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ABSTRACT

A literature review demonstrates credible evidence linking higher firm-specific stock return volatility to a more efficient stock market on one hand; and to higher firm-specific fundamentals volatility on the other. These results are reconciled if (1) market efficiency is interpreted as functionally efficiency, the allocation of capital to its best uses; (2) capital's best use is often financing Schumpeterian creative destruction, which magnifies the gap between creative winners and destroyed losers, thus magnifying firm-specific fundamentals variation; (3) initially impecunious innovators require functionally efficient markets to finance their innovations. Informed arbitrage, disclosure quality, and insider trading regulations can contribute to functional efficiency, and thus help sustained ongoing creative destruction. A range of seeming inconsistencies in the empirical literature are reconciled if information has high fixed costs, driving a wedge between functional efficiency and traditional finance concepts of information efficiency. This wedge implies positive and negative feedback loops, whereby creative destruction might either enhance or diminish functional efficiency, thereby either accelerating or retarding its subsequent pace. Institutional differences across economies and over time potentially that affect which feedback predominates merit public policy attention.

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1. Introduction

Asked to predict the market, JP Morgan famously snapped "Stock prices will fluctuate." Finance theory partitions those fluctuations into firm-specific fluctuations, unique to one (or a few) stocks, and market-wide fluctuation, affecting all (or most) stocks. This partition matters because firm-specific fluctuations cancel in a diversified portfolio, but market-wide fluctuations do not – and so are unavoidable risks. This simplifies finance research in two ways. First, asset pricing models focus on unavoidable market-wide factors by assuming investors are diversified, leaving firm-specific fluctuations a residual afterthought. Second, corporate finance can use event studies, which subtract out market-wide fluctuations, isolating firm-specific fluctuations associated with events that alter firms' fundamental values. Each researcher's afterthought is the other's focus.

In his American Finance Association Presidential Address, Roll (1988) observed that most fluctuations in U.S. share prices are firm-specific. Morck, Yeung and Yu (2000) confirm this, but observe that market-wide fluctuations were far more important in earlier 20th century U.S. data, and are currently far more important in stocks trading in emerging markets, especially where corruption is severe. Campbell et al. (2001) affirm rising firm-specific risk in U.S. stocks from 1962 to 1997 and explore its econometric characteristics. Similar increases in firm-specific risk appear in other developed (Guo and Savickas 2008) and emerging economies (Li, Morck, Yang, and Yeung 2004).

A large literature exploring these findings can appear inconsistent, but actually coalesces into a coherent, if tentative, explanation. This paper describes this synthesis and its

implications, especially as regard the role of stock markets in emerging economies. Three implications ensue..

First, many credible studies link greater firm-specific risk to more developed financial markets, more complete arbitrage, and (in a sense clarified below) stronger market efficiency. This reinforces Roll's (1988) argument that firm-specific risk constitutes share prices being moved informed trades, and reflects market efficiency in action. Moreover, institutional changes that plausibly make arbitrage less costly presage elevated firm-specific risk in stocks.

Second, greater firm-specific fluctuations in stock returns and fundamentals correlate with more dynamic economies over time and across countries. Intuitively, more intensive innovation, competition, and dynamism correspond to more (or more important) events affecting specific firm's fundamentals and returns. Schumpeter's creative destruction plausibly magnifies firm-specific variation as upstart creative firm's stocks and fundamentals surge ahead, leaving laggard firms to shrivel.

Third, greater market-wide risk relative to firm-specific risk is associated with less effective government – specifically with less open, transparent, and developed financial systems. Corruption and opacity might elevate returns comovement by obscuring insiders diverting firm-specific profits or boosting "noise" trader herding (Delong et al. 1990) or both.[1]

[1] Common time-varying risk aversion (Campbell and Shiller 1988; Fama and French 1988) is observationally equivalent to noise trader risk (DeLong et al. 1990)

2. R^2

The wheelhorse models of asset pricing theory explain any individual stock's return with changes in one or more economy-level variables that constitute common pricing factors. The simplest such framework, the Capital Asset Pricing Model (CAPM) represents the expected return of stock *j* as

[1] $$\tilde{r}_{j,t} = r_{f,t} + \beta_j\left(r_{m,t} - r_{f,t}\right)$$

where $r_{m,t}$ is the return on a fully diversified portfolio of assets and $r_{j,t}$ is the return on a risk-free asset, the coefficient β_j reflects the extent to which fluctuations in the equity risk premium, $r_{m,t} - r_{f,t}$ affect stock j's return. Key parameters of [1] are often operationally approximated using *Market Model* regressions of the form

[2] $$r_{j,t} = \alpha_j + \beta_j r_{m,t} + e_{j,t}$$

where $e_{j,t}$ is the residual component of stock j's return not explained by the equity risk premium and $\alpha_j = (1 - \beta_j)r_{f,t}$ and is non-stochastic.[2]

The non-stochastic nature of α_j and the orthogonality of regression [2]'s errors $e_{j,t}$ from its explanatory variable leave the variance in stock *j*'s return decomposable into

[3] $$variance\left[r_{j,t}\right] = \underbrace{variance\left[\beta_j r_{m,t}\right]}_{\substack{\text{market-wide}\\ \text{variation}}} + \underbrace{variance\left[e_{j,t}\right]}_{\substack{\text{firm-specific}\\ \text{variation}}}$$

[2] The CAPM and Market Model are conceptually distinct. The former derives from a stylized model of investor behavior; the latter is a purely empirical proposition.

where $variance[\beta_j r_{m,t}]$ is the market-wide variation in the stock's return and $variance[e_{j,t}]$ is the firm-specific variation in its return.

Roll (1988) notes that the regression R_j^2 of [2] is

[4] $$R_j^2 \equiv \frac{explained\ variation}{explained\ variation + residual\ variation} = \frac{market\text{-}wide\ variation}{firm\text{-}specific\ variation + market\text{-}wide\ variation},$$

and thus measures both the goodness of fit of the Market Model for stock *j*'s returns data and the fraction of the variation in stock *j*'s return that is related to market-wide fluctuations. In econometrics, a larger R_j^2 is considered evidence of a better model; however this rule-of-thumb fails in this context. A lower R_j^2 merely means that a larger fraction of the variation in stock *j*'s price is firm-specific – the stock's returns are more synchronous with the overall market. From a finance perspective, this is arguably a "good thing" in that firm-specific variation is diversifiable. Obviously,

[5] $$1 - R_j^2 = \frac{firm\text{-}specific\ variation}{firm\text{-}specific\ variation + market\text{-}wide\ variation}$$

likewise measures the firm-specific fraction of the risk in stock j's returns, the stock's tendency to move asynchronously from the overall market. To stress that the Market Model R_j^2 is more than a statistical goodness of fit, we call R_j^2 stock *j*'s *synchronicity* and $1 - R_j^2$ it's *asynchronicity*.

