Can stock market noise promote economic efficiency? Evidence from industry mispricings

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Abstract

We document a way in which active markets for corporate control and firm entry and exit can make stock market inefficiencies instrumental to the promotion of economic efficiency. We show that industry level mutual fund flow price pressure has real effects on key economic industry variables. In particular, negative fund flow price pressure is associated with an increase in M&A activity, both within and across industries as well as reduced entry and increased exit in the industries affected. We also show that funds' flow induced selling price pressure increases competitiveness and has a modest positive effect on productivity in the year following the event. Our results suggest that forecasting price inefficiency (where noise predicts future returns) can lead to improved allocative efficiency (where prices promote a more efficient use of resources).

Keywords: *Mutual fund fire sales, market frictions, price pressures, M&A, entry/exit, competition*

I. Introduction

The information content of security prices *and* their role as signals shaping economic decisions, are two central issues in modern financial economics (Bond et al. (2012)). In his seminal contribution, Hayek (1945) posited that stock prices have real effects since they aggregate and reflect agents' fundamentals information. However, if prices are efficient, the very fact that agents exploit the information they convey may potentially weaken their power as signals shaping real decisions. This is because efficient prices anticipate the corrective behavior that agents put in place as a response to the information they glean from them. As a result, a given price realization may be a signal of two distinct fundamentals values providing equivocal information to decision makers. For example, a low price realization can hint at a poorly performing CEO, which may induce a replacement decision, or to the fact that the company's CEO is in fact not that bad, which may instead fend-off such an attempt (Bond et al. (2009)). However, the fact that prices also reflect "noise" besides fundamentals (Black (1986)), may paradoxically work to reaffirm their power to guide real decisions. Indeed, price dislocations that occur outside of managerial control (that is for given fundamentals values), may offer profitable acquisition opportunities to skilled outside investors (Shleifer and Vishny (2003)).

In this paper we provide evidence that the presence of noise in stock prices may *promote the efficient allocation of resources at an aggregate level*. We focus on industrywide "price pressures"—i.e., changes in stock prices that are orthogonal to fundamentals *and* impact *industries' market valuations*—and show that these boost acquisition opportunities, reduce industry entry and increase industry exit in the industries they affect. We then offer evidence that such acquisitions are in turn efficiency boosting, in that they have both a pro-competitive *and* a productivity-enhancing final effect.

Starting with Coval and Stafford (2007), the literature has used mutual fund "fire sales" to instrument for noise, arguing that these correctly identify uninformed investors demand shocks and that they impact real economic decisions. For example, using anticipated liquidations by mutual funds (based on the combination of pre-fire sales fund holdings and outflows), Edmans, Goldstein and Jiang (2012)

argue that firms affected by a liquidation shock experience a market discount and have a greater probability of being taken over in the future. However, recent work by Wardlaw (2020) questions whether this is the case. Wardlaw (2020) shows that the fire sales measure of Edmans et al. (2012) in a given quarter is correlated with the next quarter's return of the stock experiencing mutual funds' fire sales, a feature that can compromise the orthogonality to fundamentals of the fire sales measure. Wardlaw (2020) then goes on to construct an alternative measure of price pressure at the firm level, which is unaffected by this problem, further raising doubts on the validity of the real effects documented by the prior literature.[1]

Importantly, while the existence of "firm level effects" attests to the real impact of stock markets, it fails to address the issue of stock prices' potential impacts for the wider economy, leaving the question of the allocational role of stock market prices unresolved. For example, uninformed traders' demand shocks may hit different firms in opposite directions which may lead to price pressures that in net terms have no effect for the productive sector at large. In this paper, we therefore look at the impact of price pressure on efficiency and resource allocation at the *aggregate* level. To do this, we study the impact of industry level price dislocations by constructing an industry level Wardlaw (2020) measure of price pressure[2]. We find that industry level selling pressure is associated with greater subsequent M&A activity – that is, considering both private and public deals – and the effect is present regardless of whether measured using the number or the value of M&A deals. The effects we document are of comparable magnitude with recent results in Ortiz et al (2022) showing how mandatory disclosure regulations of Europe's private firms affect M&A activity.

We also show that a negative price pressure affecting a given industry is associated with an increase in both the number of same- and inter-industry deals with a stronger effect on cash-funded acquisitions. This latter finding suggests that negative pressures render targets "cheap", making their cash funded acquisition more desirable, in line with Shleifer and Vishny (2003). We also find that following

[1] We discuss in the *Discussion and Interpretation of Results* section reasons for the differences between our findings and the findings of Wardlaw (2020).
[2] Our approach differs from that of Dessaint et al (2012). Whereas they focus on the peers of each listed firm using US data, we focus on a country-industry at the 3-digit SIC level.

price pressures, the affected industry experiences a reduction in entry and an increase in exit. Firms may be dissuaded from entering an industry if the firms within the industry are undervalued and this may also induce an increase in firm exit if firms feel that they are not being fairly valued.

We go on to investigate the impact of the increased M&A activity, greater exit, and lower entry on industry level competitiveness. Fathollahi et al. (2022) show that an increase in M&A activity increases industry concentration mostly when firms have high levels of product similarity and belong to highly concentrated industries. In our context, however, fire sales induce both *same* and *cross* industry mergers and our sample encompasses all sectors. This means that it is not ex-ante clear whether industry level competition will go down as a result of the increase in M&A activity together with reduced entry and increased exit resulting from fire sales. When we turn to the data, we find that mutual fund fire sales have a positive impact on industry level competitiveness: both the Herfindahl index of market share concentration and measures of the dispersion of industry profitability decrease.[3]

In the last section of the paper, we examine the consequences of fire sales for industry level productivity. We measure industry level productivity using both total factor productivity and labor productivity measures and for both measures we look at the effect of fire sales on the level and dispersion of productivity. When we do so, we see clear evidence that fire sales increase the average level of productivity and reduce its dispersion. Overall, it therefore appears to be the case that fire sales enhance industry level productivity, improving resource allocation.

Our paper makes a number of contributions. First, we contribute to the literature on mutual funds' fire sales by adding to our understanding of both the channels and the effects of fire sales on the real economy. While existing work has mainly focused on outcomes at the individual firm level (e.g. M&As in Edmans et al (2012), corporate investment (Dessaint et al (2019), among others), the impact of aggregate fire sales on aggregate M&A activity has received less attention. In addition, work to date has

[3] Which has been shown in the industrial organization literature to be a useful measure of market power (Hsieh and Klenow (2009)).

not shown the effect of fire sales on firm entry/exit and has not considered the impact of fire sales on competitiveness and productivity.

Second, we contribute to the empirical literature on market efficiency. Our paper shows that prices that are *less* driven by fundamentals information and *more* by noise (and that are thus less "informationally efficient") can actually induce efficient real decisions that have a pro-competitive and a productivity-enhancing effect. In a sense, our results also shed some light into how mutual fund driven noise, through fire sales, is a channel through which mutual funds' conduct can influence the real economy.

Finally, we contribute to the literature on the effects of firm disclosure. The existing literature has discussed the effect of improved firm disclosure on market efficiency with the majority of papers suggesting that disclosure enhances price efficiency (e.g. Diamond (1985), Diamond and Verrecchia (1991)), that it impacts the return variance of the firm's stock return (Shin (2003)), or that it clusters around public announcements (Acharya, De Marzo and Kremer (2011)). Furthermore Breuer (2021) and Ortiz et al (2022) show that greater firm disclosure can also enhance industry competition, positively impact industry productivity, and increase M&A activity. Our paper complements the existing literature by showing that an increase in the impact of noise in stock prices, which represents to some extent the logical opposite to more disclosure, can, via its effect on competition and productivity, have efficiency enhancing real effects.

The rest of the paper has the following structure. Section II reviews the related literature. In Section III we introduce our data and discuss our sample's descriptive statistics. In Section IV we present our empirical results on the effects of industry level flow pressure on industry level M&A, entry, exit, competitiveness, and productivity. Section V discusses and interprets our results. Section VI conducts robustness tests and Section VII concludes.

II. Literature

Our paper is concerned with the industry-level real effects of fire sales on M&A, entry and exit, competition, and productivity. This literature review therefore first discusses prior work that has looked at the real effects of fire sales and then goes on to discuss papers that shed light on the channels through which fire sales affect the real economy.

Coval and Stafford (2007) are the first to propose the use of redemption induced sales by mutual funds as a proxy for non-fundamental driven stock demand. In their paper, these authors show that mutual fund fire sales induce an initial fall in the stock prices of the firms held by funds which in turn, leads returns to decline. Once forced sales dissipate, returns recover and keep doing so over the 12 months following the fire sales event, thereby inducing a V-shaped return pattern which is consistent with a price pressure effect prompted by stock demand not driven by fundamentals information. Indeed, Coval and Stafford (2007) show that stocks which experience fire sales enjoy positive long run returns for about 24 months. Frazzini and Lamont (2008) then extend the literature to show that stocks bought by mutual funds experiencing disproportionate inflows underperform in the long-run. Both papers demonstrate that large mutual fund flow shocks lead to long-term price dislocations that create financial market opportunities.

The literature has also demonstrated both theoretically and empirically that stock price dislocations can have an impact on the real economy, via the effect they have on the market for corporate control. Shleifer and Vishny (2003) use a behavioral model to explain time variation in M&A activity and in the patterns of financing used. They argue that rational managers exploit price dislocations via takeovers. Likewise, Edmans et al. (2012) demonstrate that firms whose stock prices decline due to price pressure face an increased probability of being taken over while Khan et al. (2012) show that firms whose stock prices increase due to mutual fund inflows are more likely to engage in SEO's and stock financed M&As.

More recent work by Wardlaw (2020) argues that mutual fund fire sales are a contaminated measure of noise and demonstrates that the stock level quarterly fire sales measure of Edmans et al. (2012) is by construction correlated with the next quarter's return for the same stock. Wardlaw (2020) goes on to construct an uncontaminated measure and shows that this does not induce a V-shaped pattern in the time series of the funds returns, and importantly does not induce real effects. We take stock of Wardlaw (2020) and build an industry level Wardlaw (2020) measure and show that when we apply it at an industry level, even this uncontaminated measure has real effects, impacting M&A activity, competitiveness, and productivity.

