline, but with their peaks distributed widely over 1980–2020. We then perform cross-country regressions with country-fixed effects and the post-peak rate of listing decline as dependent variable. These confirm that only in the U.S. does the merger channel plays a significant role in explaining the post-peak rate of merger-adjusted listing decline. It appears that, in non-U.S. economies, post-peak listing declines tend to reflect *outflows* of firms from public markets rather than retentions within public acquirers – where the latter may be viewed as a U.S.-specific stock market listing benefit.

In sum, the firm-level merger-driven listing dynamics shown here points to a distinct U.S. listing advantage by providing access to a well-functioning market for complex merger transactions. While the efficiency of U.S. merger transactions is well documented by extant research, we further support this notion by also showing

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that net transaction values (inflows net of outflows) increased after 1996, and that the contribution of the remaining (50% fewer) stand-alone listed firms to employment and GDP did not fall between 1996 and 2020. Moreover, listed firms' share of R&D and patents has increased substantially over the post-peak period.

Appendix A. Data Sources and Additional Listing Information

A.1. Data on U.S. Listing Anatomy

As mentioned in the text, our data sources for the full U.S. listing anatomy, which includes both foreign and domestic target firms, are from CRSP and Refinitiv's SDC Platinum M&A database (SDC). We define U.S. public firms in CRSP and require them to be domestic companies with common stock (share codes 10 or 11) that are listed on the NYSE, AMEX, or Nasdaq (exchange codes 1, 2, 3, 31, 32, and 33). We further exclude investment funds and trusts (SIC codes 6722, 6726, and 6798–6799). We also exclude firms that are listed for only 1 day.

Table A1 provides the annual distribution of new lists and delists used in the article. New lists are recorded when a firm first appears in the sample of CRSP public firms, or when it is relisted after at least 2 weeks off public markets (thus excluding SEC trading suspensions of a listed firm, which may last no more than 10 days). To categorize new lists, we first identify IPOs using data from SDC and Jay Ritter's website (https://site.warrington.ufl.edu/ritter/ipo-data/). Spinoffs are identified either in CRSP, with distribution code 3763 (Vijh (1994)), or SDC, using acquirer name "shareholders" or spinoff, splitoff, and carve-out dummies. For each spinoff new list, we match the parent company to a U.S. public firm at the time of listing. Relistings occur after a U.S. public firm has been delisted for at least 2 weeks (not including suspension periods). Reorganizations are cases in which a merger between two public companies results in the creation of a new firm and removal of the old firms (as defined by PERMCO). We identify form changes when a firm that already exists in CRSP but did not meet the U.S. public criteria does so.[18]

Delists are recorded when a firm ceases to be publicly listed for at least 2 weeks. To classify delists, we follow Fama and French (2004) and use CRSP delisting codes: merger (delisting codes 200–399), cause (codes 400–569 and 574–999), and voluntary (codes 570–573). In CRSP, every PERMNO has one and only one delisting code observation (if a PERMNO has never been delisted, it will have a delisting code of 100 on the last day of available CRSP data). This means that if a firm is delisted and later relisted, no CRSP delisting code is provided for the first delisting. Furthermore, no delisting code is provided if a PERMNO fails to uphold the public-firm criteria listed above but still remains in CRSP. If no CRSP delisting code is available, we classify the delisting reason as unknown.[19] Finally, for CRSP merger delistings we identify the

[18]Examples of form changes include when a company relocates from another country to the U.S., changes the form of its listed equity to common stock, or a SPAC completes an acquisition and changes SIC code from investment vehicle to operating company.

[19]We manually exclude one unknown delisting and relisting: JPMorgan Chase, which changes SIC to 6726 between Sept. 9, 2009, and Jan. 28, 2010, in CRSP, causing it to disappear from the sample of U.S. public firms during this 4-month period. While this adjustment does not impact our analysis, it removes what otherwise visually appears as a large value outflow-inflow in Figure 4 during this period, despite the firm remaining active and listed on NYSE throughout.