2.1 R^2 over time in the U.S.

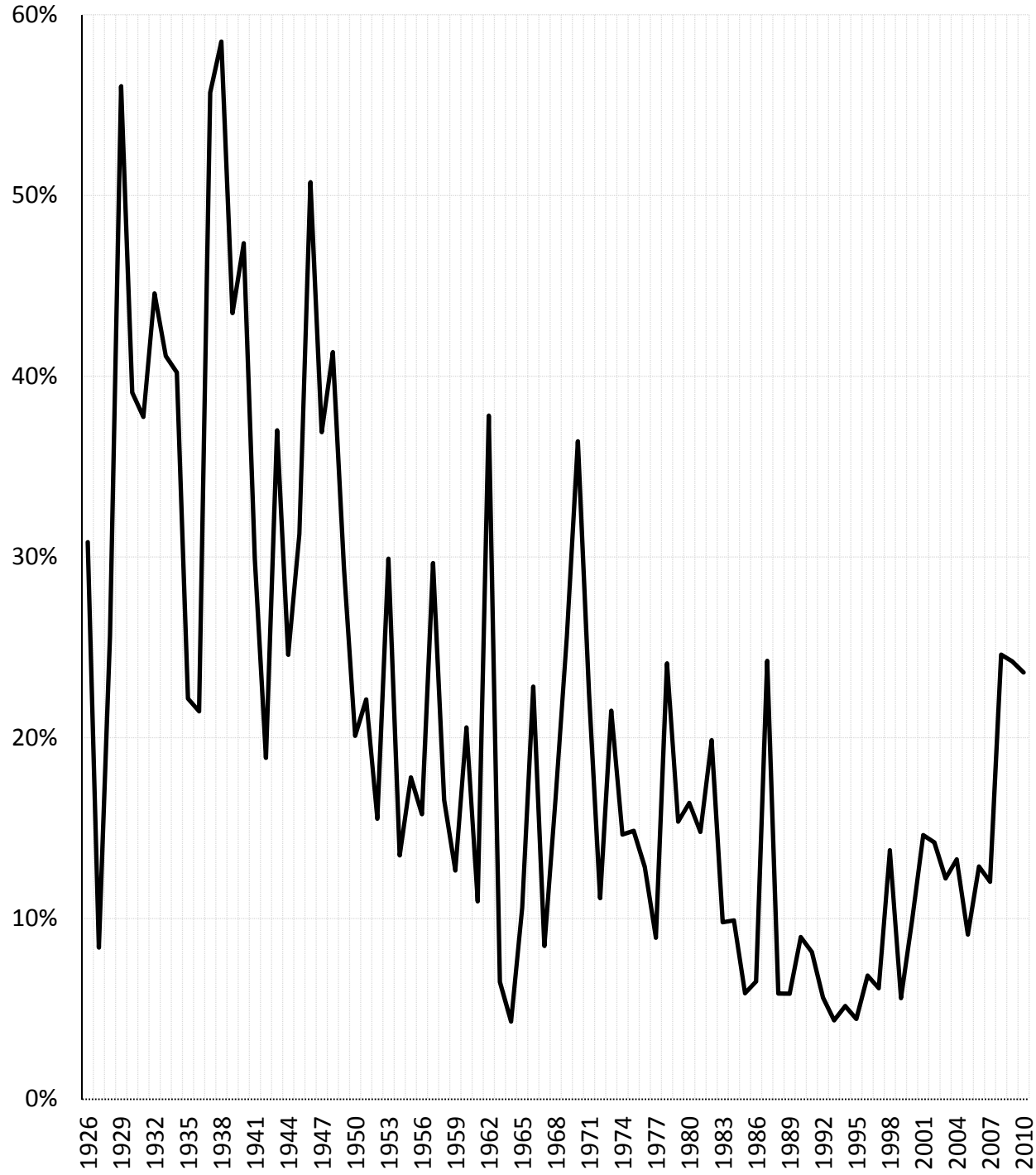
Figure 1 graphs annual mean R^2 s of all US stocks from 1926 through 2010. For each stock in each year, weekly returns are regressed on the CRSP value-weighted market returns [2]. To minimize data coding errors, weekly returns over 25% in absolute value are removed. Also, weeks with missing or zero trading volumes are removed. Finally, firms with fewer than 30 valid weekly returns in a year are dropped. The mean R^2 for each year, defined in [3], is obtained operationally by dividing the sum across stocks of the sum of squares variation explained by the model by the sum across stocks of the total sum of squares variation.

The mean R^2 declines steadily through the mid-1990s, replicating Morck et al. (2000) and Campbell et al. (2001). But spectacularly, the R^2 increases markedly after 2000, and by 2008 reaches levels that, except amid the Crash of 1987, were not seen for sustained periods since the 1970s. Explanations of why firm-specific and systematic risk change over time must account for all these patterns, not just the steady rise in the late 20th century.

Figure 1. US Stock Comovement, 1926 – 2010

R-squared is mean stock-level Market Model regression R^2, based on weekly (Wednesday-to-Wednesday) CRSP total stock returns for each stock each year. Market-wide variation is observation-weighted mean of sum-of-square variation explained by firm-level market model. Firm-specific variation is similarly-weighted mean of residual variation.

Panel A. Market Model R^2 for Individual US stocks



Panel B. Market Model Firm-specific and Market-wide Variation in Market Model regressions for Individual US Stocks each year.