Prior work has also shed light on the channels through which fire sales might affect real economic outcomes. Fathollahi, Harford, Klasa (2022) examine why same industry mergers and acquisitions do not always have a detrimental effect on industry competition. They construct a measure of industry level product similarity based on textual analysis of 10k reports. Using this measure, they show that same industry mergers are more common when there is greater product similarity, and that horizontal mergers and acquisitions have a greater negative effect on competition when there is greater product similarity. Their paper has relevance for our study as one channel through which fire sales affect industry competition is through within industry mergers and acquisitions. In contrast to this study our paper also looks at cross industry mergers and acquisitions and entry and exit as vehicles through which fire sales can affect industry level competitiveness.

The link between mergers and acquisitions and productivity has been studied in the prior literature. For example, Maksimovic and Phillips (2001) show that partial firm asset sales have a positive impact on productivity while McGukin and Nguyen (1995) demonstrate that plant ownership change is positively related to plant productivity growth.

III. Data and Summary Statistics

For our analysis we marry together data from a number of sources. Our measure of price pressure is based on the flow to stock measure of Wardlaw (2020). This requires data on fund flows, fund

holdings, fund sizes and shares outstanding held by mutual funds. We collect data on mutual fund holdings, sizes and flows of all funds sold in Europe and domiciled in Europe from the Morningstar Direct database for the period 2003 to 2017. This includes not only funds that hold domestic securities but also global funds that may invest in Europe. We include equity and mixed funds that include equity and other asset classes such as fixed income. We gather data on shares outstanding in each firm from the Compustat database. Table 1 contains data on the number of funds in the 17 countries in our sample together with data on the distribution of fund flows. The country with the largest number of funds is Luxembourg as many funds that are sold across Europe are domiciled in that country.

[Insert Table 1 about here]

We follow Edmans, Goldstein Jiang and Wardlaw (2012) and Wardlaw (2020) and define fire sales as occurring when funds experience outflows of greater than 5% of total assets in a given quarter. Table 2 contains data on the time distribution of these flow shocks in our sample. The number of funds affected by fire sales each year is calculated as the number of funds that experience fire sales in at least one quarter in the year concerned. The number of industries affected by fire sales each year are also calculated in the table by counting the number of industries where at least one of the stocks within the industry is held by at least one mutual fund that experiences outflows of greater than 5% in at least one quarter in the year concerned. While the number of funds affected by flow shocks does go up following the global financial crisis there are a substantial number of flow shocks distributed across all the years of our sample, indicating that our results are not simply a post global financial crisis phenomenon.

[Insert Table 2 about here]

We measure negative flow pressure in two ways. We take all funds experiencing fire sales in a given quarter. Using these funds, we then calculate the value weighted Wardlaw Flow To Stock (FTS)

measure quarterly for all stocks in a given SIC-3 digit industry in each country affected by these fund fire sales. As our dependent variables such as productivity are annual, we aggregate up our value weighted quarterly Wardlaw FTS measures to an annual level and use these as our measures of industry level negative flow pressure. We label this variable *Negative MFFlow.*[4] We also calculate an annual industry level negative flow dummy based on whether *MFFlow* is positive or not and we label this *Negative MFFLOW Dummy*.

Table 3 Panel A presents statistics on our country-industry-year level flow pressure measures and the proportion of firm capitalization affected. As can be seen in the first row, the negative flow dummy is 0.18, meaning that 18% of country-industry-years in our sample are affected by mutual fund price pressure. On average, 15% of the capitalization of the industry is affected, but as the 90th percentile shows, for those affected industries almost 100% of the capitalization is affected.

[Insert Table 3 about here]

We then relate these measures of price pressure to subsequent year industry level mergers and acquisition activity and to subsequent year measures of industry concentration and productivity. We collect data on European mergers and acquisitions for the 2003 to 2018 window from Zephyr (Bureau van Dijk). As in previous work (Rossi and Volpin, 2004; Larrain, Tapia, and Urzúa, 2017), we restrict our sample to private deals where control is reallocated: i.e., those where the acquirer has less than 50 percent

[4] We define $FlowtoStock(FTS)_{i,t} = \sum_j^m \frac{|F_{j,t}|}{TA_{j,t-1}} \times \frac{SHARES_{i,jt-1}}{SHROUT_{i,t-1}}$

The flow to stock measure for stock i at time t is the sum across all m funds j that hold the stock of the absolute value of flow (*F*) into fund j at time t divided by the *TA* (total assets) of fund j at time t-1 multiplied by the number of shares (*SHARES*) held by fund j in stock i at time t-1 divided by the shares outstanding (*SHROUT)* of stock i at time t-1. As $|F_{j,t}|$ is positive, TA is positive as are SHARES and SHROUT, this means that FTS is generally positive or zero.

of the target's shares before the deal and more than 50 percent after in private targets, or less than 20 percent before the deal and more than 20 after having acquired a stake larger than 10 percent for listed targets. We measure M&A activity using the number of deals and the sum of targets assets and we aggregate these at the SIC three-digit country-year level.

We calculate industry level entry and exit using data from Amadeus, which covers the universe of European firms thanks to mandatory disclosure regulations for private firms (Bernard et al 2018). For each country-industry-year we count the number of firms incorporated in that year, which we label *Firm entry SIC3*. Next, we count the number of firms that exit Amadeus at the same level of aggregation. Since all firms, regardless of their size, are required to report some financials, exiting the database means that they cease to exist. We label this variable *Firm exit SIC3*.

Table 3 Panel B presents summary statistics on M&A deals and firm entry and exit for the 61,185 country industry years in our sample. The mean number of deals for each country industry year is 1.16. The table breaks down the number of deals into same industry and different industry deals, which we define as those having an acquirer and target in the same SIC3 industry, and those involving firms in different SIC2 industries, respectively.[5] The number of same industry deals is 0.54 while the number of different industry deals is 0.51. The table also breaks down the number of deals by means of payment. Data is only available for approximately one third of deals and for those deals for which we have data, 0.11 deals on average are paid for in cash, 0.040 have a mixed payment (i.e., cash and stocks) while 0.03 are paid for in stock.

We then follow Breuer (2020) in assembling data on three types of variables that help us assess the impact of price pressure on the real economy. First, we calculate variables that capture the level of competitiveness in an industry. When it comes to industry competitiveness, our main proxy is market-share concentration, which we measure as the sum of squared market shares (HHI). In addition, we also calculate industry profitability, which we measure as EBITDA over sales. We calculate its mean, standard

[5] As certain SIC-3 digit industries can have similarities, we define different industry M&A in this case using SIC-two digit industry criteria to make sure that different industry mergers and acquisitions are clearly between different industries.

deviation, 80th and 20th percentiles, and the distance between them. Firms in industries where competition is weaker tend to exhibit a larger variability in their profitability. The impact of price pressure could affect competitiveness either way. If targets and exiting firms are underperforming, we could expect an increase in competition. If, on the other hand, price pressure means that best performing firms are relatively cheap, the opposite could happen. Table 3 Panel C presents statistics on our country-industry level competition and profitability measures.

Then we construct variables that measure total factor productivity (TFP), aiming to understand resource misallocation. Finally, we complement our measures of TFP by looking at labor productivity. For all these variables the data is from Amadeus, covering the years 2003 to 2018. We organize the data at the SIC three-digit country year level.

We look at resource misallocation by calculating revenue-productivity. As with EBITDA over sales, we calculate its mean, standard deviation, 20th and 80th percentiles and the distance between them. Hsieh and Klenow (2009) discuss how a larger dispersion of revenue-productivity signals a poor resource allocation. The rationale behind is that there can be frictions allowing the existence, within an industry, of very inefficient firms or firms with significant market power. We use an index approach measure of revenue-productivity based on Syverson (2011), which captures both levels of variability that is technical or regards pricing (Foster et al 2008)).

Third, we also collect data on labor productivity, which we define as the log of sales over the number of employees. As with previous variables, we construct its mean, standard deviation, 20th and 80th percentiles and the distance between them. Table 3, Tables D and E present statistics on our country industry revenue and labor productivity measures. Variable definitions are in the Appendix.

IV. Empirical results

In this section we present our results on the effects of industry level price pressure on industry level mispricing, M&A, entry, exit, competitiveness, and productivity.

IV a. Price Pressure and Mispricing

In this subsection we first examine whether industry level selling price pressure is correlated with significant distortions in industry valuations that could render targets cheap and entry decisions unattractive. Figure 1A plots country industry adjusted returns around fire sales in event time. In particular, we calculate for each country-industry the maximum value weighted Wardlaw measure which indicates the year in which the largest outflow induced shock occurs over the full sample period. The figure shows the coefficients and confidence intervals of a regression of industry-country yearly returns on dummy variables around the maximum outflow induced event while controlling for country-industry and year fixed effects. As can be seen, adjusted returns are positive and significant over the two years before the shock. However, in the year of the shock they turn negative and significant and then recover over the next two years.

[Insert Figure 1A about here]

One problem of our value weighted Wardlaw measure is that, by construction, it mixes the intensity of the selling shock caused by mutual funds with the market capitalization of the firms affected as it gives more weight to firms with larger market capitalization. To separate out these two effects, in Figure 1B we plot country-industry adjusted returns around fire sales in event time but instead separate out observations into four groups along the two dimensions of percentage of industry affected (High% or Low%) and strength of shock (strong or weak). We define a high percentage shock as occurring when all firms in an industry are affected by fire sales and a low percentage shock when not all firms are affected. A strong shock is defined as occurring when a country industry experiences its maximum outflow shock over the full sample period while weak shocks are shocks where our Negative MF Flow variable takes a value close to the median.

