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March 13, 2019

Stock Selection: Research and Results March 2019

Patents: Undervalued Assets?

Tardy 10-K/Q Filers: Better Late Than Never?

The Mad Scientists Have the Last Laugh

- Do investors correctly value intangible assets? That's becoming an increasingly important question as the asset base of U.S. companies shifts from the physical world into a virtual realm. Back in the 1990s expansion publicly-listed companies spent less than 40 cents on R&D for every dollar they invested in capex. Today that number is 63 cents for every dollar of capex. Unfortunately, many of the tools and heuristics that investors (still) rely on were developed for a world where physical assets represented most of the return-generating capacity of the economy. Those tools are now showing their age. In this research we lean on our recent Big Data work to see if we can sharpen our game for the knowledge economy.
- Part of what's gone on is that globalization has allowed a dollar of capex to stretch a lot further than it used to. That's because in the Bretton Woods II era the price of capital equipment – that now contains more chips and software – has been steadily falling relative to the price of everything else. In contrast, the prices of the things one buys with R&D spending – like the salaries of highly-skilled scientists – have mostly kept pace with prices in the broader economy. In fact, academics estimate that R&D productivity is declining as more of it is done. The number of patents granted to U.S. publicly-listed companies per dollar of real R&D spending is down by (60)% since the 1980s.
- That suggests the total dollar value of accumulated R&D may not be the best way to measure a firm's innovative capacity, rather a measure of the efficiency and quality of the R&D is needed. An obvious candidate is a firm's patent base. The challenge is that patents are hard to value directly because estimating the future profits that might be generated by a patent involves a lot of guesswork. Instead, we deploy a more direct approach: does the market accurately price patent *news* when it comes out? If stocks with positive patent news tend to outperform over the long-run then investors are consistently *undervaluing* the importance of patents to the long-term success of the firms.
- It turns out investors have indeed underpriced patent news in patent-intensive industries like biopharma, medical devices, semiconductors and tech hardware. For example, biopharma stocks with positive patent news have outperformed their industry peers by +6 percentage points over the next year. For medical devices stocks the industry-relative alpha has been about +7 points on a one-year horizon and for semis and tech hardware issues about +3 points.
- Positive patent news is a particularly valuable catalyst when a firm's accumulated R&D stock is trading at a discount. Such issues have outperformed their industry by almost +10 percentage points in the year thereafter. Appendix 1 on page 11 lists stocks from patent-intensive industries that have had positive patent news in the past six months, sorted by their R&D stock-to-capitalization ratio. STMicroelectronics, Stryker, Alphabet and Xerox feature, among others.

Late-Filers: No Sympathy for Stragglers

- We also took a look at how companies that are late in filing their 10-Ks or Qs fare thereafter. Unsurprisingly, the answer is: somewhat poorly. On average late-filers – which we take to be companies that have missed at least one filing date in the past year – have underperformed the market by (2) percentage points per annum. It doesn't matter so much whether the missed filing was a 10-K or Q, both have been bad omens.
- Appendix 2 on page 11 lists the current crop of laggards. We've sorted the list by our Failure Model such that the worst offenders are at the top. Marvell Technology, TechnipFMC, Nutanix and Brighthouse Financial screen as Failure Candidates and also have missed at least one recent filing deadline.