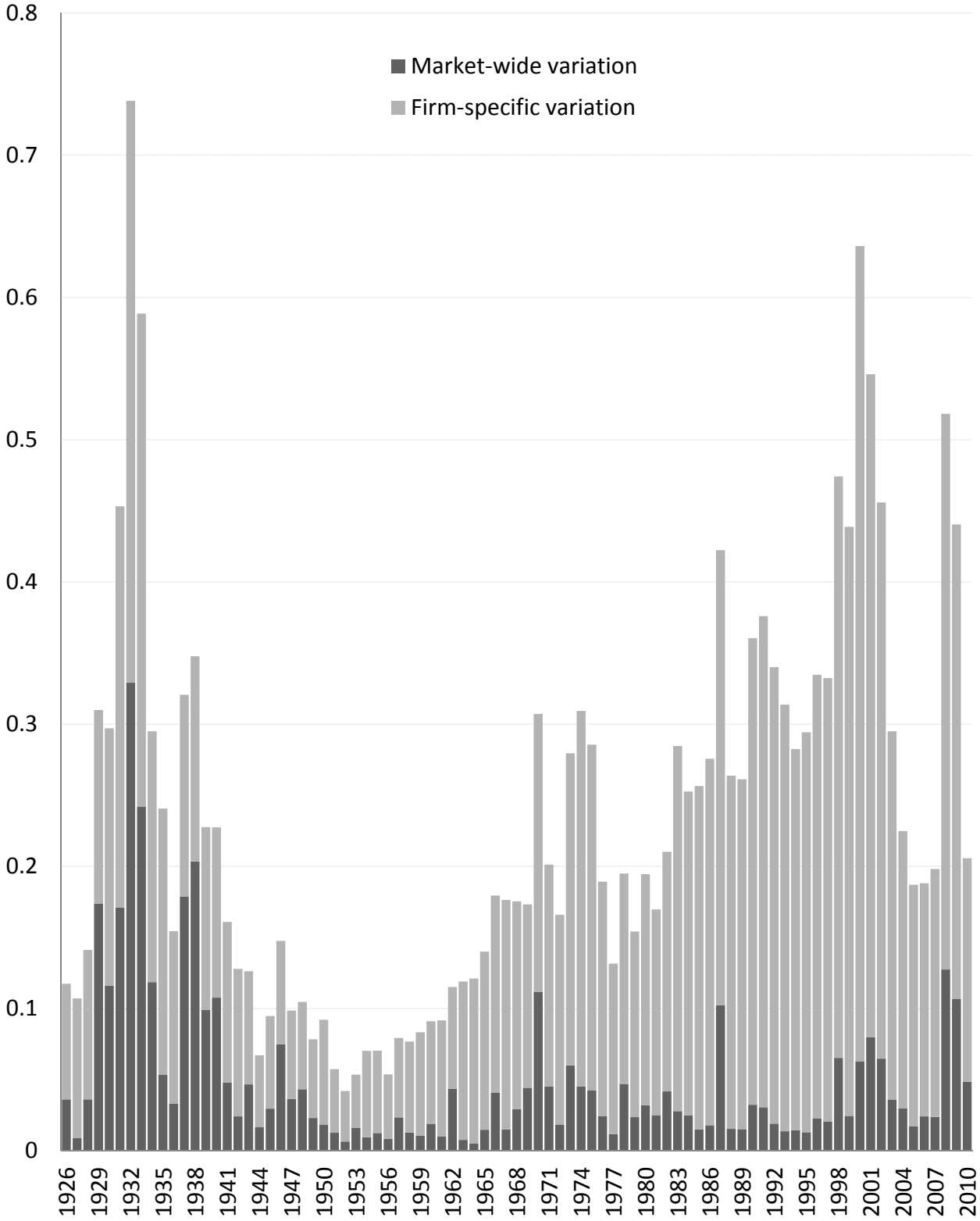
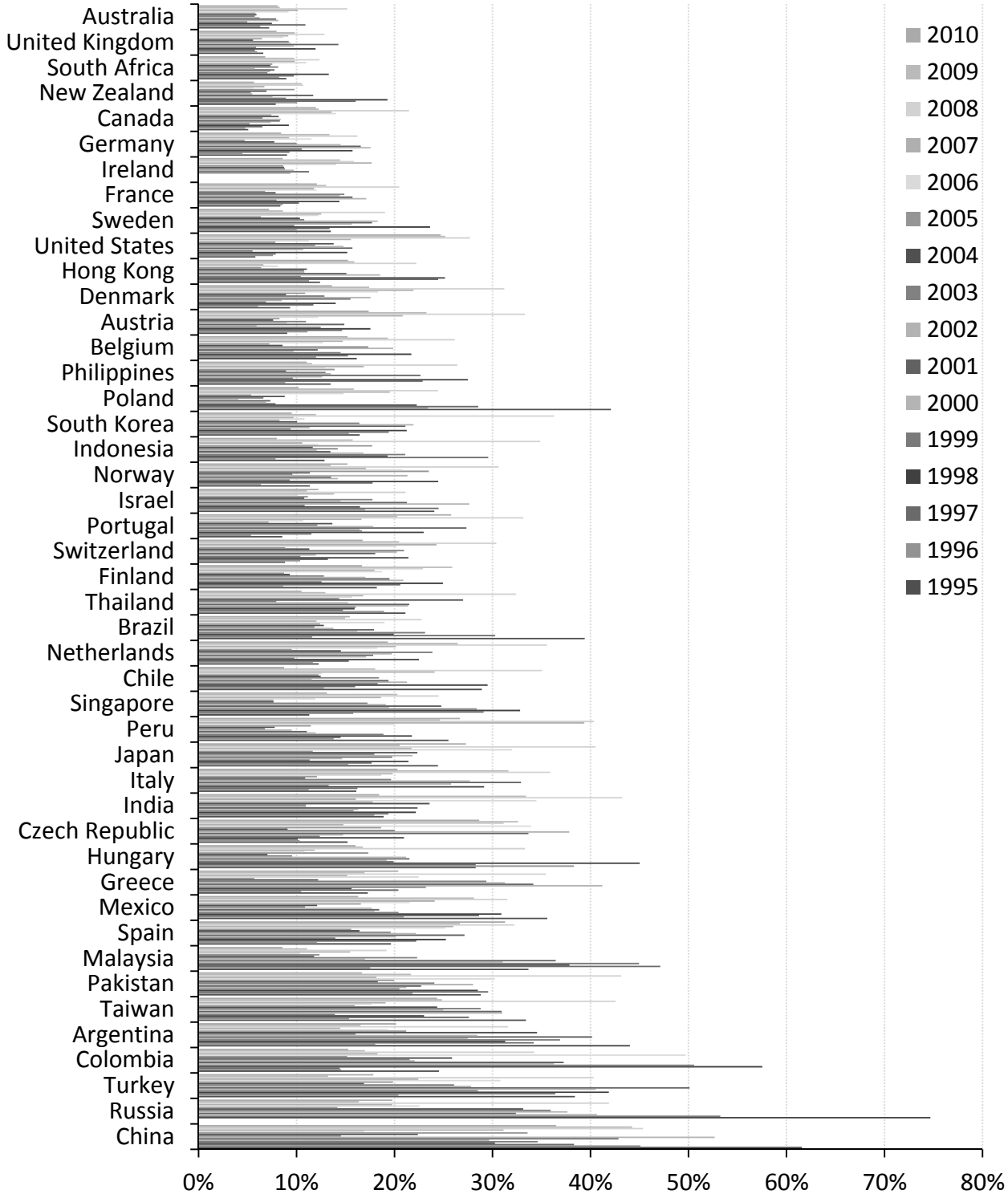


Figure 2. Higher Firm-specific Return Variation in Higher Income Economies

Mean stock-level market model R^2, by year from 1995 to 2010 for each country, estimated using weakly (Wednesday-to-Wednesday) DataStream total returns and country total return indexes, sorted by mean R^2 over all years.



2.2 R^2 across countries

Figure 2 graphs the mean R^2 of each country's stocks from 1995 through 2010. The countries are sorted by their mean R^2, averaged across all stocks and years. Thus, the pattern Morck et al. (2000) observe in the 1990s persists in subsequent years. Even the reported major anomaly, Japanese stocks exhibiting markedly low firm-specific variation given that country's per capita GDP, persists. South Africa, presents the other major exception: a relatively low income country whose stocks move highly idiosyncratically.

One major difference between Morck et al. (2000) and Figure 3 is that American stocks, the most idiosyncratic in the 1990s, became more synchronous over time, leaving its stock only the tenth most asynchronous in the figure. Another is that Polish stocks, among the most synchronous in the word in the 19990s, become quite idiosyncratic over time.

3. Market Efficiency

Morck et al. (2000) speculate that higher firm-specific stock returns volatility might signify more firm-specifically nuanced stock price movements that more accurately reflect underlying firm-specific changes in fundamental values. To test this, Durnev et al. (2003) show that current stock price changes are better explained by future earnings changes in US industries where stock returns also exhibit higher firm-specific volatility. Noting that the power of future earnings changes to explain current stock returns is a widely accepted measure of stock market efficiency in the accounting literature (Collins et al. 1994 and Basu 1997) they conclude that

elevated firm-specific returns variation does indeed reflect more informationally efficient share pricing.

Further development on this line of reasoning requires an exploration of the determinants of stock market efficiency. Fama (1970) describes the stock market as more informationally efficient if share prices adjust faster and more completely to new information. Informational efficiency can reflect private arbitrageurs gathering new information, reassessing firms' fundamental values, and trading to profit from those reassessments (Grossman 1976); or more meaningful public announcements (Fama et al. 1969); or more energetic insider trading (Manne 1966). Each can push stock prices towards fundamental values, all else equal, raising informational efficiency where informed arbitrage is less costly, disclosure fuller and timelier, and insider trades more informative. Obviously, all else rarely remains equal.

3.1 Private information-based arbitrage

Roll (1988) argues that firm-specific fluctuations rarely reflect public news announcements, and posits that private arbitrage must be responsible for most such price fluctuations. Consistent with this, Berry and Howe (1994) detect no relationship between the incidence of public news and stock returns. If private arbitrageurs are the main force pushing prices to fundamental values, arbitrageurs' costs of doing business and revenues from informed trading determine the informational efficiency of the stock market (Grossman and Stiglitz 1980).

If so, higher firm-specific variation in higher income countries and later 20th century decades reflects arbitrageurs' lower costs or higher revenues. In a dynamic model with discrete fixed costs to information gathering and processing, Veldkamp (2006) formalizes this argument. Competition leads information suppliers to produce information useful in estimating the fundamental values of many stocks because this attracts more buyers than would information relevant to one stock. Higher fixed costs of information production increase this effect. More arbitrageurs trading en masse on the same information about the same subset of stocks causes returns to move more synchronously. Finally, stocks move more synchronously in recessions and more independently in expansions (Ribeiro and Veronesi 2002; Brockman, Liebenberg, and Shcutte 2010) and this effect is stronger in lower income countries (Brockman, Liebenberg and Shcutte (2010). These findings also fit Veldcamp's model because larger fixed costs in any industry loom more important in downturns. Thus, stock return comovement is countercyclical because firm-specific information production is procyclical.

Attending to the economics of the information production industry reconciles several seemingly discordant findings. Stocks followed by more analysts commove more in the US (Piotroski and Roulstone 2004) and elsewhere (Chan and Hameed 2006). Hameed, Morck, and Yeung (2005) show that firms whose fundamentals are closely correlated with other firms' fundamentals attract more extensive analyst coverage, consistent with Veldcamp's prediction that analysts tend to produce information useful for estimating the fundamental value of many firms, rather than just one. This leaves more investors trading on the same information about the same subset of stocks, inducing stock return comovement. Also consistent with this reasoning, analysts' forecasts rely mainly on industry and economy-level information (Schutte

and Unlu 2009; Crawford, Roulstone and So 2012).[3] Presumably, firm-specific information enters stock prices via arbitrage by other private parties with better information generation abilities – perhaps hedge funds.