The figure clearly shows that when there is weak shock the percentage of the industry affected does not matter a great deal. However, when there is a strong shock the percentage of the industry

affected does clearly matter, as the High%/Strong shock panel of Figure 1B shows a much more marked and protracted fall in country-industry adjusted price than is the case in the Low%/Strong shock figure.

[Insert Figure 1B about here]

IV b. Price Pressure, M&A activity and Entry/Exit

We next turn to our regression analysis relating M&A activity to price pressure. If industries have more firms then this may mechanically affect the number of mergers and acquisitions. In addition, if a larger proportion of the industry is listed then any negative price pressure shock may reverberate more strongly in the remaining private firms. We therefore control for these two variables in all our regressions. We also include industry-year and country-year fixed effects to control for the possibility that industries go through different consolidation cycles and to control for macroeconomic conditions that affect M&A activity (Harford 2005).

[Insert Table 4 about here]

Table 4 equation 1 shows that the negative price pressure dummy is associated with more deals the year after the shock while equation 3 shows that this is still the case even if we measure price pressure based on the actual level of negative price pressure for the industry concerned. Equations 2 and 4 show that these regression results still hold if we control for positive mutual fund flow shocks in the country industry year concerned, where positive mutual fund flow shocks mirror negative ones in that they are defined as flow shocks that are greater than plus 5% of the fund concerned. Our subsequent regressions have the same tenor regardless of whether we include or not positive flow shocks, and therefore do not include these in our subsequent regressions for the sake of simplicity.

Table 4 equations 5-8 show that negative price pressure (whether measured in dummy form or in absolute level) is also associated with a greater sum of targets' assets involved, suggesting that the deal activity that we observe is not exclusive to the smallest firms. Table 4 therefore shows that both the number and the value of mergers and acquisitions undertaken in an industry are boosted by mutual funds' selling pressure. In terms of economic significance, the coefficients in columns one and two of Table 4 suggest that industries affected by a mutual fund fire sale shock in year(t-1) have 11-20% more mergers and acquisitions in year(t), a sizable effect.

Table 5 shows the effect of mutual fund flow shocks on firm entry and exit. Negative mutual fund flow shocks depress valuations in the industry concerned making industry entry less attractive and increasing the push to exit the industry and equations 1 to 4 demonstrate this. In terms of economic significance, the coefficient in column one suggests a drop in firm entry of 2.6% whereas that in column three points to an increase in exit of 4.4%. Compared to their respective means, the effect on entry is equivalent to a 0.87% increase (0.026/2.96), while that on exit represents a 1.6% increase.

[Insert Table 5 about here]

Given the mixed effect that horizontal mergers can have on industry competition (e.g. Shahrur (2005) Bhattacharyya and Nain (2011)), Table 6 also presents regression results of the effects of mutual fund flow pressure on both horizontal and diversifying (e.g., different 2-digit SIC code) mergers. We accompany these results by showing how price pressure affects deals' method of payment. The first two columns in Table 6 show that both the number of same industry and different industry deals are boosted by the presence of a flow shock[6]. Importantly, these results are also economically significant, with the coefficients suggesting a 13-14% increase in the number of deals following the shock – a sizable effect if we consider that the mean for same industry (diversifying) deals is 0.20 (0.22).The last three columns

[6] These results are also robust if we look at the sum of targets' assets, both for same industry and diversifying deals.

indicate that the number of deals where cash is used as the means of payment is greater than the number of deals where there is mixed payment or payment in stock. This is consistent with the predictions of Shleifer and Vishny (2002) who argue that if an industry is underpriced then there will be more payment in cash.

[Insert Table 6 about here]

IV c. Price Pressure and Industry Competitiveness

Our results so far show that following a price pressure shock, industries have more mergers and acquisitions, both horizontal and diversifying, less entry, and more exit. Since these may affect competition, in Table 7 we investigate the link between industry level competitiveness and price pressure shocks. We measure industry level competitiveness in various ways. The first measure we use is the Herfindahl-Hirschmann index for the industry concerned (HHI) calculated as the sum of squared market shares which is a measure of industry concentration. The second industry level measure of competitiveness is the EBITDA/Sales measure of profitability. Stigler (1961) and Jensen (2007) both mention that profit margins may be a measure of informational barriers to competitionleading to the violation of the law of one price. Both papers therefore suggest that competitiveness of a sector increases when dispersion and distance of EBITDA/Sales goes down.[7]

[Insert Table 7 about here]

7 We measure Dispersion (EBITDA/Sales) as the Standard deviation of EBITDA scaled by sales (normalized by the average EBITDA/Sales ratio). Distance (EBITDA/Sales) is measured as difference between the 80th and 20th percentile of EBITDA scaled by sales (normalized by the average EBITDA/Sales ratio).

Table 7 Equation 1 shows that negative flow shocks decrease industry concentration as measured by the HHI index. The 1.5% drop in HHI that column one documents represents a 13% drop when compared to the median (11.4%). To put this finding in perspective, this result is comparable to the drop in concentration in Breuer (2020), who studies how European mandatory disclosure regulation of private firms affects resource allocation. In our remaining regressions in this table, we look at industry profitability. In Equation 2, we study the effect of flow shocks on industry profitability, and we can see that there is a modest increase in its level of 0.4% (the sample mean is 16%). Our results in Equation 3 further point to an increase in competitiveness, as the dispersion of profitability drops by 6% compared to the mean (0.006/0.093) following a price pressure shock. Column 4 of the table shows that the effect of flow shocks is to reduce the distance between the 20^{th} and 80^{th} percentiles but that the change is not large enough to be statistically significant and this is consistent with both the 20^{th} and 80^{th} percentiles going up in columns 5 and 6.

IV d. Price Pressure and Resource (Mis)Allocation

We next examine the effects of negative industry flow shocks on measures of allocative efficiency at the industry level.

[Insert Table 8 about here]

Table 8 Panels A and B show our regression results for TFP and labour productivity. Both of our employee-based measures of the level of productivity, whether based on total factor productivity or labour productivity, indicate that productivity rises following industry negative fund flow pressure shocks. In addition, all our measures of productivity variability show a significant decline following industry negative fund flow pressure shocks. Both these pieces of information indicate that resource allocation improves following negative flow shocks. When we calculate the economic effect of mutual fund fire sales on industry productivity, we find that TFP increases by 2% following mutual fund fire

sales (the mean is 9.01). The effects on resource misallocation are more relevant, as following the price pressure shock dispersion drops by 0.7%, a 6.4% compared to its mean. Table 8 Panel B paints a similar picture, with modest improvements in labor productivity but larger reductions in dispersion.

V. Discussion and Interpretation of Results

Our results show that negative *industry level* price pressures induced by mutual funds' fire sales, may cause listed prices of an industry stocks to fall and subsequently recover. We show that this fall in prices is accompanied by a change in the governance and industry structure of the affected industry. Specifically, the fire sales shock induces an increase in mergers and acquisitions, and also an increase in exit and a reduction in entry. We then examine the combined effect of this shock on the competitiveness of the affected industry and find that it leads to a statistically significant positive impact on competitiveness. This is the case whether we measure competitiveness using the Herfindahl index of market share concentration or through the variability of profitability across the industry. Finally, we investigate whether there is any impact of these changes on the productivity of the industry, and find that levels of productivity rise after fire sales while productivity variability falls. Both these findings suggest that noise can induce a superior allocation of resources.

Fathollahi, Harford, Klasa (2022) show that the impact of horizontal mergers on competition within an industry depends on the degree of product similarity and concentration within industries, with industries with high initial levels of product similarity and high concentration experiencing the biggest reduction in competitiveness following horizontal mergers. We revisit the findings in Fathollahi et al (2022) as they can help us explain why mutual fund fire sales driving an increase in horizontal mergers and acquisitions, reduced entry, and increased exit are not followed by reduced competitiveness. Following their approach, we partition country industries into two groups: one with high initial levels of concentration and product similarity, and the other with the opposite characteristics. While our results show that fire sales lead to more M&A deals in both samples (columns one and five), the significant reduction in competitiveness that we document seems to exist only in country industries outside those

with high concentration and high product similarity, as can be seen when comparing columns two to four with columns six to eight in Table 9, Panel A. Overall, our results are in line with Fathollahi et al.'s (2022) finding that horizontal mergers depend on initial levels of competition and product similarity.

[Insert Table 9 about here]

Our results so far show that mutual fund fire sales can cause price dislocations that induce increased M&A activity, reduced entry, and increased exit. It can still be the case however, that our *Negative MF Flow Dummy* proxies for other time-varying country-industry characteristics. To explore this possibility we construct an industry-wide version of *Negative MF Flow Dummy* that considers all listed firms within each 3-digit SIC industry, regardless of the country. Regressing this industry-wide variable in country-industries without listed firms provides a cleaner test of whether the transmission occurs through industry-wide price dislocations or through other channels. Columns one to six in Table 9, Panel B, show our results for country-industries without listed firms. While the effects of negative flow shocks are obviously stronger in country-industries with both listed and unlisted firms, there is still a positive and significant effect on M&A activity in country-industries without listed firms as shown in column one. And we also see an improvement in competitiveness in column four, as the coefficient for HHI is negative and significant. Overall, the effects of negative shocks appear greater when industries contain more listed companies., as expected, but we do see a significant effect on those without listed firms, in line with the industry level price dislocation channel.

We further explore the importance of public markets. In countries where industries are dominated by listed firms, private firms are likely to be more responsive to investment opportunities given the richer informational environment (Badertscher et al (2013)). Since these countries are likely to have a greater fraction of stock-market capitalization to GDP ratio, we sort countries by stock market capitalization to GDP into high (above median) and low stock market capitalization to GDP (below median) countries and Table 9 Panel C presents our results for these sub samples. Our results echo the results of Table 9 Panel B

as for countries where the stock market capitalization is greater and where there is a greater dominance by listed firms we find that there is a greater effect of negative flow shocks on mergers and acquisitions, entry and exit, on industry concentration and on productivity.