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TABLE A1

New Lists and Delists in the U.S. by Type, 1981–2020

Beginning at the end of 1980, Table A1 shows the total annual (year-end) number of listing, $L_t = L_{1980} + \sum_{\tau=1981}^{t} \Delta L_t$, cumulated across NYSE, AMEX, and Nasdaq. The annual change in the actual listing count, ΔL_t is the sum of the following six variables, all of which are defined in Table 1 and equations (2)–(4) in the text:

$$\Delta L_t = \begin{cases} \text{NEWLISTS}_t(+): & \text{IPO}_t + \text{SPIN}_t + \text{MISC}_{New,t} \\ \text{DELISTS}_t(-): & \text{MERGE}_{\text{Public-to-Public},t} + \text{MERGE}_{\text{Public-to-Private},t} + \text{MISC}_{\text{Del,t}} \end{cases}.$$

IPO_t are all initial public offerings in year t, SPIN_t are spinoffs, and $\text{MISC}_{\text{New},t}$ are miscellaneous new listings. $\text{MISC}_{\text{Del},t}$ are miscellaneous delists. The subscript in MERGE indicates the direction of the change in the target's public/private status.

Panel A. $\text{NEWLISTS}_t = \text{IPO}_t + \text{SPIN}_t + \text{MISC}_{\text{New},t}$

					MISC_{New}			
Year	Listing Count (L)	NEWLISTS	IPO	SPIN	Uplists	Relist	Reorg.	Form
1	2	3	4	5	6	7	8	9
1981	5,073	646	309	0	315	14	4	4
1982	4,999	326	105	0	182	34	4	1
1983	5,571	944	638	0	263	34	5	4
1984	5,691	621	318	8	242	47	4	2
1985	5,652	570	293	11	208	49	4	5
1986	5,930	984	603	10	292	65	1	13
1987	6,222	828	453	13	292	64	5	1
1988	5,955	437	191	14	175	47	8	2
1989	5,770	419	181	14	163	55	3	3
1990	5,634	414	156	15	177	52	7	7
1991	5,672	529	344	5	129	42	3	6
1992	5,801	650	463	13	145	23	2	4
1993	6,334	894	587	15	238	47	4	3
1994	6,634	747	495	15	210	24	3	0
1995	6,861	796	514	13	220	37	8	4
1996	7,325	1,028	747	19	212	30	14	6
1997	7,315	709	490	21	164	21	8	5
1998	6,873	523	299	10	174	21	11	8
1999	6,539	633	467	20	104	28	12	2
2000	6,246	585	347	15	153	47	18	5
2001	5,550	196	76	11	57	37	6	9
2002	5,129	170	69	9	50	32	8	2
2003	4,807	192	68	8	69	42	4	1
2004	4,750	320	172	8	71	52	7	10
2005	4,684	320	160	10	99	43	6	2
2006	4,616	304	164	10	86	35	4	5
2007	4,524	349	195	14	93	41	4	2
2008	4,259	144	36	19	46	33	3	7
2009	4,005	126	44	5	54	16	2	5
2010	3,874	194	100	5	59	25	2	3
2011	3,721	150	88	11	27	20	2	2
2012	3,601	161	116	10	26	3	2	4
2013	3,594	232	173	11	33	11	3	1
2014	3,713	317	225	21	44	20	5	2
2015	3,681	219	140	22	31	21	4	1
2016	3,542	155	84	16	40	13	1	1
2017	3,515	230	140	9	60	12	5	4
2018	3,520	232	156	12	42	12	2	8
2019	3,520	231	153	6	33	13	1	25
2020	3,633	312	228	10	40	20	2	12
Total		17,837	10,587	458	5,118	1,282	201	191
Average	5,108	446	265	11	128	32	5	5

Panel B. $\text{DELISTS}_t = \text{MERGE}_{\text{Public-to-Public},t} + \text{MERGE}_{\text{Public-to-Private},t} + \text{MISC}_{\text{Del},t}$