Stocks move more independently after emerging markets reduce inward foreign portfolio investment restrictions (Li, Morck, Yang, and Yeung 2004) receive increased equity investment inflows from the U.S. (Bae, Bailey, and Mao 2006) announce stock market liberalizations (Bae, Bailey, and Mao 2006) or allow cross-listings or closed-end country funds into the U.S., U.K, (Bae, Bailey, and Mao 2006) or Hong Kong (Gul, Kim, and Qiu 2010). These findings also fit the pattern if foreign arbitrageurs raise the intensity and sophistication of informed trading.

More binding short sale restrictions correlate positively with stock return synchronicity (Bris, Goetzmann, and Zhu 2007). Arbitrageurs with information that a stock is overvalued profit from short selling – borrowing an overpriced stock, selling it, and repurchasing and returning it after the price falls. Because CEOs and politicians often blame short sellers for stock price declines, some countries ban the practice, presumably reducing the value of roughly half the information Veldcamp's information producers generate. Bris et al. further distinguish a *downside* R^2, measuring stock return co-movement when the local market return is negative, from an *upside* R^2, measuring stock return co-movement in periods when the local market return is non-negative. This reveals short-sales restrictions to correlate more strongly with the *downside* $R^{2.}$ Chang, Cheng, Pinegar, and Yu (2012) provide similar evidence based on firm-level data for the Hong Kong market.

[3] The latter add that analysts beginning to follow stocks other analysts already follow use firm-specific information

Who the informed arbitrageurs are in this picture is less clear. Malkiel and Xu (2002)reporting higher firm-specific returns volatility for stocks whose institutional ownership is larger, argue that this reflects noise trading by institutions. Chung, Fung, Shilling, and Simmons-Mosley (2011) advance an alternative explanation more consistent with the literature: institutions' economies of scale in informed arbitrage better cover the fixed costs of information acquisition. Supporting this thesis, they find firm-specific variation positively correlated with the stakes of hedge funds, another genre of large investor widely seen as informed arbitrageurs. Piotroski and Roulstone (2004) revisit institutional investors in general and report higher returns synchronicity in stocks with larger institutional stakes or less institutional trading. Ferreira and Laux (2007) find institutional stakes positively correlated with firm-specific variation around mergers for firms unprotected from takeovers (Gompers et al. 2003).

These findings coalesce into fixed costs of information limiting informed arbitrage. Hedge funds are implicated as firm-specific information generators, as are institutional investors more generally in at least some circumstances. Analysts appear to generate information the market interprets as more broadly relevant. The roles of other classes of potential private arbitrageurs remain unclear. Ambient institutions (restrictions on foreign investors, short sales, etc.) or conditions (recessions, etc.) that increase the net effect of fixed information costs correlate with less independent stock returns.

3.2 Public Information Announcements

Boudoukh et al. (2013) using advanced text recognition software find more firm-specific stock price movements corresponding to public news announcements than did Roll (1988). Thus, institutions affecting the timeliness and completeness of public announcements also affect stock return synchronicity.

Morck et al. (2000) find no such correlation with mandated accounting standards. However, impressive accounting standards are unimportant if unenforced; and measures of accounting disclosure quality do correlate with less synchronicity (Lau, Ng, and Zhang 2012).[4] Moreover, firm-specific returns volatility rises after countries adopt International Financial Reporting Standards, which generally requires more extensive and stringent disclosure than did their supplanted domestic regimes (Bissessur and Hodgson 2012; Kim and Shi 2012). The increase is larger in countries with poorer institutional environments. Durnev, Fox, Morck, and Yeung (2003) find a 1980 increase in U.S. disclosure requirements raising firm-specific return variation, but only for firms most affected by the change.

Jin and Myers (2006) model coordination problems limiting insiders' diversions of market-wide, but not firm-specific, abnormal profits, where firm-level disclosure is weak. Consistent with this, they report economy-level measures of firm-level disclosure quality positively correlated with firm-specific returns variation. Several additional tests further support their model. These findings suggest that differences in investors' property rights over the wealth their firms generate might help explain cross-country differences in returns

[4] Their risk premium volatility, by construction, measures synchronicity.

synchronicity (Morck et al. 2000). Also supporting Jin and Myers' model, Hutton, Marcus and Tehranian (2009) find firm-specific returns variation negatively correlated with accruals management, which they interpret as measuring management's preference for opacity, in U.S. firms. Moreover, this relationship vanishes with the passage of the Sarbanes-Oxley Act, which limits earnings manipulation. Asynchronicity's positive correlation with shareholder rights (Morck et al 2000) is also consistent with Jin and Myers' model.

Corporate disclosure is always partly voluntary. Mangers might disclose the bare minimum consistent with a legalistic reading of the regulations, or go out of their way to be transparent. The stocks of US firms with better voluntary disclosure ratings move more independently (Haggard, Martin, and Pereira 2008); as do those of Chinese firms that employ a Big Four auditor (Gul, Kim, and Qiu 2010). Ferreira and Laux (2007) find firm-specific return variation correlating positively with corporate governance quality, which they interpret as reflecting investors' power to demand transparency. A similar interpretation explains higher firm-specific return variation in Chinese stocks with more dispersed ownership, more foreign ownership, and less state control (Gul, Kim, and Qiu (2010). This reasoning suggests a reinterpretation of the Li et al (2004), Bae et al. (2006) and Gul et al. (2010) findings of increased asynchrony after foreign investors enter. More sophisticated investors might demand transparency, rather than intensify information-based arbitrage.

Transparency is especially important to firms needing external equity (Myers and Majluf 1984) so securities regulations typically require unusually detailed disclosure prior to equity issues. Dasgupta, Gan, and Gao (2010) report elevated firm-specific return variation prior to

seasoned equity issues (SEOs) and cross-listings, which often precede SEO, as well as depressed firm-specific variation subsequent to these events.

These findings highlight the timing of information flow into public markets. Durnev et al. (2004) speculate that opacity might merely delay the release of information. If the delay is constant and fundamentals follow a martingale (West 1988) firm-specific variation is unaffected. However, if the stock price moves with the market as firm-specific mispricing builds up, and then adjusts abruptly to fundamental value, that unchanging variance manifests as a few large fluctuations rather than many small ones. If such large corrections are rare, short data windows might miss these black swan events and a negative correlation between transparency and *observed* synchronicity might result. Alternatively, Durnev et al. (2004) posit that the firm-specific component of fundamental value might be mean reverting, rather than a martingale. For example, abnormally high dividends due to an exceptionally good CEO would cease after his passage from the scene. Because the timing of such changes cannot be foreseen with certainty, stock prices might rise as investors become aware of the CEO's talent and then drop back after she retires. Jin and Myers (2006) allow such abnormal profits to be captured by an insider, so the world continues as if they had never existed.

These studies link highly independent stock price movements to enhanced disclosure quality, and to high standards of voluntary disclosure especially. These findings qualify, but do not contradict, evidence linking informed arbitrage to firm-specific stock returns variation. For example, better disclosure might reduce arbitrageurs' fixed costs of information; or lower fixed

costs of arbitrage might replace rare large corrections with frequent small ones, more readily observable in any given time window.

3.3 Insider Trading

Informed arbitrage and public disclosure are not the only ways private information can enter share prices. Manne (1966) argues for unrestricted insider trading because insiders, having the most information about their firm, are best able to engage in informed arbitrage if their firm's shares become mispriced. However, unrestricted insider trading might equally well worsen information asymmetry problems (Bhattacharya and Nicodano 2001) and deter outsider arbitrageurs from paying for information (Fishman and Hagerty 1992).