Wardlaw is skeptical of the real effects of flow induced mispricing on mergers and acquisitions.[8] How can we reconcile our findings of real effects of fire sales with Wardlaw (2020)? The difference between our results and Wardlaw's findings are likely to stem from the numerous differences between our analysis and Wardlaw's tests. Below we highlight a few of the key differences. First, our study uses a sample of mutual fund shocks taken from the European fund industry rather than the U.S. fund industry and there are many notable differences between these mutual fund industries. According to Investment Company Institute figures (2021), the number of funds in Europe is nearly 6 times the number of funds in the United States and despite this the assets under management of the European fund industry is only two thirds the assets under management of the U.S. fund industry, making fund sizes considerably smaller in Europe than in the U.S. These figures suggest that the size distribution of shocks both across time and across funds are likely to be different between the Wardlaw sample and our sample. Second, our study contains private firms while Wardlaw's paper includes only listed firms. In our paper, the majority of the impact of shocks on mergers and acquisitions and entry and exit is felt by private firms which may explain why we detect a significant impact of price pressure on M&A activity. Third, our study is conducted at the country-industry level while Wardlaw's analysis is at the firm level which means that our study looks at the aggregate impact of fire sales taking into account the impact on not only the firm experiencing the fire sale but also on other firms within the industry. Fourth, our study includes multiple countries and allows for cross-border interactions while Wardlaw's study does not. All these differences create the possibility of the differences between our findings and Wardlaw's analysis.

[8] Using firm level regressions Wardlaw (2020) shows that the discount in the industry-adjusted Q ratio of firms is not significantly affected by his flow to stock measure of price pressure. In addition, he estimates firm level probit regressions using his flow to stock price pressure measure as an instrument for the discount and he finds that his price pressure instrument fails the weak instrument test. He states that his results suggest that "future research should treat existing evidence on the real effects of flow induced mispricing with scepticism."

VI. Robustness

In this section we discuss various robustness tests. We first present tests that involve splitting the sample in various ways and then discuss tests based on alternative variable definitions.

As stock market conditions might affect the intensity with which M&A and entry/exit occur from a given industry we check whether our results are different between hot and cold markets. We define hot markets as occurring when the main stock market annual return in the country concerned is above the median annual return level (across the country years in our sample) while a cold market is defined as occurring when the country concerned is below the same median annual return level. The results presented in Table 10 show that our results carry over to both hot and cold markets although the effect of negative flow shocks is slightly more muted in cold markets.

[Insert Table 10 about here]

Next, we turn to alternative definitions of some of our key variables. The flows data that we use in the main body of the paper is downloaded from the Morningstar Direct platform. This is based on actual flows data provided to Morningstar directly from fund families. Most US studies using mutual fund fire sales use institutional investor 13F filings to imply flows based on fund returns and fund sizes. To check whether implying flows instead of using actual flows makes a difference to our results we also calculate our mutual fund flow pressure measure using implied flows based on fund returns and fund sizes using exactly the same method that most US papers use. Table 11 Panel A demonstrates that this makes little difference to our results. Our negative flow pressure measure is based on the value-weighted Wardlaw measure. We also check whether equally weighting the Wardlaw measure makes any difference and we show in Table 11 Panel A that this is not the case.

Table 11 Panel B investigates whether using the value-weighted Edmans Goldstein Jiang (EGJ) flow pressure measure instead of the value weighted Wardlaw measure makes a difference to our results.

The EGJ measure is typically negative by construction which means that our coefficients should have exactly the opposite sign to our coefficients when we use the Wardlaw measure.[9] We find that the qualitative economic effects of negative flow shocks are preserved when we use this measure instead. The EGJ flow pressure measure is criticized by Wardlaw (2020) for implicitly being correlated with stock returns and so to purge the EGJ measure of this correlation we regress the value weighted Edmans Goldstein, Jiang (2020) measure on country industry returns and take the residual and we call this measure the residual EGJ measure.[10] Our results show that even with the residual EGJ measure we get a significant effect of fire sales on industry level competitiveness and productivity.

Finally, we investigate the span of the effect of fire sales on country industry variables. Table 12 shows that there is a significant effect of a price pressure shock on mergers and acquisitions in the first, second and third years after the shock event.

VII. Conclusion

In this paper we document a way in which stock market inefficiencies can promote *aggregate* economic efficiency. We build an *industry-level* mutual fund flow price pressure measure that is in line with Wardlaw (2020) and show that industry-level fire sales have real effects on key economic industry variables. In particular, negative fund flow price pressure is associated with an increase in mergers and acquisition activity, both private and public and within and across industries. In addition, the same flow pressure is associated with an increase in firm exit from and a decrease in firm entry to the industry

[9]Wardlaw (2020) shows that the Edmans, Goldstein, Jiang (2012) flow pressure measure EGJ $EGJ(i,t) = (-1) \times FTS \times \left(\frac{1}{TURNOVER_{i,t}}\right)\left(\frac{1}{1+r_{i,t}}\right)$. is typically negative. This is because the flow to stock (FTS) measure is positive, turnover is positive and one plus the return is typically positive.

[10] Wardlaw (2020) states that "This direct effect of the inclusion of the quarterly gross return in MFFlow is the primary determinant of the correlation between MFFlow and equity returns during the event quarter."

concerned. We also show that mutual funds' flow-induced price pressure affects industry concentration, profitability, and productivity, overall improving resource allocation. Our results are consistent with the view that forecasting price inefficiency (where noise can predict future returns) can lead to improved allocative efficiency (where prices can promote a more efficient use of resources).

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Figure 1A: Yearly Country-Industry Adjusted Returns around Mutual Funds Fire Sales

The following table plots country-industry adjusted returns for industries in event time around fire sales.

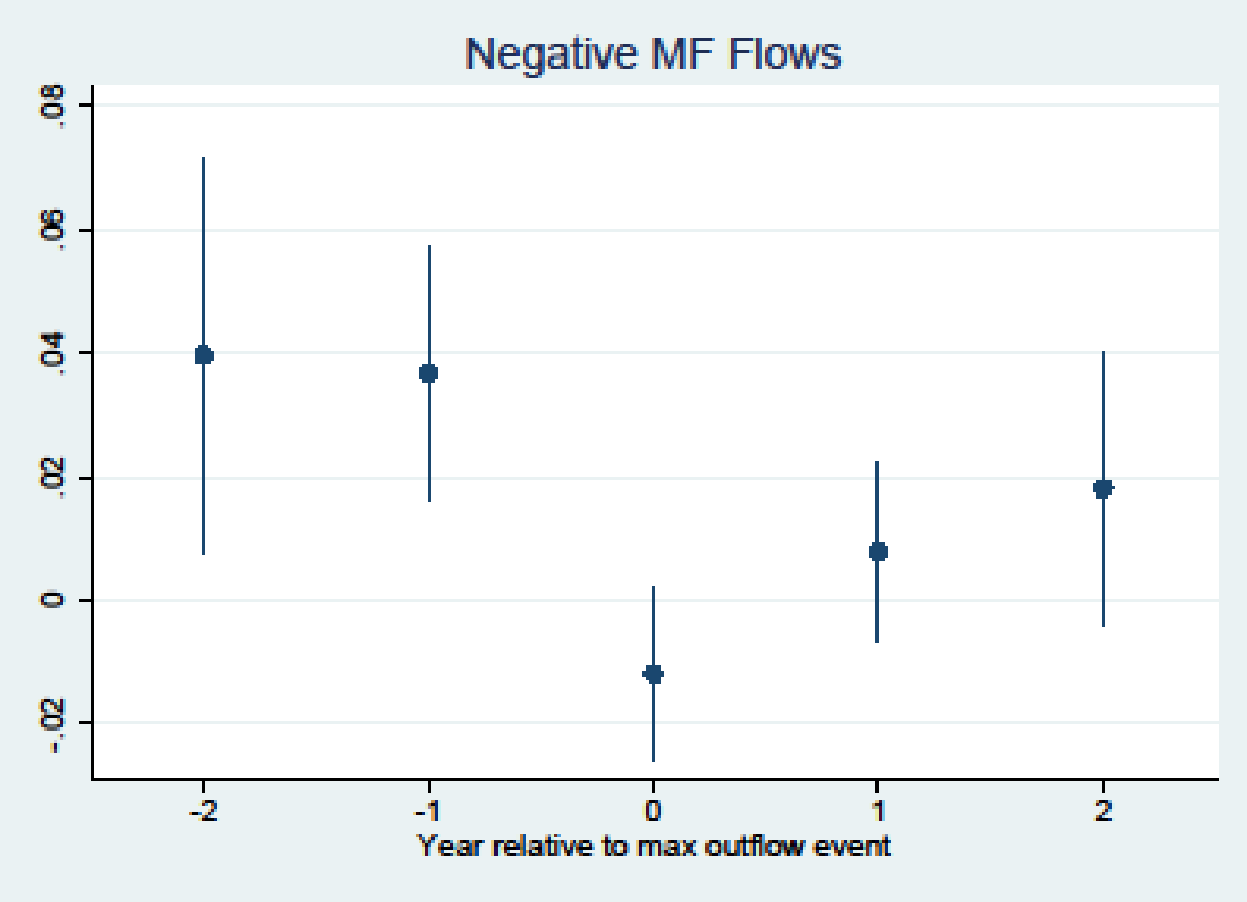

Figure 1b: Yearly Country Adjusted Returns around Mutual Funds Fire Sales

The following table plots country adjusted returns for industries in event time around fire sales. High % is defined as the case where a high proportion of firms in an industry are affected and low % is the case where a low proportion of firms in the industry are affected. Strong shock means that the shock is the maximum size of shock at the country industry level.