				$\text{MERGE}_{\text{Public-to-Private}}$				MISC_{Del}		
Year	Listing Count (L)	DELISTS	$\text{MERGE}_{\text{Pub-to-Pub}}$	Acq. by U.S. Priv.	Acquired by Non-U.S. Public	Acquired by Non-U.S. Private	Acq. by Unknown	Cause	Voluntary	Unknown
1	2	3	4	5	6	7	8	9	10	11
1981	5,073	290	97	40	10	11	12	96	1	23
1982	4,999	397	114	51	8	8	10	162	1	43
1983	5,571	373	121	53	0	3	7	144	4	41
1984	5,691	501	127	95	9	4	4	201	15	46

(continued on next page)

TABLE A1 (continued)

New Lists and Delists in the U.S. by Type, 1981–2020

Panel B. $DELISTS_t = MERGE_{Public\text{-}to\text{-}Public,t} + MERGE_{Public\text{-}to\text{-}Private,t} + MISC_{Del,t}$

				$MERGE_{Public\text{-}to\text{-}Private}$				$MISC_{Del}$		
Year	Listing Count (L)	DELISTS	$MERGE_{Pub\text{-}to\text{-}Pub}$	Acq. by U.S. Priv.	Acquired by Non-U.S. Public	Acquired by Non-U.S. Private	Acq. by Unknown	Cause	Voluntary	Unknown
1	2	3	4	5	6	7	8	9	10	11
1985	5,652	607	161	78	10	4	10	263	12	69
1986	5,930	708	169	94	23	2	16	317	10	77
1987	6,222	535	160	68	25	4	12	204	9	53
1988	5,955	704	164	145	36	10	13	275	15	46
1989	5,770	605	116	103	33	4	5	280	16	48
1990	5,634	550	97	57	26	5	8	307	7	43
1991	5,672	491	86	20	6	1	1	325	13	39
1992	5,801	520	115	16	2	0	1	328	21	37
1993	6,334	361	131	32	5	1	4	151	9	28
1994	6,634	449	200	28	19	0	1	157	9	35
1995	6,861	567	247	47	20	1	1	204	11	36
1996	7,325	565	305	57	25	4	0	152	6	16
1997	7,315	719	353	76	37	3	2	217	4	27
1998	6,873	967	392	98	47	7	0	368	5	50
1999	6,539	965	377	92	80	6	0	333	7	70
2000	6,246	879	373	109	74	5	0	273	8	37
2001	5,550	891	268	86	49	10	0	394	25	59
2002	5,129	590	161	50	15	4	0	286	28	46
2003	4,807	515	145	68	16	2	0	217	24	43
2004	4,750	376	162	67	14	2	0	94	17	20
2005	4,684	389	142	53	23	6	0	110	30	25
2006	4,616	369	146	82	23	7	1	76	7	27
2007	4,524	441	164	119	40	12	0	85	7	14
2008	4,259	410	105	71	40	3	0	143	25	23
2009	4,005	380	66	38	17	0	0	181	49	29
2010	3,874	326	97	71	22	3	0	105	18	10
2011	3,721	303	65	90	26	5	0	90	8	19
2012	3,601	282	81	76	16	4	0	84	5	16
2013	3,594	239	85	65	13	8	0	48	7	13
2014	3,713	197	79	41	18	3	0	36	6	14
2015	3,681	251	99	35	33	4	0	54	9	17
2016	3,542	293	101	56	27	13	0	84	2	10
2017	3,515	273	94	52	31	11	0	54	8	23
2018	3,520	211	85	42	21	6	0	42	3	12
2019	3,520	232	55	62	24	13	0	59	8	11
2020	3,633	198	39	37	21	8	0	64	13	16
Total		18,919	6,144	2,620	984	207	108	7,063	482	1,311
Average	5,108	473	154	66	25	5	3	177	12	33

acquiring firm using SDC, CRSP variables "acquiring PERMNO" and "acquiring PERMCO," or by hand using web searches.

The value of a new listing is the CRSP market cap on the day of the listing. If this value is unavailable, we use the earliest available market value within 2 weeks. To estimate the value of a firm at delisting, we use the CRSP variable "amount after delisting." If this is missing or equal to 0, we use CRSP delisting price instead. If the delist is not marked in CRSP (i.e., an unspecified delist), or if both amount after delisting and delisting price are missing, we use market cap on the day of delisting. If no market cap data are available on that day, we use the closest available data no more than 2 weeks before the delisting. If a firm (PERMCO) has two or more U.S. public PERMNOs (usually different share classes) simultaneously, we sum the value of these when calculating market cap.