Higher firm-specific return variation correlates positively with the intensity of insider trading in U.S. data (Piotroski and Roulstone 2004); but with stronger insider trading restrictions in cross-country data (Durnev and Nain 2007). These discordant results are reconciled by recalling that insider trading restrictions do not ban insider trading, but require insiders to refrain from trading until material inside information is made public, and to disclosure their trades. Thus, insider trading intensity arguably correlates with the intensity of information disclosure in the US, and thus with high firm-specific stock price fluctuations. However, countries that do not meaningfully regulate insider trading deter informed arbitrage by outsiders, so stocks move less independently.

Consistent with this reconciliation, Khwaja and Mian (2005) report that Pakistani insiders' "pump and dump" strategies render stock price movements more synchronous, consistent with their deterring informed arbitrage by outsiders. Fernandes and Ferreira (2009) find a country's first enforcement of its insider trading laws elevating firm-specific variation in developed, but not emerging economies. This is consistent with insider trading restrictions encouraging fuller disclosure in other developed economies, but not where disclosure is chronically unreliable. Bhattacharya, Daouk, and Kehr (2000) argue that this characterizes many emerging economies, that firm-specific information in such economies enters stock prices via insider trading well before it is publicly disclosed.

3.4 Feedback

Thus, informational efficiency is higher where informed arbitrage is less costly, disclosure fuller, and insider trading regulations more conducive to transparency, all else equal. Obviously, all else is unlikely to remain equal. Rather, each effect feeds back on itself and the others.

First, more active informed arbitrage arguably deters subsequent informed arbitrage. This is because the firm-specific share price fluctuations caused by one arbitrageur's informed trading appears as higher firm-specific risk to other prospective arbitrageurs. This makes holding large undiversified positions in mispriced stocks riskier, which deters arbitrage (Shleifer and Vishny 1997). Thus, a negative feedback loop constrains informed arbitrageurs ability to render the stock market increasingly informationally efficient. Theoretical work on this effect would be helpful.

Second, Fernandes and Ferreira (2008) find cross-listings into the U.S. elevating firm-specific returns variation if the cross-listed stock's home market is another developed economy, but reducing firm-specific returns variation if the home market is a developing economy. They posit that fuller disclosure conveys more information to stock prices, but also makes finding genuinely valuable private information more difficult, and so deters informed arbitrage. They conclude that cross-listing into the stricter U.S. disclosure regime mainly intensifies informational efficiency for stocks based in developed economies, but primarily crowd out informed arbitrage for emerging market stocks. This could be because additional valuable information is less costly to unearth in other developed economies.

An intriguing study by Xing and Anderson (2011) argues that these effects combine to make stocks move more idiosyncratically if public information is either very abundant or very scarce. This is because abundant free information renders the market informationally efficient without extensive informed arbitrage, and scarce public information makes intensive private information generation and informed arbitrage economically viable. An intermediate availability of public information then minimizes informational efficiency, and maximizes synchrony. Using the annual number of voluntary management earnings forecasts as a proxy for the provision of public firm-specific information, they find such a nonlinear relationship. Further work is needed to map out such nonlinearities in these feedback effects. [5]

Finally, insider trading might feedback upon informed arbitrage and disclosure quality. For example, stronger regulations mandating full disclosure before insiders may trade might

[5] Such interactions might explain how firms-specific returns variation could rise in US stocks as earnings disclosure quality fell through the late 20th century (Rajgopal and Venkatachalam 2011; Chen, Huang, and Jha 2012) Perhaps lower quality earnings disclosure was more than offset by more private information generation.

render disclosures more credible, but might also cause firms to hide private information so insiders' trades appear to comply. And, as noted above, more active insider trading could deter outside investors from gathering private information.

Such feedback loops, however helpful in reconciling otherwise disjoint empirical findings, leave informational efficiency constrained not just by the cost of information (Grossman and Stiglitz 1981)but also by its cost structure (Veldcamp 2006) which may not be entirely exogenous. Thus, the economic impact of institutional developments associated with informational efficiency – trading, disclosure, and insider trading regulations – may be subject to interacting feedback effects.

3.3 Functional Efficiency

Fortunately, information efficiency is a means to an end, not an end in itself. The social purpose of financial markets is arguably to allocate the economy's savings to their highest value uses (Schumpeter 1911). Tobin (1980) defines the stock market as *functionally efficient* if stock price changes coordinate a microeconomically efficient allocation of capital, and notes that the functional and informational efficiency need not coincide. Indeed, Grossman and Stiglitz (1980) prove they cannot if information is costly. Consistent with Tobin's thinking, Griffin, Kelly and Nardari (2013) find, if anything, negative correlations between informational efficiency measures (e.g. the fit of stock returns to a martingale process) and measures of either financial development or stock return independence.

These considerations shift our focus from informational efficiency to functional efficiency: Do stock prices that move about more independently better direct capital to its highest value uses? To explore this, Wurgler (2000) gauges the functional efficiency of a country's financial system by the correlation of capital spending with value added across industries. If a country's capital spending concentrates in high value-added industries, capital flows to where it creates new wealth and Wurgler's measure is near plus one. If capital is sprinkled randomly across sectors, without regard to where its return is higher, the measure is near zero. If capital perversely flows disproportionately to where its value-added is lowest, the measure drops to minus one.

Wurgler finds more functional efficiency in the financial systems of higher-income economies, economies with larger financial sectors, and economies with stronger shareholder rights. In contrast, Griffin, Kelly and Nardari (2013) find that emerging economy stock prices more closely approximate martingale processes, a key implication of informational efficiency. Grossman and Stiglitz (1980) and Black (1987) predict precisely such a discord: capital allocative efficiency necessitates imperfect informational efficiency. The issue then is whether the informational efficiency Griffen et al. (2013) observe in more developed economies correspond to better or worse functional efficiency (Tobin 1984).

Figure 4 plots Wurgler's (2000) finding that more asynchronous stock prices are statistically significantly correlated with more functionally efficient capital allocation. Griffin et al. (2013) also report no correlation, or even a negative correlation, between their informational efficiency proxies and stock return asynchrony. These finding are reconciled if a

wedge separates functional efficiency from perfect information efficiency (Grossman and Stiglitz 1980).

Using industry-level US data, Durnev et al. (2004) replicate Wurgler's finding. Gauging the marginal return to capital by Tobin's marginal Q ratio (one plus the NPV of the firm's marginal capital investment project as a frat ion it that project's setup cost) adjusted for tax distortions; they report lower firm-specific stock returns volatility in US industries where marginal Q is farther from one. Thus, they correlate more efficient capital allocation with higher firm-specific returns volatility. This could reflect more nuanced firm-specific stock price movements holding managers more to account for their decisions, providing "crowd sourcing" feedback to managers that leads to better decisions, forcing firms to employ more talented and creative people, or just better reflecting firms' actual fundamental values. Potentially consistent with all but the last, Durnev et al. (2004a) link more independently moving stock prices to higher TFP growth across countries.

These studies argue for further theoretical and empirical reflection on the functional efficiency of financial markets, its determinants, and its relationship to the informational efficiency – often misconstrued as a normative goal in the finance literature.

Figure 4. Functional Efficiency and R^2

Higher levels of Wurgler's (20000) measure of functional efficiency indicate a greater concentration of capital spending in industries with higher value-added. R-squared is from Morck et al. (2000). Both variables use mid 1990s data.

4. Fundamentals

The previous section presumes a given underlying pattern in the fundamental value of a stock, and considers how differences in the way market prices approximate fundamentals might generate observed time series and cross sectional patterns in firm-specific versus market-wide returns fluctuations. Morck et al. (2000) argue that higher income and less corrupt countries' stocks exhibit higher proportions of firm-specific volatility after controlling for firm-specific earnings volatility. Subsequent work shows their control variable inadequate. Better fundamentals co-movement measures explain substantial fractions of returns comovement in cross-section (Pastor and Veronesi 2003) and panel (Wei and Zhang 2006; Chun et al. 2008; Irvine and Pontiff 2009) data. These findings necessitate an exploration of changing fundamentals volatility.