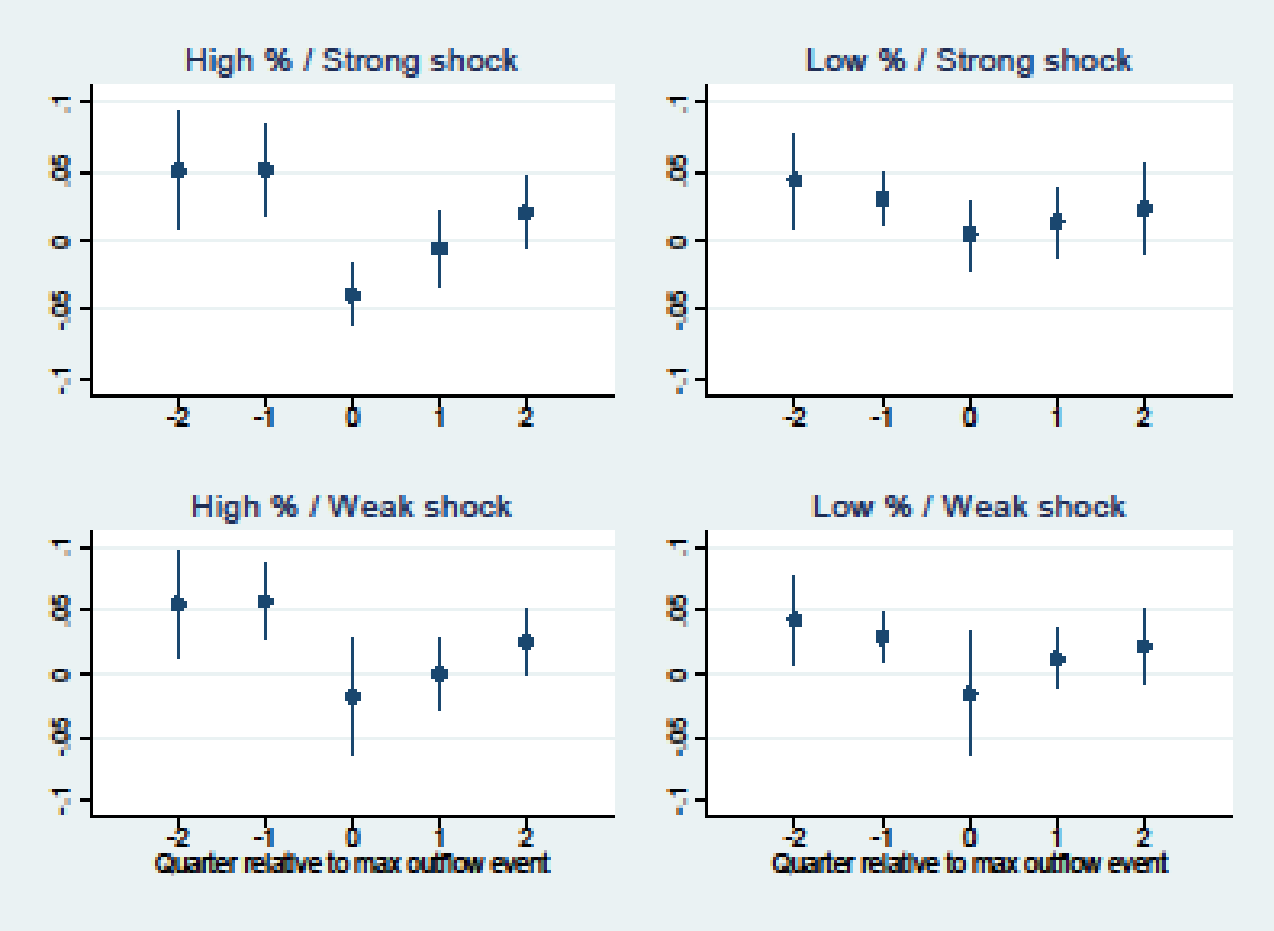

Table 1: Fund level statistics

This table presents statistics on the number of European open-end funds by country that hold European equities from 2003 to 2017 inclusive gathered from the Morningstar Direct database excluding sector funds. It also presents statistics on fund quarterly percentage flows by country that are also gathered from Morningstar Direct.

		Fund Percentage Flow		
Country of fund domicile	Number of funds	25th Pctile	50th Pctile	75th Pctile
Austria	1405	-0.0418	-0.0059	0.0222
Belgium	2156	-0.0586	-0.0235	-0.0057
Switzerland	1107	-0.0349	-0.0006	0.0350
Germany	2099	-0.0368	-0.0054	0.0199
Denmark	632	-0.0334	0.0000	0.0502
Spain	7620	-0.0248	0.0000	0.0000
Finland	446	-0.0346	0.0055	0.0602
France	5754	-0.0350	-0.0059	0.0177
UK	3138	-0.0268	-0.0035	0.0334
Greece	87	-0.0419	-0.0121	0.0009
Ireland	1184	-0.0435	0.0000	0.0568
Italy	1339	-0.0724	-0.0299	0.0007
Luxembourg	7941	-0.0515	-0.0084	0.0323
Netherlands	359	-0.0358	-0.0053	0.0283
Norway	414	-0.0389	0.0000	0.0595
Portugal	355	-0.0644	-0.0148	0.0029
Sweden	747	-0.0246	0.0018	0.0518

Table 2: Time Series Distribution of flow shocks

The number of funds affected by fire sales each year are calculated by calculating the number of funds that experience outflows of greater than 5% in at least one quarter in the year concerned. The number of industries affected by fire sales each year are calculated by counting the number of industries where at least one of the stocks within the industry is held by at least one mutual fund that experiences outflows of greater than 5% in at least one quarter in the year concerned.

Variables	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Number of funds with fire sales in year	224	517	718	860	1661	2021	1539	1613	1701	1769	1458	1481	1404	1516	1348
Number of 3 digit SIC industries with fire sales in year	228	242	252	256	259	260	257	253	253	251	253	257	257	255	254

Table 3: Summary statistics

Panel A: This panel presents statistics on country-industry-year flows and the percentage of capitalization affected. The negative flow variable is the value - weighted Wardlaw flow to stock measure while the negative flow dummy is set to 1 if the value weighted Wardlaw flow to stock measure is greater than zero for the industry concerned. The proportion of firm capitalization affected is calculated as the market capitalization of firms affected by a flow shock in a given country industry year divided by the total market capitalization of all firms in that given country industry year. Data is from Morningstar and Compustat. All variables are defined in the appendix.

	Mean	SD	P10	P25	P50	P75	P90	Total
Negative MF Flow Dummy	0.18	0.39	0.00	0.00	0.00	0.00	1.00	61,185
Negative MF Flow (%)	0.09	0.28	0.00	0.00	0.00	0.00	0.28	61,185
Capitalization Affected (%)	15.80	34.74	0.00	0.00	0.00	0.00	97.52	61,185
Negative Flows (Implied) (%)	0.11	0.34	0.00	0.00	0.00	0.00	0.36	61,185
Negative Flows (Equally Weighted) (%)	0.08	0.24	0.00	0.00	0.00	0.00	0.22	61,185
Negative Flows (Edmans et al 2012) (%)	-1.59	5.90	-3.05	0.00	0.00	0.00	0.00	61,185
Negative Flows (Industry) (%)	0.70	1.98	0.00	0.00	0.00	0.00	2.57	61,185

Panel B: This panel presents statistics on industry level mergers and acquisition activity measured using the number of deals and the sum of firm assets involved in deals measured in thousands of euros. It further breaks down the number of deals into the number of same industry and different industry deals. In addition, it also presents statistics on the means of payment used in M&A deals. Firm entry (exit) is measured as the number of firms incorporated (cease to report) in a country-industry-year. Data is from Zephyr and Amadeus. All variables are defined in the appendix.

	Mean	SD	P10	P25	P50	P75	P90	Total
Nr of Deals	1.16	5.34	0.00	0.00	0.00	1.00	3.00	61,185
Sum of Assets (Eur thd)	62,448.05	1,577,502.52	0.00	0.00	0.00	551.57	21,565.99	61,185
Firm entry SIC3	194.39	1,056.48	0.00	2.00	16.00	89.00	336.00	61,185
Firm exit SIC3	175.94	1,270.41	0.00	1.00	10.00	62.00	265.00	61,185
Nr of Same Industry Deals	0.54	3.25	0.00	0.00	0.00	0.00	1.00	61,185
Nr of Different Industry Deals	0.51	2.09	0.00	0.00	0.00	0.00	1.00	61,185
Nr of Deals: Payment in Cash	0.11	0.78	0.00	0.00	0.00	0.00	0.00	61,185
Nr of Deals: Mixed Payment	0.04	0.47	0.00	0.00	0.00	0.00	0.00	61,185
Nr of Deals: Payment in Stocks	0.03	0.28	0.00	0.00	0.00	0.00	0.00	61,185

Table 3: Summary statistics (continued)

Panel C: This table presents statistics on country-industry-year level measures of competition and profitability. Data is from Zephyr and Amadeus.

	Mean	SD	P10	P25	P50	P75	P90	Total
HHI	0.25	0.30	0.01	0.03	0.11	0.36	0.81	57,757
EBITDA/Sales (Mean)	0.16	0.10	0.07	0.10	0.13	0.20	0.29	52,058
Dispersion (EBITDA/Sales)	0.09	0.16	0.00	0.01	0.03	0.10	0.26	47,873
Distance (EBITDA/Sales)	0.11	0.25	0.00	0.00	0.01	0.06	0.33	47,839
EBITDA/Sales (20th pct)	0.01	0.05	0.00	0.00	0.00	0.00	0.02	52,019
EBITDA/Sales (80th pct)	0.03	0.08	0.00	0.00	0.00	0.02	0.09	52,053

Panel D: This table presents statistics on country-industry-year level measures of total factor productivity. Data is from Zephyr and Amadeus.