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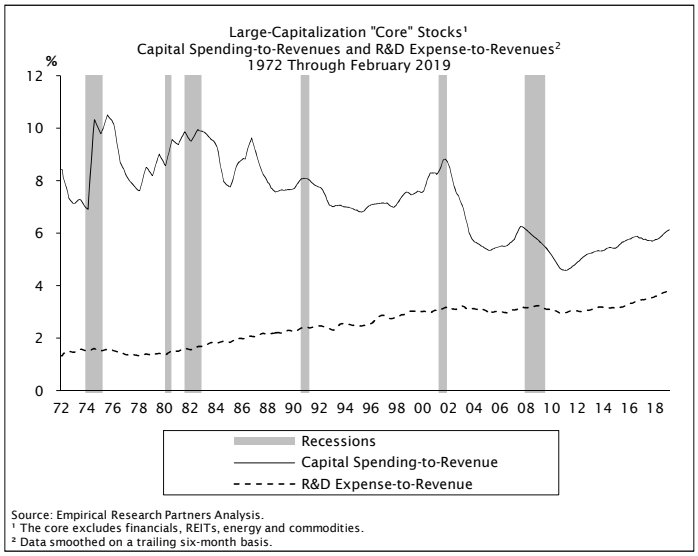
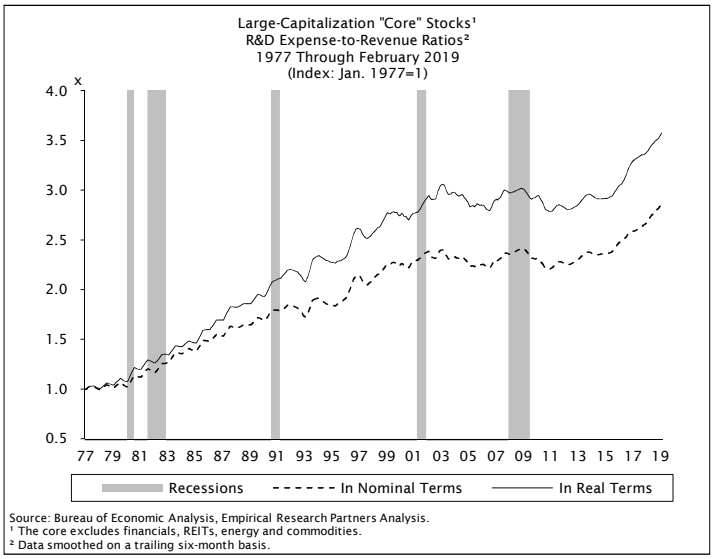
Conclusions in Brief

- R&D spending is catching up with capital spending…



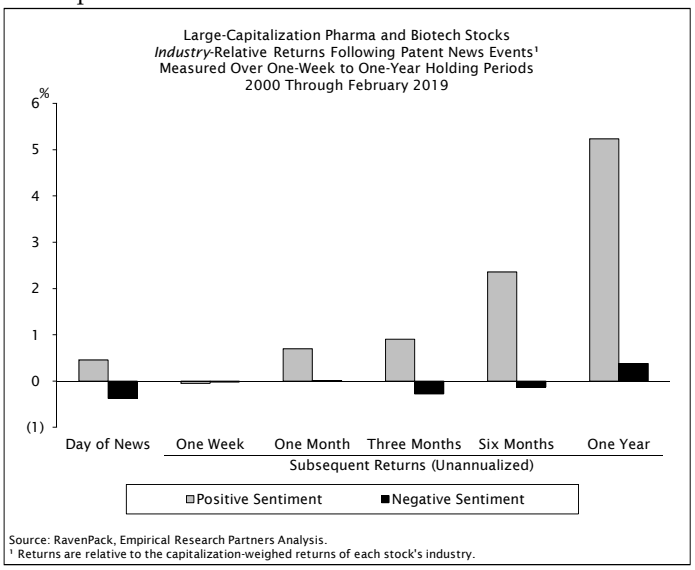
Source: Empirical Research Partners Analysis.
¹ The core excludes financials, REITs, energy and commodities.
² Data smoothed on a trailing six-month basis.

- …And it hasn't benefited from price deflation like capex has:



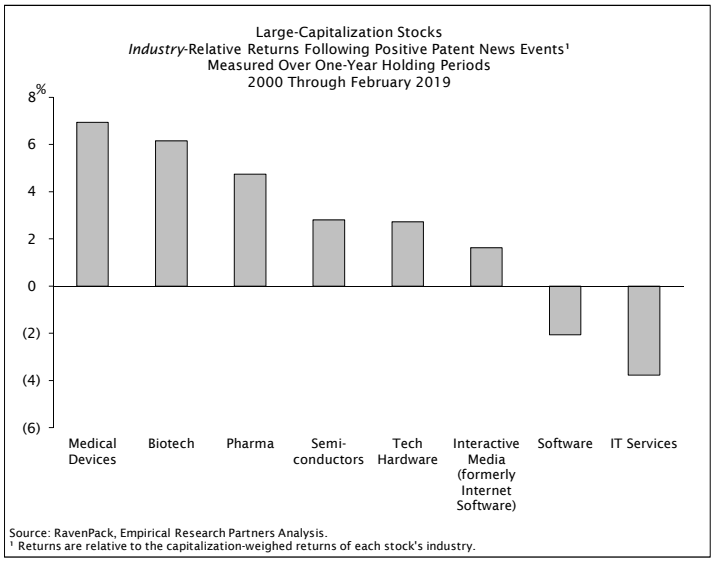
Source: Bureau of Economic Analysis, Empirical Research Partners Analysis.
¹ The core excludes financials, REITs, energy and commodities.
² Data smoothed on a trailing six-month basis.