4.1 An excess of explanations

Irvine and Pontiff (2009) link elevated firm-specific volatility in fundamentals and returns to increased competition, arguing that lesser momentary leads and missteps induce more protracted gains and losses in an increasingly competitive latter 20th century U.S. economy. Bolstered by larger increases in fundamentals volatility in deregulated industries, this explanation also accommodates declining fundamentals returns. Gasper and Massa (2006) similarly argue that market power lets firms smooth firm-specific earnings and lower

information uncertainty for investors, explaining their finding that firms with larger market shares have lower firm-specific fundamentals and stock returns volatilities.

Pastor and Veronesi (2003) find higher idiosyncratic earnings volatility in younger firms; and Fama and French (2004) report a rising incidence of small and newly listed firms, which have lower and more positively skewed earnings, in the late 20th century. Both suggest that newer firms may be harder for investors to value. Brown and Kapadia (2007) link the time trend in idiosyncratic return volatility to IPOs; and report persistently higher idiosyncratic volatility in later cohorts of IPOs. They conclude that the findings of Fama and French reflect riskier firms listing, not smaller firms being riskier. Fink, Fink, Grullon, and Weston (2010) find a steady drop in firm age at IPO – from about 40 years in the early 1960s to less than 5 years by 2000 – and that controls for firm age explain the time trend in idiosyncratic return volatility.

Several studies relate elevated firm-specific returns volatility to better corporate governance. Recall that Ferreira and Laux (2007) find elevated firm-specific stock return volatility in firms with higher corporate governance scores, and Gul, Kim, and Qiu (2010) report higher firm-specific return volatility in Chinese stocks with more disperse ownership, more foreign ownership, and less state control. If better governed firms are more prone to undertake risky innovative investments (John, Litov and Yeung 2008), these findings might reflect higher firm-specific fundamentals volatility, as well as greater transparency. Also supporting a governance effect, Cheng (2011) finds lower firm-specific fundamentals and stock returns variability in firms with larger boards, a widely accepted proxy for poor governance (Yermak 1996; Hermalin and Weisbach 2003; Adams et al. 2010). Malkiel and Xu's (2002)

linking institutional investor stakes to elevated firm-specific returns volatility can be reinterpreted as institutional investors holding managers to higher governance standards (Shleifer and Vishny's 1986). A similar reinterpretation might recast fuller disclosure (Jin and Myers 2006; Haggard, Martin, and Pereira 2008; Dasgupta, Gan, and Gao 2010) and cross-listing into a regulatory regime enforcing stronger shareholder rights (Fernandes and Ferreira 2008) as also improving corporate governance. Adams, Almeida, and Ferreira (2005) find elevated stock return volatility in firms controlled by their founders, and argue that these firms, like firms with small boards, can undertake more value enhancing risks because of their concentrated and responsible decision-making authority.

Cross-country differences in corporate governance might also matter. Listed corporations in more corruption-prone economies are more apt to belong to business groups, and thus have equity cross-holdings, a common set of directors, and/or a common controlling shareholder (La Porta et al. 1999). Firms in business group exhibit lower firm-specific returns volatility in Japan (Hamao, Mei, and Xu 2007) and elsewhere (Khana and Thomas 2009). One possible explanation of this result is that group firms co-insure (Hoshi, Kashyap and Scharfstein 1991) against adverse firm-specific shocks: temporarily successful group member firms prop up temporarily unsuccessful related firms.

Japan, which grants bankers substantial corporate governance influence, is an outlier in Figure 2 – a high income economy where firm-specific returns volatility is persistently low (Morck and Yeung 200x) and dropping through the 1990s (Hamao, Mei, and Xu 2007). Banker governance influence correlates with Japanese firms pursuing low-risk strategies (Morck,

Nakamura and Shivdasani 2000), and firm-specific return volatility is significantly higher in Japanese family-controlled firms (Nguyen 2011).

Finally, macroeconomists find a Great Moderation in US macroeconomic volatility in latter 20th century, more or less contemporaneous with rising firm-level (Comin and Mulani 2006) and firm-specific (Chun et al. 2011) sales volatility. Moreover, the financial crisis of 2008 ended the Great Moderation with a sharp resurgence in macroeconomic volatility, even as firm-specific volatility fell off (Chun et al. 2011).

4.2 Synthesis

Chun et al (2008, 2011) find industries that invest more intensively in information technology (IT) experience larger increases in firm-specific fundamentals and stock returns volatility and higher productivity growth. Endogenous growth theory (Jovanovic and Rouseau 2005) links IT to a broad wave of creative destruction (Schumpeter 1911) across the U.S. economy in the late 20th century. That is, the creative firms across throughout the economy that most successfully applied IT in their sectors profited hugely, leaving unsuccessful innovators and non-innovative incumbents partially or completely destroyed. Chun et al. (2011) argue that elevated firm-specific returns and fundamentals volatilities reflect this wave of IT driven creative destruction magnifying the gap between winners and losers across the US economy. Consistent with this, they find this effect fading in the early 21st century as IT investment plateaued across sectors and the IT boom was widely regarded as having run its course.

This explanation is consistent with Irvine and Pontiff (2009) who link high firm specific volatility in fundamental and returns to increased competition associated with deregulation. Extensive US deregulation in the 1980s exposed creaking formerly regulated monopolies (Stigler 1971) to abrupt intense competition and to pressure from more innovative rivals.

A wave of creative destruction also meshes with a firm age effect (Pastor and Veronesi 2003; Fama and French 2004; Brown and Kapadia 2007; Fink et al. 2010). This shift in corporate demography is likewise consistent with a wave of creative destruction because the top executives of established firms, whose human capital relates to existing technologies, often block disruptive innovation (Bower & Christensen 1995) and because new firms offer creative entrepreneurs surer ownership of their ideas (Schumpeter 1911). Finally, Chun et al. (2013) argue that low returns in listed firms can accompany a wave of creative destruction that increases the overall productivity of the economy if the owners of creative firms capture much of the return to innovation prior to their IPOs.

Also consistent with more general innovation elevating firm-specific volatility, Kothari, Laguerre, and Leone (2002) find R&D investments positively related to subsequent earnings volatility. Osinga, Leeflang, Srinivasan, and Wieringa (2011) find advertising spending correlated to elevated firm-specific returns volatility in pharmaceutical firms, which could reflect either advertising campaigns having winner-take-all characteristics akin to R&D races or advertising intensity tracking the intensity of innovation. Bartram, Brown, and Stulz (2012) report higher idiosyncratic return volatility of U.S. firms than in comparable foreign firms, and link the difference to R&D and patents. Brown and Kimbrough (2011) find link intangible

investments to earnings variability, and find R&D especially elevating earnings variability in industries where patents are better protected.

Building on the real option models of Galai and Masulis (1976) and Myers (1977), Cao, Simin, and Zhao (2008) argue that levered firms' managers, to maximize the existing shareholders' wealth, favor investments that elevate the firm's idiosyncratic risk. Cao et al find firm-specific return volatility positively correlated with Tobin's average Q, which they interpret as a proxy for the value of growth options. They further find that controlling for growth options removes, or even reverses, the idiosyncratic volatility trend in Campbell et al (2001) and renders insignificant other explanatory variables, including profitability (Pastor and Veronesi 2003; Wei and Zhang 2006)and firm age and size (Pastor and Veronesi 2003; Fama and French 2004; Fink et al 2010). Zhang (2010) analogously correlates firm-specific returns volatility with market-to-book ratios and earnings volatility in industry-level data for the U.S. and nine other high-income countries. Bekaert, Hodrick, and Zhang (2012) likewise find time variation in idiosyncratic volatility in the G7 countries significantly positively correlated to market-to-book ratios, business cycles variables, and systematic volatility. To the extent that growth options arise from new technologies and that Tobin's average Q ratios and market-to-book ratios approximates Tobin's marginal Q ratio, a theoretically valid measure of growth options, these findings also support the thesis rising elevated firm-specific volatility reflects a gathering wave of technological change.