	Mean	SD	P10	P25	P50	P75	P90	Total
TFP (Employees) (Average)	9.01	0.91	8.00	8.45	8.93	9.43	10.17	52,368
Dispersion (TFP (Employees))	0.11	0.16	0.00	0.01	0.05	0.14	0.32	48,256
Distance (TFP (Employees))	0.13	0.25	0.00	0.00	0.01	0.10	0.48	48,256
TFP (Employees) (20th pct)	0.84	2.44	0.00	0.00	0.01	0.07	1.99	52,368
TFP (Employees) (80th pct)	1.92	3.19	0.01	0.03	0.19	2.08	8.11	52,368

Panel E: This table presents statistics on country-industry-year level measures of labor productivity. Data is from Zephyr and Amadeus.

	Mean	SD	P10	P25	P50	P75	P90	Total
Y/L (Employees) (Average)	12.16	1.17	10.96	11.43	11.95	12.67	13.72	52,973
Dispersion Y/L (Employees)	0.11	0.15	0.00	0.01	0.04	0.13	0.31	49,289
Distance Y/L (Employees)	0.12	0.25	0.00	0.00	0.01	0.09	0.45	49,244
Y/L (Employees) (20th pct)	1.02	3.16	0.00	0.00	0.01	0.07	1.67	52,973
Y/L (Employees) (80th pct)	2.43	4.20	0.01	0.03	0.22	2.27	10.86	52,973

Table 4: The effect of industry level fund flow pressure on industry level M&A

This table presents regression results of industry level mergers and acquisition activity on industry level measures of fund flow pressure. We measure mergers and acquisition activity using the number of deals within a given SIC three-digit industry and also based on the sum of assets involved in mergers and acquisition deals within a given SIC three digit industry. All variables are defined in the appendix.

VARIABLES	(1) Nr of Deals (log)	(2) Nr of Deals (log)	(3) Nr of Deals (log)	(4) Nr of Deals (log)	(5) Sum of Assets (log)	(6) Sum of Assets (log)	(7) Sum of Assets (log)	(8) Sum of Assets (log)
Negative MF Flow Dummy	0.215***	0.113***			1.219***	0.641***		
	(0.014)	(0.017)			(0.069)	(0.105)		
Negative MF Flow			18.723***	10.020***			96.328***	49.284***
			(1.905)	(1.816)			(8.402)	(10.335)
Nr of Firms (log)	0.054***	0.053***	0.056***	0.056***	0.335***	0.334***	0.350***	0.349***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.023)	(0.023)	(0.024)	(0.024)
Listed Assets (%)	0.022*	0.017	0.062***	0.056***	0.255***	0.222**	0.493***	0.464***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.092)	(0.092)	(0.088)	(0.089)
Observations	61,185	61,185	61,185	61,185	61,185	61,185	61,185	61,185
R-squared	0.571	0.572	0.566	0.567	0.441	0.442	0.437	0.438
Positive MF Flows	No	Yes	No	Yes	No	Yes	No	Yes
Country X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 5: The effect of industry level fund flow pressure on industry level entry/exit activity

This table presents regression results of industry level entry and exit on fund flow pressure. Firm entry (exit) is measured as the number of firms incorporated (cease to report) in a country-industry-year. All variables are defined in the appendix.

VARIABLES	(1) Firm entry SIC3 (log)	(2) Firm entry SIC3 (log)	(3) Firm exit SIC3 (log)	(4) Firm exit SIC3 (log)
Negative MF Flow Dummy	-0.026***		0.044***	
	(0.009)		(0.010)	
Negative MF Flow		-0.332		3.717***
		(0.931)		(1.157)
Nr of Firms (log)	0.705***	0.704***	0.674***	0.675***
	(0.006)	(0.006)	(0.014)	(0.014)
Listed Assets (%)	-0.030**	-0.038***	-0.061***	-0.053***
	(0.013)	(0.013)	(0.016)	(0.016)
Observations	61,185	61,185	61,185	61,185
R-squared	0.936	0.936	0.910	0.910
Country X Year FE	Yes	Yes	Yes	Yes
Industry X Year FE	Yes	Yes	Yes	Yes

Table 6: The effect of industry level fund flow pressure on disaggregated industry level M&A activity

This table presents regression results of industry level M&A activity broken down in different ways on fund flow pressure. Columns one and two show regressions where deals are in the same industry (column one), defined as acquirer and target being in the same SIC3; or in a different industry (column two), defined as acquirer and target being in different SIC2 industries. Columns three to five break down deals by means of payment where this data is available. Column three shows deals paid in cash, column four are deals whose payment is mixed (cash and stock) and column five shows deals paid with stock. Mutual fund flow pressure using the value weighted flow to stock Wardlaw price pressure measure. All variables are defined in the appendix.

VARIABLES	(1) Nr of Same Industry Deals (log)	(2) Nr of Diff. Industry Deals (log)	(3) Nr of Deals: Payment in Cash (log)	(4) Nr of Deals: Mixed Payment (log)	(5) Nr of Deals: Payment in Stocks (log)
Negative MF Flow Dummy	0.139***	0.131***	0.062***	0.028***	0.017***
	(0.012)	(0.011)	(0.009)	(0.005)	(0.003)
Nr of Firms (log)	0.033***	0.032***	0.011***	0.006***	0.006***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Listed Assets (%)	-0.000	0.008	-0.005	-0.004	0.004
	(0.010)	(0.011)	(0.007)	(0.004)	(0.003)
Observations	61,185	61,185	61,185	61,185	61,185
R-squared	0.475	0.482	0.352	0.272	0.218
Country X Year FE	Yes	Yes	Yes	Yes	Yes
Industry X Year FE	Yes	Yes	Yes	Yes	Yes

Table 7: The effect of industry level fund flow pressure on industry competitiveness

This table presents regression results from regressions of industry level competitiveness on industry level measures of price pressure. We measure industry level competitiveness in two ways. First, we use the Herfindahl–Hirschman index of industry concentration calculated using the sum of squared market shares of all the firms in the industry. Second, we use firm profitability measured using EBITDA/Sales. We measure variation in firm profitability based on the dispersion and the distance between the 20th and 80th percentile of these measures. All variables are defined in the appendix.

VARIABLES	(1) HHI	(2) EBITDA/Sales (Mean)	(3) Dispersion (EBITDA/Sales)	(4) Distance (EBITDA/Sales)	(5) EBITDA/Sales (20th pct)	(6) EBITDA/Sales (80th pct)
Negative MF Flow Dummy	-0.015***	0.004***	-0.006***	-0.001	0.002***	0.002***
	(0.003)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)
Nr of Firms (log)	-0.064***	0.005***	-0.037***	-0.052***	-0.008***	-0.014***
	(0.003)	(0.001)	(0.001)	(0.002)	(0.000)	(0.001)
Listed Assets (%)	0.072***	0.001	0.021***	-0.000	-0.002**	-0.000
	(0.007)	(0.002)	(0.004)	(0.007)	(0.001)	(0.002)
Observations	57,735	51,914	47,717	47,683	51,875	51,909
R-squared	0.494	0.555	0.466	0.422	0.294	0.401
Country X Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry X Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 8: The effect of industry level fund flow pressure on industry productivity

This table presents regression results from regressions of industry level productivity on industry level measures of price pressure. We measure productivity in two ways. First, in Panel A we measure total factor productivity (TFP) using an index approach measure of revenue-productivity based on Syverson (2011). Second, in Panel B we measure labor productivity as sales over the number of employees (log). For both measures we calculate average, dispersion, and the distance between the 20th and 80th percentile of these measures. All variables are defined in the appendix.

Panel A: Total Factor Productivity

VARIABLES	(1) TFP (Employees) (Average)	(2) Dispersion (TFP (Employees))	(3) Distance (TFP (Employees))	(4) TFP (Employees) (20th pct)	(5) TFP (Employees) (80th pct)
Negative MF Flow Dummy	0.020***	-0.007***	-0.006*	0.028	-0.013
	(0.007)	(0.002)	(0.003)	(0.025)	(0.031)
Nr of Firms (log)	-0.026***	-0.045***	-0.065***	-0.504***	-0.878***
	(0.007)	(0.002)	(0.003)	(0.021)	(0.031)
Listed Assets (%)	-0.136***	0.014***	0.006	-0.147**	-0.182***
	(0.014)	(0.004)	(0.007)	(0.058)	(0.063)
Observations	52,255	48,104	48,104	52,255	52,255
R-squared	0.639	0.587	0.507	0.416	0.629
Country X Year FE	Yes	Yes	Yes	Yes	Yes
Industry X Year FE	Yes	Yes	Yes	Yes	Yes

Panel B: Labor Productivity

VARIABLES	(1) Y/L (Employees) (Average)	(2) Dispersion Y/L (Employees)	(3) Distance Y/L (Employees)	(4) Y/L (Employees) (20th pct)	(5) Y/L (Employees) (80th pct)
Negative MF Flow Dummy	0.022***	-0.007***	-0.006**	0.005	-0.053
	(0.008)	(0.002)	(0.003)	(0.033)	(0.039)
Nr of Firms (log)	-0.034***	-0.045***	-0.066***	-0.656***	-1.187***
	(0.008)	(0.002)	(0.003)	(0.029)	(0.041)
Listed Assets (%)	-0.006	0.016***	0.007	-0.075	-0.070
	(0.016)	(0.004)	(0.007)	(0.074)	(0.084)
Observations	52,865	49,141	49,096	52,865	52,865
R-squared	0.741	0.592	0.506	0.418	0.635
Country X Year FE	Yes	Yes	Yes	Yes	Yes
Industry X Year FE	Yes	Yes	Yes	Yes	Yes

Table 9: Further Sample Splits

In Table 9 we replicate our main results from Tables 4 to 8. In Panel A we split the sample along industry concentration (HHI) and industry product similarity, for which we use a product similarity index by Fathollahi et al (2022). Columns five to eight study country-industries with high concentration and high product similarity. Remaining country-industries are in columns one to four. Panel B presents our results for country industries that have both listed and unlisted firms and for country industries that have only unlisted firms. As price pressure measures for country industries with no listed firms cannot be calculated, this analysis is conducted at the industry level rather than the country industry level. All variables are defined in the appendix.