Table A2 provides the annual distribution of the merger-adjusted new lists and delists used in the article. The motivation for the merger adjustment procedure, as well

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TABLE A2

Merger-Adjusted New Lists and Delists in the U.S. by Type, 1990–2020

Starting in year-end 1980, Table A2 shows the total annual (year-end) number of merger adjusted listings, $L_{A,t} = L_{1980} + \sum_{\tau=1981}^{t} \Delta L_{A,\tau}$, cumulated across NYSE, Nasdaq, and AMEX. The annual change in the actual listing count, $\Delta L_{A,\tau}$ is the sum of the following six variables, all of which are defined in Table 1 and equations (2)–(4) in the text:

$$\Delta L_{A,\tau} = \begin{cases} \text{NEWLISTS}_{A,\tau}(+): \ \text{IPO}_{\tau} + \text{MERGE}_{\text{Private-to-Public},\tau} + \text{MISC}^{N}_{\text{New},\tau} \\ \text{DELISTS}_{A,\tau}(-): \ \text{MERGE}^{N}_{\text{Public-to-Private},\tau} + \text{DIVEST}_{\text{Subsidiary-to-Private},\tau} + \text{MISC}^{N}_{\text{Del},\tau} \end{cases}.$$

The superscript N indicates that the count adjusts for the acquisition index (equation (4)). The subscript in MERGE^{N} and DIVEST indicates the direction of the change in the target's public/private status.

				$\text{MERGE}_{\text{Priv-to-Pub}}$						
Year	All-Merger-Adjusted Count (L_A)	NEWLISTS_A	IPO	U.S. Priv. Target	Non-U.S. Target	$\text{MISC}^{N}_{\text{New}}$	DELISTS_A	$\text{MERGE}^{N}_{\text{Pub-to-Priv}}$	$\text{DIVEST}_{\text{Sub-to-Priv}}$	$\text{MISC}^{N}_{\text{Del}}$
1	2	3	4	5	6	7	8	9	10	11
1981	5,320	812	309	160	1	342	208	80	8	120
1982	5,574	553	105	224	0	224	299	82	8	209
1983	6,551	1,248	638	298	1	311	271	69	8	194
1984	7,085	951	318	330	4	299	417	140	6	271
1985	7,264	691	293	103	3	292	512	145	5	362
1986	7,730	1,082	603	99	4	376	616	175	3	438
1987	8,220	936	453	96	4	383	446	158	7	281
1988	8,092	523	191	79	9	244	651	278	8	365
1989	8,016	531	181	99	18	233	607	186	14	407
1990	7,989	563	156	108	13	286	590	163	11	416
1991	8,183	692	344	124	18	206	498	40	18	440
1992	8,565	876	463	199	30	184	494	29	27	438
1993	9,488	1,229	587	297	29	316	306	62	27	217
1994	10,311	1,150	495	360	45	250	327	67	26	234
1994	11,130	1,250	514	389	59	288	431	107	26	298
1996	12,279	1,565	747	454	68	296	416	164	19	233
1997	13,010	1,262	490	469	82	221	531	209	13	309
1998	13,361	1,178	299	501	129	249	827	258	24	545
1999	13,592	1,140	467	384	105	184	909	326	16	567
2000	13,850	1,156	347	439	100	270	898	374	15	509
2001	13,305	473	76	216	59	122	1,018	274	25	719
2002	12,924	409	69	158	54	128	790	112	15	663
2003	12,705	416	68	134	46	168	635	155	13	467
2004	12,967	647	172	198	70	207	385	173	16	196
2005	13,073	623	160	208	71	184	517	234	20	263
2006	13,129	578	164	174	59	181	522	319	17	186
2007	13,137	653	195	214	66	178	645	456	22	167
2008	12,833	347	36	134	60	117	651	308	28	315
2009	12,452	239	44	70	29	96	620	151	14	455
2010	12,307	356	100	74	60	122	501	270	19	212
2011	12,084	350	88	117	57	88	573	375	18	180
2012	12,005	327	116	110	49	52	406	197	19	190
2013	12,085	427	173	81	61	112	347	217	10	120
2014	12,302	529	225	137	48	119	312	170	16	126
2015	12,340	437	140	136	53	108	399	195	21	183
2016	12,186	314	84	88	34	108	468	289	17	162
2017	12,174	397	140	93	43	121	409	258	19	132
2018	12,265	356	156	92	20	88	265	172	3	90
2019	12,190	361	153	78	26	104	436	261	9	166
2020	12,195	394	228	58	12	96	389	202	3	184
Total		28,021	10,587	7,782	1,699	7,953	20,542	7,900	613	12,029
Average	10,907	701	265	195	42	199	514	198	15	301