Perhaps most importantly, this explanation reconciles firm specific returns volatility being related to both market efficiency and fundamentals volatility. King and Levine (1993)

present empirical evidence supporting Schumpeter's (1911) argument that an efficient financial system, especially a functionally efficient stock market, is essential to fast-paced creative destruction. This is because creative potential entrepreneurs often lack wealthy parents, and must raise capital from others to develop their innovations.

Creative undertakings are uniquely ill-suited for bank loans because they promise huge upside potential but entail substantial downside risk. Because banks receive fixed interest, bankers are unimpressed by upside potential, however huge, but deeply concerned about downside risk. Bankers, parsing information for downside risk problems, may not even monitor upside gains. Creative innovators typically have scant collateral, which bankers value highly. Even ultimately successful innovators may not generate substantial revenues until many years in the future, yet bank loans typically require prompt commencement of regular payments of interest and principal.

Schumpeter (1911) argues that creative entrepreneurs therefore need economically efficient financial markets to raise capital.[6] Stock markets are especially expedient (Atje and Jovanavlc 1993; Levine and Zervos 1998). Shareholders balance downside risk against upside potential, demand no collateral, accept that dividends may not begin for many years, and attend to information about both gains and losses. Even venture capital firms, financial institutions that provide capital to innovators, typically do so with the expectation of recouping their investment plus a profit when the innovators' firms go public. Once listed, these firms can

[6] Schumpeter was unimpressed with high finance, viewing highly leveraged banks his era's financial engineering as diversions from the financial system's social purpose (Leathers and Raines 2004).

grow further by issuing more equity or by using accumulated physical assets or stabilized earnings to raise debt.

Costly regulations with scant real positive impact on corporate governance render outside equity capital from either an IPO or a seasoned equity offering (SEO) more costly. The period from 1975 through 2000 saw a series of sweeping financial liberalizations in the U.S. and elsewhere that, at first at least, dismantled a broad range of arguably inefficient regulation. While events in and after 2000 lead many to conclude that deregulation may well have gone too far, it seems plausible that increasing competition among market makers and brokers (Geisst 2012) and an expanding venture capital fund to IPO cycle (Gompers and Lerner 2001) improved informational and functional efficiency in U.S. financial systems, like liberalizations may have had like effects in other countries (Bekaert, Harvey and Lundblad 2005; Henry 2007).

Causality in these events is plausibly bidirectional. A broad realization that developing new technologies has very high returns leads to democratic pressure on governments to reduce barriers to broad participation in these investments (Kindleberger 1978). Such reforms often begin with the removal of excessive regulation, often the legacy of an overreaction to a prior and historically distant financial crisis, but can easily go too far if high realized returns overinflate investor sentiment, and mania-driven investors and financial insiders press for the removal of socially cost-effective regulations too. Likewise, regulatory reforms that reduce information asymmetries and enhance corporate governance let capital flow more reliably and precisely into firms with better prospects of successfully creating value from new technologies. Again, momentum driven investors can pour too much capital into such firms and sectors,

ultimately fuelling their overexpansion. But, after the dust settles, the economy is left with new productivity-increasing technologies in use.

This linkage between financial dynamism and creative destruction can also play out across countries. In countries where corporate governance standards are lower, public equity capital is dearer (La Porta et al. 1998; Rajan and Zinglaes 1998) and new listings rarer (La Porta et al. 1998); and entrepreneurs, intent on founding new firms, find tough going. In such countries, wealthy business families often control vast business groups (Rajan and Zingales 2003; Morck et al. 2004), whose member firms assets are what creative destruction would destroy (Morck and Yeung 2003). Thus, less firm-specific variation amid business groups (Khanna and Thomas 2009 might reflect sluggish innovation.

Even Japan fits in. Japan's prolonged economic slowdown after 1990 is attributed to stalled innovation (Morck and Yeung 2003). Risk-averse bank-influenced firms (Morck et al. 2001) predominate in sheltered backwater sectors, while many family firms are actually run by first generation entrepreneurs, whom business families adopt as legal sons and heirs (Mehotra et al. 2013). Perhaps higher returns comovement for bank-linked than family firms (Nguyen 2011) reflects more innovation in the latter.

An alternative interpretation of higher synchronicity in firms with larger boards (Cheng 2011), smaller institutional investor stakes (Malkiel and Xu 2002), worse governance scores (Ferreira and Laux 2007); worse disclosure (Jin and Myers 2006; Haggard, Martin, and Pereira 2008; Dasgupta, Gan, and Gao 2010) and purely domestic listings (Fernandes and Ferreira 2008) also follows. Worse governance might stymie innovation. Also, Adams, Almeida, and Ferreira's

(2005) finding of elevated stock return volatility in firms controlled by their founders might reflect a preponderance of founder control in firms that are both young and highly innovative.

Finally, a connection can be drawn – albeit with loose ends – to the Great Moderation and the financial crisis of 2007. Morck et al. (2000) and Campbell et al. (2001) show that the declining R^2 evident in US stocks in the late 20^{th} century reflects rising firm-specific variation, more than falling market wide variation. Comin and Mulani (2006) argue that an intensifying pace of innovations altered the structure or risk-return payoffs in the U.S. by augmenting firm-specific gains and losses, which cancel out in diversified portfolios. For reasons still unclear, market-wide volatility in individual stocks simultaneously declined and the Great Moderation of U.S. macroeconomic volatility ensued. Kindleberger (1978) shows that episodes of intensive technological change historically induce financial manias that end in panics and crashes. Perhaps a gathering mania reduced investor risk aversion, rendering discount rates low and stable through the Great Moderation, until panics and crashes in 2000 and, more finally, in 2007/8 reset risk aversion to normal levels and reconnected discount rates to macroeconomic fundamentals. This reasoning is obviously highly speculative, but is consistent with several accounts of these events (Kindleberger and Aliber 2011; Reinhart and Rogoff 2011; Shiller 2012).

4.3 Feedback

Section 3 assumed exogenous firm-specific fundamentals variation, and described a feedback effect where informed trading, by inducing firm-specific price movements, creates firm-specific risk that limits subsequent informed arbitrage. This section shows that firm-specific

fundamentals variation reflects creative destruction, which depends on functional market efficiency. This insight leads to three additional feedback effects.

First, if higher firm-specific price variation is a sign of more functionally efficient capital allocation, this fuels faster creative destruction, which elevates firm-specific fundamentals variation. This has two possible feedback effects. First, large firm-specific swings in fundamental value make private information potentially more valuable because any given stake in a mispriced stock is more valuable if the subsequent price correction is larger. This makes informed arbitrage more profitable, all else equal. To the extent that this enhances functional efficiency, creative destruction accelerates further and a virtuous circle of productivity growth ensues.

But a second feedback effect can also arise. Higher firms-specific fundamentals variation also elevates firm-specific returns variation. As in section 3, this makes large undiversified arbitrage positions riskier, deterring arbitrage. To the extent that this limits functional efficiency, it feeds back to limit creative destruction and thus firm-specific fundamental variation. Which fundamentals feedback effect dominates is a priori unclear because the link between informational efficiency and functional efficiency is not fully understood.

A third feedback exists. Bebchuk and Fershtman (1994) model that freedom to do insider trading might cause CEOs to undertake firm-specifically riskier projects so they can make bigger insider trading profits of wider swings in the stock. On the other hand, the expected

swings raise the risk of informed risk arbitrage and can limit functional efficiency and in turn real creative destructions. These effects are worth further research efforts.

5. Noise traders

Malkiel and Xu (2002) posit that firm-specific volatility is noise in an economic, as well as an econometric, sense. They suggest that firm-specific stock price movements result from uninformed investors buying and selling at prices disconnected from fundamental by randomly changing gaps. This view of noise traders' impact on stock prices differs from standard models of noise trader risk, in which uninformed traders elevate systematic risk by sharing common misperceptions (De Long et al. 1990) or herding (Keynes 1936; Kindleberger 1978; Devenow and Welch 1996). A model of noise trader-generated firm-specific risk would be helpful.