Panel A: High concentration and product similarity

VARIABLES	(1) Nr of Deals (log)	(2) HHI	(3) Dispersion (EBITDA/Sales)	(4) Dispersion (TFP (Employees))	(5) Nr of Deals (log)	(6) HHI	(7) Dispersion (EBITDA/Sales)	(8) Dispersion (TFP (Employees))
Negative MF Flow Dummy	0.228***	-0.015***	-0.005***	-0.006***	0.103***	-0.011	-0.016*	-0.015*
	(0.015)	(0.003)	(0.002)	(0.002)	(0.020)	(0.011)	(0.009)	(0.008)
Nr of Firms (log)	0.054***	-0.065***	-0.036***	-0.044***	0.031***	-0.056***	-0.045***	-0.061***
	(0.003)	(0.003)	(0.001)	(0.002)	(0.011)	(0.008)	(0.005)	(0.004)
Listed Assets (%)	0.029**	0.074***	0.019***	0.014***	0.020	0.051***	0.042***	0.014
	(0.014)	(0.008)	(0.005)	(0.004)	(0.027)	(0.017)	(0.014)	(0.011)
Observations	57,898	54,683	45,488	45,798	3,223	2,986	2,177	2,267
R-squared	0.578	0.485	0.456	0.582	0.513	0.582	0.593	0.668
High HHI and Similarity	No	No	No	No	Yes	Yes	Yes	Yes
Country X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: Country industries with and without listed firms

VARIABLES	(1) Nr of Deals (log)	(2) Firm entry SIC3 (log)	(3) Firm exit SIC3 (log)	(4) HHI	(5) TFP (Employees) (Average)	(6) Y/L (Employees) (Average)	(7) Nr of Deals (log)	(8) Firm entry SIC3 (log)	(9) Firm exit SIC3 (log)	(10) HHI	(11) TFP (Employees) (Average)	(12) Y/L (Employees) (Average)
Negative Flows (Industry)	1.532***	-0.352	0.039	-0.501**	0.586	-0.048	2.575***	-0.653***	0.351	-0.228***	0.495***	0.481**
	(0.402)	(0.452)	(0.629)	(0.216)	(0.616)	(0.545)	(0.274)	(0.220)	(0.244)	(0.083)	(0.176)	(0.217)
Nr of Firms (log)	0.029***	0.669***	0.597***	-0.056***	-0.004	-0.011	0.115***	0.782***	0.813***	-0.069***	-0.044***	-0.057***
	(0.003)	(0.007)	(0.016)	(0.003)	(0.008)	(0.010)	(0.005)	(0.007)	(0.012)	(0.002)	(0.008)	(0.009)
Listed Assets (%)							0.083***	0.004	-0.022	0.077***	-0.132***	-0.046***
							(0.015)	(0.014)	(0.019)	(0.007)	(0.014)	(0.016)
Observations	30,904	30,904	30,904	28,886	24,773	25,259	29,768	29,768	29,768	28,329	26,962	27,090
R-squared	0.399	0.913	0.880	0.435	0.648	0.754	0.624	0.957	0.943	0.634	0.697	0.779
Listed firms	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Country X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel C: Sample split by stock market capitalization over GDP

This table presents our results for countries where countries have been sorted by their ratio of stock market capitalization to GDP. Countries with above median ratios of stock market capitalization to GDP are labelled high countries and countries with below median ratios of stock market capitalization to GDP are labelled low countries. All variables are defined in the appendix.

VARIABLES	(1) Nr of Deals	(2) Entry	(3) Exit	(4) HHI	(5) TFP (Emp)	(6) Y/L (Emp)	(7) Nr of Deals	(8) Entry	(9) Exit	(10) HHI	(11) TFP (Emp)	(12) Y/L (Emp)
Negative MF Flow Dummy	0.413***	0.007	0.043***	-0.009*	-0.002	0.003	1.063***	-0.056***	0.042***	-0.014***	0.034***	0.034***
	(0.053)	(0.013)	(0.015)	(0.005)	(0.012)	(0.014)	(0.151)	(0.013)	(0.014)	(0.004)	(0.008)	(0.009)
Nr of Firms (log)	0.136***	0.706***	0.644***	-0.071***	0.008	0.013	0.451***	0.714***	0.711***	-0.057***	-0.038***	-0.057***
	(0.016)	(0.007)	(0.021)	(0.003)	(0.008)	(0.010)	(0.058)	(0.010)	(0.018)	(0.003)	(0.011)	(0.013)
Listed Assets (%)	0.569***	0.033*	-0.059**	0.085***	-0.141***	0.045	-0.821***	-0.089***	-0.073***	0.063***	-0.111***	-0.038**
	(0.138)	(0.019)	(0.025)	(0.012)	(0.023)	(0.029)	(0.215)	(0.016)	(0.021)	(0.007)	(0.016)	(0.016)
Observations	30,929	30,929	30,929	28,791	25,044	25,231	29,929	29,929	29,929	28,648	26,914	27,341
R-squared	0.477	0.930	0.915	0.515	0.680	0.779	0.464	0.949	0.919	0.550	0.659	0.743
Stock Market Cap over GDP	Low	Low	Low	Low	Low	Low	High	High	High	High	High	High
Country X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robustness

Table 10: Hot and cold markets

In Table 10 we replicate the main results from Tables 4 to 8 but splitting the sample between hold and cold markets. We define hot markets as occurring when the main stock market annual return in the country concerned is above the median annual return level across all the country years in our sample while a cold market is defined as occurring when the country concerned is below its median annual return level across all the country years in our sample. All variables are defined in the appendix.

VARIABLES	(1) Nr of Deals (log)	(2) Firm entry SIC3 (log)	(3) Firm exit SIC3 (log)	(4) HHI	(5) TFP (Employees) (Average)	(6) Y/L (Employees) (Average)	(7) Nr of Deals (log)	(8) Firm entry SIC3 (log)	(9) Firm exit SIC3 (log)	(10) HHI	(11) TFP (Employees) (Average)	(12) Y/L (Employees) (Average)
Negative MF Flow Dummy	0.232***	-0.028**	0.030**	-0.020***	0.008	0.014	0.195***	-0.023*	0.058***	-0.010**	0.020**	0.019*
	(0.020)	(0.013)	(0.014)	(0.004)	(0.010)	(0.011)	(0.019)	(0.014)	(0.013)	(0.005)	(0.010)	(0.011)
Nr of Firms (log)	0.056***	0.702***	0.721***	-0.062***	-0.029***	-0.039***	0.052***	0.708***	0.641***	-0.068***	-0.026**	-0.034***
	(0.005)	(0.010)	(0.019)	(0.004)	(0.008)	(0.009)	(0.004)	(0.009)	(0.020)	(0.004)	(0.011)	(0.013)
Listed Assets (%)	0.032*	-0.063***	-0.072***	0.075***	-0.123***	-0.016	0.018	-0.011	-0.061***	0.070***	-0.132***	0.016
	(0.019)	(0.020)	(0.026)	(0.010)	(0.020)	(0.025)	(0.017)	(0.017)	(0.020)	(0.009)	(0.020)	(0.022)
Observations	29,382	29,382	29,382	27,898	25,694	26,033	31,080	31,080	31,080	29,148	26,004	26,273
R-squared	0.614	0.939	0.928	0.530	0.692	0.763	0.563	0.939	0.900	0.502	0.643	0.759
Cold Markets	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No
Country X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 11: Alternative Definitions of Price Pressure

In Table 11 we replicate the main results from Tables 4, 5, 7 and 8 using alternative definitions of our price pressure variable. Panel A presents our results where our industry level measures of price pressure are calculated using either implied fund flows rather than actual fund flows and where our industry level measures are equally weighted rather than being value weighted. Panel B presents our results using first the original Edmans Goldstein Jiang (2012) flow pressure measure and second using a Residual EGJ measure where the original EGJ measure is purged of country industry level returns. All variables are defined in the appendix.

Panel A: Value weighted Wardlaw measure based on implied flows or equally weighted Wardlaw measure

VARIABLES	(1) Nr of Deals (log)	(2) Firm entry SIC3 (log)	(3) Firm exit SIC3 (log)	(4) HHI	(5) TFP (Employees) (Average)	(6) Y/L (Employees) (Average)	(7) Nr of Deals (log)	(8) Firm entry SIC3 (log)	(9) Firm exit SIC3 (log)	(10) HHI	(11) TFP (Employees) (Average)	(12) Y/L (Employees) (Average)
Negative Flows (Implied)	15.839***	-1.003	2.542***	-0.816***	0.710	0.652						
	(1.553)	(0.783)	(0.934)	(0.268)	(0.705)	(0.741)						
Negative Flows (Equally Weighted)							16.364***	-0.571	3.487***	-1.039***	1.897*	1.291
							(2.039)	(1.092)	(1.314)	(0.341)	(1.026)	(1.037)
Nr of Firms (log)	0.056***	0.704***	0.675***	-0.065***	-0.026***	-0.034***	0.056***	0.704***	0.675***	-0.065***	-0.026***	-0.034***
	(0.003)	(0.006)	(0.014)	(0.003)	(0.007)	(0.008)	(0.003)	(0.006)	(0.014)	(0.003)	(0.007)	(0.008)
Listed Assets (%)	0.061***	-0.037***	-0.052***	0.069***	-0.131***	0.001	0.069***	-0.038***	-0.052***	0.069***	-0.132***	0.000
	(0.013)	(0.013)	(0.016)	(0.007)	(0.014)	(0.016)	(0.013)	(0.013)	(0.016)	(0.007)	(0.014)	(0.016)
Observations	61,185	61,185	61,185	57,735	52,255	52,865	61,185	61,185	61,185	57,735	52,255	52,865
R-squared	0.566	0.936	0.910	0.494	0.639	0.741	0.564	0.936	0.910	0.494	0.639	0.741
Country X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: Edmans Goldstein Jiang based flow pressure measures