as the selection of the minimum size threshold for private targets, are detailed in the main text.[20]

A.2. Data on Economic Contribution of Listed Firms

In the Supplementary Material, we tabulate the values used to generate Figure 10: the annual amount of employment, gross product, R&D spending, and patents generated by U.S. public firms, the U.S. economy as a whole, and majority-owned foreign

[20]Recall from there that we designate an acquirer or target as "private" even if it trades over-the-counter or on a minor exchange in the U.S. or on a public exchange in a foreign country.

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affiliates (MOFAs), explained below. To calculate the contribution of public firms to U.S. employment, we follow the methodology of Schlingemann and Stulz (2022). For U.S. public firms, we collect the Employees (EMP) variable from CRSP/Compustat Merged Fundamentals Annual (CCM) database from WRDS. We only keep firms that can be matched to our CRSP sample of end-of-year public firms described above. If a firm is missing EMP in 1 year but not in adjacent years before and after, we replace the missing value with the average of the adjacent values. To find U.S. aggregate employment, we use non-farm employment in December of each year (not seasonally adjusted) as reported by the Bureau of Labor Statistics (BLS) (series ID: CEU0000000001). Since Compustat does not distinguish between the employment and gross product generated by U.S. multinational corporations (MNCs) in the U.S. versus abroad, it is necessary to adjust aggregate U.S. employment to also include output generated by MOFAs of U.S. MNCs. We therefore add MOFA employment from the Bureau of Economic Analysis (BEA) to U.S. employment reported by the BLS.

Schlingemann and Stulz (2022) also provide the methodology that we use to calculate the fraction of U.S. gross product (value added) attributable to public firms. Firm-level gross product is found by summing Operating Income Before Depreciation (OIBDP) and Staff Expense Total (XLR). To fill in missing values of XLR, we find the median ratio of XLR to EMP for industries with at least 20 non-missing observations (firms) in each year. For firms with missing XLR but non-missing EMP, EMP is multiplied with this median ratio to estimate labor expenses. Four industry classifications are used, in order of descending preference: Fama–French 17, Fama–French 12, 2-digit SIC, and finally BLS Supersectors. At the aggregate U.S. level, GDP is from the IMF and MOFA gross product is from the BEA.

To analyze the role of U.S. public firms in innovation, we look at both research and development (R&D) expenditure and patents. Firm-level R&D spending is found in CCM using the Research and Development Expense (XRD) variable. U.S. aggregate R&D spending is reported by the OECD (series name: GERD-SOF) and includes the source of funding. We include all sectors with funding from domestic sources. We also add MOFA R&D spending to the U.S. aggregate with data from the BEA. The BEA does not report MOFA R&D prior to 1989, so we estimate these values by assuming that the ratio of MOFA R&D to value added is the same in 1982–1988 as in 1989. Firm-level patents are from the University of Virginia Darden School of Business Global Corporate Patent Dataset (GCPD) (Bena, Ferreira, Matos, and Pires (2017)). The GCPD reports the annual number of utility patents granted by the U.S. Patent and Trademark Office (USPTO) to publicly listed firms around the world, with complete coverage from 1980 to 2016. After matching GCPD data to our CRSP sample of public firms and aggregating patent grants by year, we divide by the annual count of USPTO utility patent grants of U.S. origin.