Current models of noise traders suggest a link to market-wide volatility. The Great Moderation in macroeconomics (Blanchard and Simon 2001) is a long period of low market-wide U.S. volatility in the late 20th century that abruptly ended with the unfolding of a major financial crisis in the early 21st century. The Great Moderation thus tracks inversely the decline and rise of firm-specific volatility in Figures 1 and 2. In cross-country data, Morck et al. (2000) find very high market-wide volatility in very low-income countries – again the inverse of the relationship they observe for firm-specific volatility. A comprehensive explanation must accommodate all these findings.

One possibility, advocated by macroeconomists in the late 20th century, is that more sophisticated macroeconomic theory reduced mistakes in monetary policy in later decades in

more developed countries (Taylor 2000). Lower-income economies' governments, this argument goes, inflict excess systematic risk upon their economies. Ill-advised monetary policy might be part of this, but generally erratic public policies could also raise systematic fundamentals risk. The recent financial crisis in the United States and some European countries undermines this explanation, though not irreparably. Australia, Belgium, Canada, Denmark, and many other developed economies remain largely unaffected by this crisis, which may have been an artifact of specific ill-advised banking regulation reforms in the United States and affected European countries, not an indictment of macroeconomics.

Another possibility is the elevation in market-wide volatility standard behavioral finance models associate with more noise trading. In De Long et al. (1990) noise trader herding elevates market-wide stock return risk above market-wide fundamentals rise. If capital is not completely mobile, this raises costs of capital for, among others, informed arbitrageurs. Higher capital costs to potential innovators also curtail economic growth, consistent with lower income economies exhibiting higher systematic as well as lower firm-specific stock returns volatility.

Here again a feedback loop arises. Informed arbitrageurs can buy into market-wide underpricing and short an over-priced market. Such market-wide arbitrage should check noise trading, reducing noise traders' elevation of systematic risk and reducing costs of capital, which lowers arbitrageurs costs of borrowing and also makes capital cheaper for creative entrepreneurs, fueling creative destruction and economic growth in an expanding virtuous circle.

6. Conclusions

In an efficient financial market, firm-specific variation in stock prices measures the intensity with which events, the gist of event studies, occur. A higher firm-specific volatility in stock returns therefore measures either the intensity of firm-specific changes to fundamental values or the faithfulness with which stock returns reflect those changes.

A stream of empirical work links stock return asynchronicity to plausible indicators of more intensive informed arbitrage: easier short-selling, hedge fund interest, openness to foreign investors, investor rights, and the like. Another line of work links returns asynchronicity to measures of the quality of public disclosure. Both lines of work are credible and suggest that stock returns are more asynchronous where new information plausibly affects stock prices sooner and more completely.

Several results appear discordant with this conclusion, but actually are not. First, more analysts analyzing a stock arguably push its price closer to its fundamental value, but such stocks move more synchronously. This paradox is resolved by theoretical and empirical studies showing that analysts disproportionately generate information pertinent to many stocks, rather than just one, because such information fetches a higher price industry and economy level information, and their forecasts Thus, the stocks analysts follow are apt to have less idiosyncratic fundamentals fluctuations, all else equal. Second, returns asynchronicity correlates poorly with measures of the closeness with which countries stocks approximate a martingale. However, the stock return asynchronicity correlates positively with a plausible measure of Tobin's (1980) concept of functional efficiency: the extent to which the financial

system allocates capital to its highest value uses. Tobin argues that Informational efficiency is a means for attaining functional efficiency, a more fundamental concept because it is a defensible normative end. Indeed, Grossman and Stiglitz (1980) show that perfect informational efficiency is inconsistent with functional efficiency, and Black (1988) argues that functional efficiency necessitates substantial informational inefficiency. Thus, if stock prices were set by spinning a roulette wheel, and lacked any relationship to fundamentals, they would approximate a random walk more accurately than would stock prices in a functionally efficient market. The second set of seemingly discordant results may thus reflect conceptual; problems with inferring efficiency from stock returns' closeness to a martingale process.

A second stream of work shows links cross-sectional and time series variation in stock return synchronicity to like variation in fundamentals synchronicity. Firm-specific fundamentals are less synchronous in high-income countries than in emerging markets, and in the 1990s than in the mid-20th century or early 21st century. Fundamentals plausibly move more asynchronously when the economy is adjusting to innovations that create profit opportunities for some firms and trouble for others. Schumpeter links technological progress to creative destruction: creative entrepreneurs' rapidly rising new firms destroying established firms partially or totally. This process implies winners that win big and losers that lose big: magnified firm-specific fundamentals volatility. The 1990s saw a wave of technological innovation associated with information technology; and high income countries depend on technological innovation for sustained prosperity, while emerging markets can apply off-the-shelf technology as they 'catch up" . Studies associating elevated asynchronicity with increased populations of newly listed firms also fit this patter because highly creative entrepreneurs prefer to found their

own companies, rather than work at established firms. Thus, high firm-specific returns and fundamentals variation can be interpreted as evidence of intense adjustment to microeconomic disequilibrium, such as occurs when new technology creates economically significant profit opportunities for some firms and consigns others to losing money.

Finally, asynchronicity can readily be understood to accompany both more efficient capital allocation and more intensive innovation. Highly creative innovators are often initially impecunious, and need risk-tolerant financing to found and grow their firms. This is more likely to happen in an economy that allocates capital more efficiently. This evokes Schumpeter's (1954) concept of a healthy capitalist economy as always converging to equilibrium, but never in equilibrium and Tobin's (1980) concept of a functionally efficient capital market as allocating capital to its highest value uses.

The interaction of these lines of research suggests a virtuous circle: informed arbitrage and transparency enhance the efficiency of capital allocation, which allows creative entrepreneurs to capitalize new higher productivity firms, which elevates fundamentals asynchronicity, which elevates returns asynchronicity, which leaves arbitrageurs earning bigger trading gains from private information about likely swings in specific firms' stock prices, which encourages information generation, which crowds out noise traders, thereby reducing the cost of capital (De Long et al. 1988) to both arbitrageurs and new entrant innovators. Each completion of the cycle leaves the economy with higher productivity technologies in place, enhanced functional efficiency of capital allocation, and a lower cost of capital. We speculate

that sustaining high incomes requires an economy to sustain this virtuous circle, at least intermittently.

A variety of blockages can stall this virtuous circle. Public disclosure and insider trading might augment the efficiency of capital allocation; but this is not necessarily so. Either might equally well reduce the returns to private information generation and informed arbitrage, thereby potentially reducing the informational efficiency of capital allocation. Lessened informed trading might let noise trading expand, elevating market-wide stock returns swings and raising the cost of capital to arbitrageurs and innovators alike. A negative feedback then constraints creative destruction.

Informed arbitrageurs make more money if they successfully predict the bigger firm-specific fundamentals swings generated by more intense creative destruction. But imperfectly informed latent arbitrageurs might equally well see these fluctuations as elevated firm-specific risk, which increases the cost of holding a large undiversified position in a stock they believe mispriced. Reduced informed arbitrage could clear space for noise traders, whose herding could elevate market-wide risk and make capital dearer for both arbitrageurs and innovators. Here too, intensified creative destruction could trigger a negative feedback loop, damping subsequent creative destruction.

These considerations suggest that economic policymakers desiring sustainably intensive creative destruction attend to the institutional factors that contribute to positive feedback and deter negative feedback. For example, institutional arrangements limiting the revenues accruing from informed arbitrage, such as restrictions on information-based short selling, are

contraindicated. In contrast, regulations deterring noise traders from overrunning the stock market are endorsable. Qualitatively meaningful basic disclosure standards and insider trading regulations are also defensible. In contrast, practices justified by their enhancement of information efficiency alone need not be supportable. For example, high-frequency trading, wherein computers profit from nanosecond inconsistencies in asset prices across markets, might not augment functional efficiency, and might even damp information-based arbitrage. Functional efficiency, not informational efficiency, allocates capital to creative entrepreneurs founding and growing the new businesses sustained creative destruction demands.

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