VARIABLES	(1) Nr of Deals (log)	(2) Firm entry SIC3 (log)	(3) Firm exit SIC3 (log)	(4) HHI	(5) TFP (Employees) (Average)	(6) Y/L (Employees) (Average)	(7) Nr of Deals (log)	(8) Firm entry SIC3 (log)	(9) Firm exit SIC3 (log)	(10) HHI	(11) TFP (Employees) (Average)	(12) Y/L (Employees) (Average)
Negative Flows (Edmans et al 2012)	-0.583***	-0.047	-0.278***	0.090***	-0.075	-0.061						
	(0.061)	(0.044)	(0.055)	(0.018)	(0.046)	(0.056)						
Residuals Edmans on Industry Returns							-0.552***	-0.040	-0.262***	0.086***	-0.059	-0.037
							(0.061)	(0.045)	(0.055)	(0.018)	(0.045)	(0.055)
Nr of Firms (log)	0.057***	0.704***	0.675***	-0.065***	-0.026***	-0.034***	0.060***	0.711***	0.689***	-0.063***	-0.025***	-0.032***
	(0.003)	(0.006)	(0.014)	(0.003)	(0.007)	(0.008)	(0.004)	(0.007)	(0.014)	(0.003)	(0.006)	(0.007)
Listed Assets (%)	0.077***	-0.040***	-0.054***	0.070***	-0.131***	0.000	0.081***	-0.041***	-0.056***	0.070***	-0.133***	-0.004
	(0.013)	(0.013)	(0.016)	(0.007)	(0.014)	(0.016)	(0.013)	(0.013)	(0.016)	(0.006)	(0.014)	(0.016)
Observations	61,185	61,185	61,185	57,735	52,255	52,865	55,453	55,453	55,453	52,188	47,911	48,380
R-squared	0.564	0.936	0.910	0.494	0.639	0.741	0.568	0.937	0.915	0.512	0.640	0.738
Country X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 12: Timing of Effects

This table presents regression results of industry level mergers and acquisition activity on industry level measures of fund flow pressure measured 1 year before the mergers and acquisition activity labelled (t-1), 2 years before labelled (t-1) and 3 years before labelled. We measure mergers and acquisition activity using the number of deals within a given SIC three-digit industry and also based on the sum of assets involved in mergers and acquisition deals within a given SIC three-digit industry. All variables are defined in the appendix.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Nr of Deals (log)	Nr of Deals (log)	Nr of Deals (log)	Nr of Deals (log)	Sum of Assets (log)	Sum of Assets (log)	Sum of Assets (log)	Sum of Assets (log)
Negative MF Flow Dummy (t-1)	0.215***			0.089***	1.219***			0.533***
	(0.014)			(0.017)	(0.069)			(0.114)
Negative MF Flow Dummy (t-2)		0.212***		0.057***		1.198***		0.257*
		(0.015)		(0.020)		(0.072)		(0.137)
Negative MF Flow Dummy (t-3)			0.208***	0.090***			1.220***	0.584***
			(0.015)	(0.018)			(0.073)	(0.122)
Nr of Firms (log)	0.054***	0.054***	0.054***	0.053***	0.335***	0.343***	0.342***	0.339***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.023)	(0.025)	(0.026)	(0.026)
Listed Assets (%)	0.022*	0.023*	0.021	0.010	0.255***	0.269***	0.210**	0.152
	(0.013)	(0.014)	(0.014)	(0.014)	(0.092)	(0.098)	(0.099)	(0.100)
Observations	61,185	57,313	53,356	53,356	61,185	57,313	53,356	53,356
R-squared	0.571	0.573	0.573	0.574	0.441	0.443	0.445	0.446
Country X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry X Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Appendix:

Table 1A: Alternative definitions of productivity: Summary Statistics

	Mean	SD	P10	P25	P50	P75	P90	Total
TFP (Wage) (Average)	1.51	0.77	0.61	1.15	1.53	1.92	2.37	50,365
Dispersion (TFP (Wage))	0.12	0.29	0.00	0.01	0.04	0.15	0.38	46,639
Distance (TFP (Wage))	0.13	0.37	0.00	0.00	0.01	0.08	0.46	46,638
TFP (Wage) (20th pct)	0.11	0.44	-0.00	0.00	0.00	0.00	0.13	50,364
TFP (Wage) (80th pct)	0.32	0.65	0.00	0.00	0.02	0.24	1.18	50,365

	Mean	SD	P10	P25	P50	P75	P90	Total
Y/L (Wage) (Average)	1.47	0.78	0.59	1.06	1.44	1.87	2.38	50,660
Dispersion Y/L (Wage)	0.13	0.26	0.00	0.01	0.05	0.16	0.39	47,015
Distance Y/L (Wage)	0.13	0.35	0.00	0.00	0.01	0.08	0.46	46,971
Y/L (Wage) (20th pct)	0.12	0.45	0.00	0.00	0.00	0.00	0.13	50,615
Y/L (Wage) (80th pct)	0.33	0.69	0.00	0.00	0.02	0.24	1.19	50,657

Table A2: Revisiting Effects of Price Pressure on TFP

VARIABLES	(1) TFP (Wage) (Average)	(2) Dispersion (TFP (Wage))	(3) Distance (TFP (Wage))	(4) TFP (Wage) (20th pct)	(5) TFP (Wage) (80th pct)
Negative MF Flow Dummy	-0.011	-0.017***	-0.017***	0.000	-0.015**
	(0.008)	(0.003)	(0.005)	(0.005)	(0.006)
Nr of Firms (log)	0.008*	-0.043***	-0.059***	-0.074***	-0.144***
	(0.005)	(0.002)	(0.003)	(0.004)	(0.006)
Listed Assets (%)	-0.185***	0.005	-0.005	-0.085***	-0.139***
	(0.019)	(0.007)	(0.009)	(0.012)	(0.016)
Observations	50,232	46,512	46,511	50,231	50,232
R-squared	0.592	0.292	0.305	0.303	0.482
Country X Year FE	Yes	Yes	Yes	Yes	Yes
ustry X Year FE	Yes	Yes	Yes	Yes	Yes

Table A3: Revisiting Effects of Price Pressure on Labor Productivity

VARIABLES	(1) Y/L (Wage) (Average)	(2) Dispersion Y/L (Wage)	(3) Distance Y/L (Wage)	(4) Y/L (Wage) (20th pct)	(5) Y/L (Wage) (80th pct)
Negative MF Flow Dummy	-0.006	-0.015***	-0.016***	0.003	-0.017***
	(0.008)	(0.003)	(0.004)	(0.005)	(0.006)
Nr of Firms (log)	0.019***	-0.050***	-0.066***	-0.074***	-0.146***
	(0.005)	(0.002)	(0.003)	(0.004)	(0.006)
Listed Assets (%)	-0.093***	0.023***	0.009	-0.038***	-0.077***
	(0.016)	(0.007)	(0.011)	(0.010)	(0.015)
Observations	50,530	46,885	46,841	50,484	50,526
R-squared	0.586	0.362	0.365	0.340	0.495
Country X Year FE	Yes	Yes	Yes	Yes	Yes
Industry X Year FE	Yes	Yes	Yes	Yes	Yes

APPENDIX: VARIABLE DEFINITIONS

Variable	Frequency	Definition
Flow to stock (FTS)	Quarterly	The flow to stock measure for stock i at end of quarter t is the sum across all m funds j that hold the stock of the absolute value of flow (F) into fund j at end of quarter t divided by the TA (total assets) of fund j at end of quarter t-1 multiplied by the number of shares (SHARES) held by fund j in stock i at end of quarter t-1 divided by the shares outstanding (SHROUT) of stock i at end of quarter t-1.
VWFTS	Quarterly	Value weighted Flow To Stock (FTS) measure quarterly for all stocks in a given SIC-3 digit industry in each country affected by these fund fire sales
Negative MFFlow	Annual	Sum of VWFTS across four quarters in a year.
Negative MFFLOW Dummy	Annual	Dummy based on whether MFFlow is positive or not
Firm entry SIC3	Annual	For each country-industry-year we count the number of firms incorporated in that year into Amadeus
Firm exit SIC3	Annual	We count the number of firms that exit (cease to report) Amadeus at the same level of aggregation
HHI	Annual	Sum of squared market shares
Dispersion (EBITDA/Sales)	Annual	Standard deviation of EBITDA scaled by sales (normalized by the average EBITDA/Sales ratio)
Distance (EBITDA/Sales)	Annual	Difference between the 80th and 20th percentile of EBITDA scaled by sales (normalized by the average EBITDA/Sales ratio)

Variable	Frequency	Definition
EBITDA/Sales (20th pct)	Annual	20th percentile of EBITDA scaled by sales
EBITDA/Sales (80th pct)	Annual	80th percentile of EBITDA scaled by sales
TFP (Employees) (Average)	Annual	Average labor productivity defined as log sales less 0.3*log tangible capital and 0.7*log employees
Dispersion (TFP (Employees))	Annual	Standard deviation of total factor productivity defined as log sales less 0.3*log tangible assets and 0.7*log employees (normalized by average TFP (Employees))
Distance (TFP (Employees))	Annual	Difference between 80th and 20th percentile of total factor productivity defined as log sales less 0.3*log tangible assets and 0.7*log wage expense (normalized by average TFP (Wage))
TFP (Employees) (20th pct)	Annual	20th percentile of total factor productivity defined as log sales less 0.3*log tangible assets and 0.7*log wage expense
TFP (Employees) (80th pct)		80th percentile of total factor productivity defined as log sales less 0.3*log tangible assets and 0.7*log wage expense
Y/L (Employees) (Average)	Annual	Average labor productivity defined as log sales less log employees
Dispersion Y/L (Employees)	Annual	Standard deviation of average labor productivity (normalized by average labor productivity) Difference between 80th and 20th percentile of
Distance Y/L (Employees)	Annual	Difference between 80th and 20th percentile of average labor productivity
Y/L (Employees) (20th pct)	Annual	20th percentile of average labor productivity
Y/L (Employees) (80th pct)		80th percentile of average labor productivity