- Biopharma stocks with positive patent news have outperformed over investment horizons…



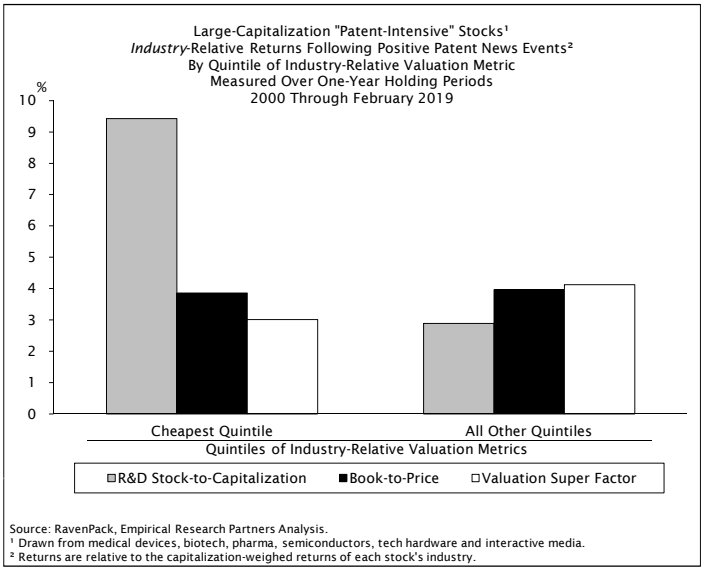
Source: RavenPack, Empirical Research Partners Analysis.
¹ Returns are relative to the capitalization-weighed returns of each stock's industry.

- …As have stocks from most of the other patent-intensive industries:



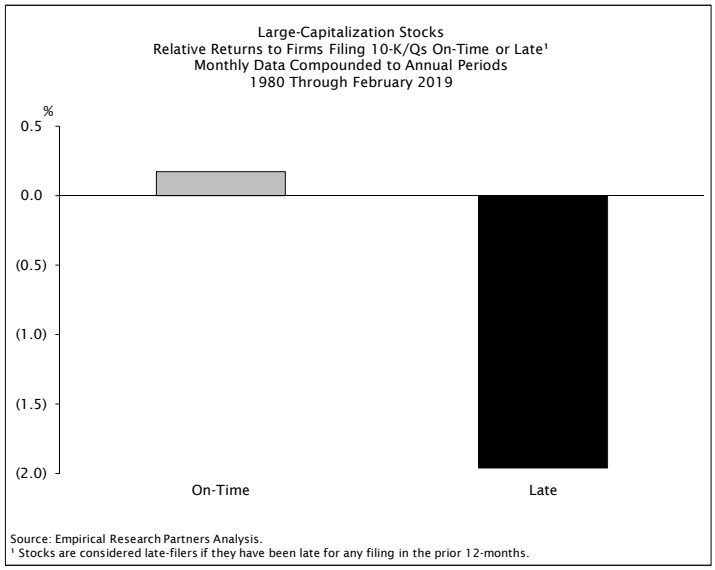
Source: RavenPack, Empirical Research Partners Analysis.
¹ Returns are relative to the capitalization-weighed returns of each stock's industry.

- Positive patent news is a powerful catalyst when a firm's accumulated R&D trades at a discount:



Source: RavenPack, Empirical Research Partners Analysis.
¹ Drawn from medical devices, biotech, pharma, semiconductors, tech hardware and interactive media.
² Returns are relative to the capitalization-weighed returns of each stock's industry.

- Companies that file their 10-Ks or Qs late are best avoided:



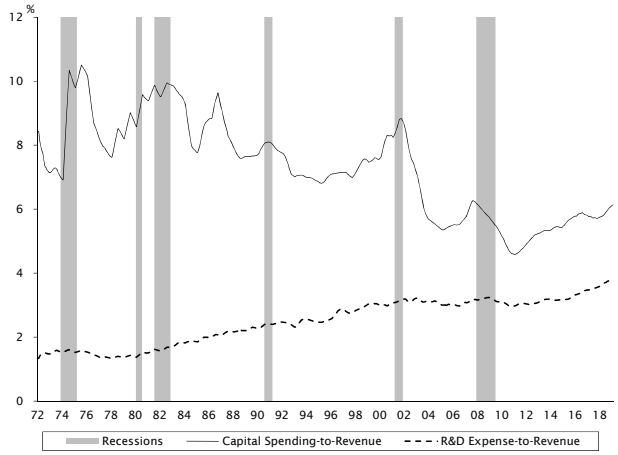
Source: Empirical Research Partners Analysis.
¹ Stocks are considered late-filers if they have been late for any filing in the prior 12-months.