A.3. Data on Non-U.S. Listings and Mergers

To select which countries are included in our international sample, we start with the top 100 countries and territories by GDP per the IMF and as of 2020. For each country, we require listing count data to be available from WDI, WFE, CEIC, or stock exchange homepages. We also require the 2020 listing count to be reported and the country to have at least 10 years of listing count observations. The full list of countries and territories included in each step of the sample selection procedure is available in the Supplementary Material.

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U.S. listing data are from CRSP as per above. For non-U.S. countries, the number of listed firms is sourced from WDI and supplemented when necessary with data from the WFE, CEIC, and foreign stock exchange homepages themselves. Data from the following stock exchange's homepages are used: Borsa Italiana, Boursa Kuwait, Bratislava Stock Exchange, Cambodia Securities Exchange, Central Africa Securities Stock Exchange (BVMAC), Euronext, Ghana Stock Exchange, Japan Exchange Group, Nairobi Securities Exchange, Nasdaq Baltic, Nasdaq Nordic, Pakistan Stock Exchange, Prague Stock Exchange, and TMX Group. In some cases, older versions of a stock exchange's homepage are accessed via The Wayback Machine.

The WDI data source raises some issues due to the merging of smaller local stock exchanges within a country. To account for this, we use the data sources listed above to record a consistent set of stock exchanges for each sampled country.[21] As in the U.S., we exclude investment companies, mutual funds, real estate investment trusts (REITs), and other collective investment vehicles.

We identify international merger transactions using SDC. Deals are required to be completed, result in 100% ownership by the acquirer, and take the deal form merger, acquisition, or acquisition of majority/partial/remaining interest (since the latter also results in delisting). To be counted as public, a target or acquirer must be listed on a major exchange. Targets listed on minor or OTC exchanges are counted as private.

We identify listing peaks if a country's actual listing count is lower in 2020 than earlier in the sample period. The listing-peak year is then the year of the country's listing count maximum. When a country has 2 identical peak years, we use the most recent year. For 5 non-advanced countries (Brazil, Bulgaria, Kenya, Nigeria, and Poland), there are 2 identical peak years. Furthermore, if a country has a second peak at least 10 years after the first and with a listing count within 95% of the first peak, we use the year of the second peak (Belgium, Mexico, Norway).

Appendix B. Further on U.S. Listing Gap Econometrics

In this appendix, we provide a detailed comparison of alternative ways to estimate the U.S. listing gap. While we use the parameter γ_t to compute the listing gap, Doidge et al. (2017) instead employ a non-U.S. dummy in their basic listing-gap regressions and use the year-fixed effect to compute the gap. In our vernacular, this alternative approach is equivalent to using $\gamma_t + \tau_t$ to compute the gap. To see why, consider the regression model in Doidge et al. (2017):

[21] For example, the WDI Canadian listings include only the Toronto Stock Exchange (TSX) prior to 2003, and the sum of the TSX and TSX Venture Exchange (TSXV) afterward (resulting in a 1-year jump in the number recorded listed firms from 1,252 to 3,578). The TSXV was formed in 1999 by combining regional Canadian stock exchanges (primarily Alberta and Vancouver). The firm population in these smaller regional stock exchanges is different from that of the country's major stock exchange(s): New ventures are typically smaller and more risky than the more established firms. Based on this population difference, and in order to preserve a consistent time series within any given country, we exclude changes in the WDI listing counts resulting from regional exchange consolidations. In the case of Canada, we therefore use the TSX listing count net of the TSXV. Similarly, for Japan, we exclude listings on the Osaka Exchange from the Japan Exchange Group (JPX) after the exchange consolidation in 2013. While the WDI listing count data for Spain include regional exchanges, these exchanges are consistent over time and we thus keep these data as recorded. Were we to instead use data from Spain's primary exchange (the Mercado Continuo) only, we would have observed a listing peak in 2007 instead of 2015.

(B-1) $$\ln(Y_{it}) = \alpha' + \tau'_t + \beta' D_{\text{Non-US}} + \Gamma'\left(D_{\text{Non-US}} \times \tau'_t\right) + \lambda' X_{it} + \varepsilon_{it}, t = 1990, \ldots, 2012, i = 1, .., N.$$

Their gap parameter in year t is therefore

(B-2) $$\begin{aligned} E(Y_{it}|D_{\text{Non-US}} = 0, \text{year} = t) - E(Y_{it}|D_{\text{Non-US}} = 0, \text{year} = 1990) \\ = \left(\alpha' + \tau'_t\right) - \alpha' \\ = \tau'_t. \end{aligned}$$

If we switch the country dummy back to our D_{US}, and noting that $E(Y_{it}|D_{\text{Non-US}} = 0) = E(Y_{it}|D_{\text{US}} = 1)$, it follows that

(B-3) $$\begin{aligned} \tau'_t &= E(Y_{it}|D_{\text{US}} = 1, \text{year} = t) - E(Y_{it}|D_{\text{US}} = 1, \text{year} = 1990) \\ &= (\alpha + \tau_t + \beta + \gamma_t) - (\alpha + \beta) \\ &= \gamma_t + \tau_t. \end{aligned}$$

Hence, the year fixed effect (τ'_t) estimated in Doidge et al. (2017) equals the sum of the year fixed effect τ_t and the gap parameter in this article γ_t, where τ_t is the portion of the U.S. listing trend that is common to the U.S. and all other countries.

The estimates provided in the first table of the Supplementary Material illustrate the impact of the two different econometric parameterizations of the U.S. listing gap—here and in Doidge et al. (2017). This table shows estimates of the listing-gap parameters γ_t, τ_t, and τ'_t when we use a U.S. dummy (columns 1 and 3, as in our analysis) and a non-U.S. dummy (columns 2 and 4, as in the earlier paper), respectively. This information allows us to isolate the impact on the U.S. listing-gap computation of the inclusion of τ_t. Columns 1 and 2, which exclude the country fixed effect δ_i in the estimation, show that $(\tau_{2020} + \gamma_{2020})/\gamma_{2020} = \tau'_{2020}/\gamma_{2020} = (-0.915)/(-0.506) = 1.81$. In columns 3 and 4, where country-fixed effects are included in the regression, the corresponding ratio is smaller: 1.27. In other words, in our analysis, including the global common trend in the listing gap computation (which we do not do) would have increased the size of the gap by 27% at minimum and 81% at maximum. Finally, note that using $-\gamma_t$ as the listing-gap parameter in a regression with a non-U.S. dummy produces exactly the same listing-gap estimate as using γ_t with a U.S. dummy.

The above analysis provides a basis for directly comparing the actual (not merger-adjusted) U.S. listing gaps reported by Doidge et al. (2017) and this article. For year 2012 (the last year in the sample period of the earlier paper) the two gaps are −5,436 and − 3,289 (both significant at the 1% level), respectively. The above difference in the two listing gap estimates is primarily driven by the earlier paper's inclusion of the common listing trend τ_t in their estimate. However, the two estimates also differ because we adjust for the growth in the dependent-variable scaling factor and take the antilog of γ_t (as per equation (9)). Other differences arise because of our inclusion of country fixed effects, somewhat different data sources for the listing count, a slightly different set of sampled countries, and a longer sample period (1990–2020 instead of 1990–2012).

Finally, in the Supplementary Material, we show that replacing our dependent variable with $\ln(L_{it})$ and using the scaling factor as a regressor does not alter our main

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conclusion using either the full sample of 74 countries or the subsample of 33 advanced economies.[22]

Supplementary Material

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[22]Lattanzio et al. (2023) also report listing-gap estimates, but with the unscaled actual (not merger-adjusted) listing count $\ln(L_{it})$ as the dependent variable—moving their scaling factors $\ln(\text{POP})$ and $\ln(\text{GDP})$ to the right-hand side as regressors. As Doidge et al. (2017), they use the equivalent of our parameter τ_t' to compute the listing gap (and hence do not filter out the listing trend that is common across countries). They also add country-level regressors in the form of aggregates stock market valuation, private equity volume, and merger activity, which helps to lower the listing gap estimates.

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