Patents: Undervalued Assets?

The Mad Scientists Have the Last Laugh

A recent theme running through our work has been the valuation of intangible assets.[1] That's a question that's become increasingly important in the Bretton Woods II era of globalization because U.S. companies have successfully outsourced a chunk of their physical asset base to a host of willing partners in the emerging markets. What they've kept in-house often takes the form of "virtual" assets like accumulated know-how from R&D spending or a thick folder of valuable patents. That transformation is evident in Exhibit 1, that plots the capital spending-to-revenue and R&D expense-to-revenue ratio for the core of the U.S. large-cap market. In aggregate companies are currently spending 63 cents on R&D for every dollar they spend on capital spending. Back in the 1990s expansion the ratio was less than 40 cents of R&D for every dollar of capex.

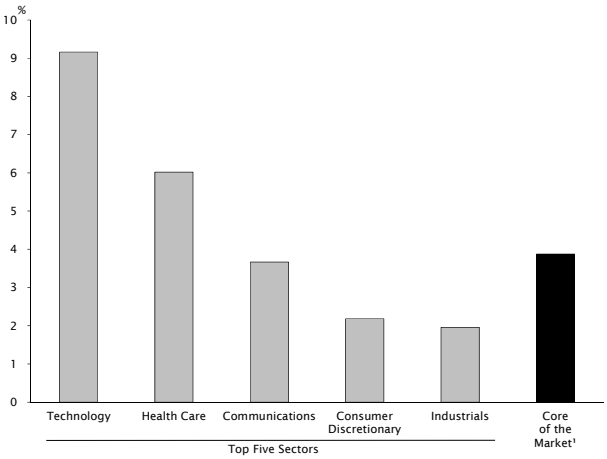
Exhibit 1: Large-Capitalization "Core" Stocks[1]
Capital Spending-to-Revenues and R&D Expense-to-Revenues[2]
1972 Through February 2019



Source: Empirical Research Partners Analysis.

[1] The core excludes financials, REITs, energy and commodities.
[2] Data smoothed on a trailing six-month basis.

Exhibit 2: Large-Capitalization Stocks
Aggregate R&D Expense-to-Revenues: Top Five Sectors
As of February 2019



Source: Empirical Research Partners Analysis.

[1] The core of the market excludes financials, REITs, energy and commodities.

Of course, most of that market-wide R&D spending is concentrated in a handful of knowledge-intensive sectors, led by technology, health care and the recently-reconstituted communications sector, that now includes the likes of Alphabet and Facebook (see Exhibit 2). Zooming in further, biotechnology, pharmaceuticals and semiconductors are the three industries with the highest R&D intensity relative to revenues (see Exhibit 3).

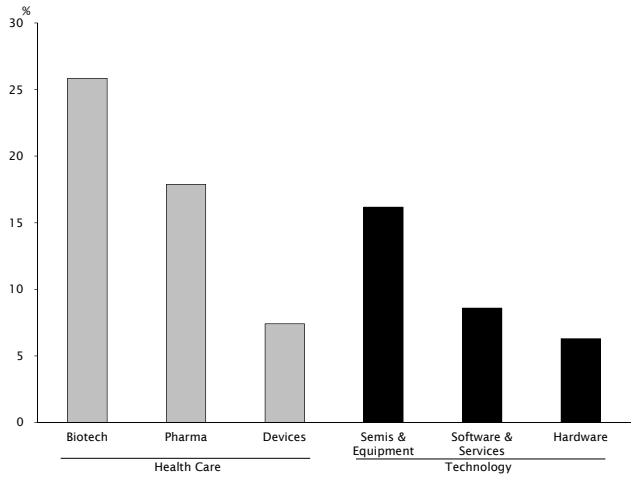
However, not all R&D is created equal. For example, R&D invested in a new drug that comes with robust patent protection probably has a longer shelf-life than R&D that's directed towards a new tech hardware gadget that might be lucky to last a year before it's supplanted by a shiny new model. Foldable smartphones anyone? In our work we account for this via an R&D "asset" that's created by capitalizing R&D expenses over different lookback periods depending on the industry. In biopharma we accumulate R&D expenses over almost a decade whereas in technology it's closer to three years. Once we make that adjustment health care is, unsurprisingly, the industry with the largest R&D stock relative to total assets, since past R&D spending depletes more slowly than in tech firms (see Exhibit 4).

Another point that's quite important but often overlooked when studying the difference between physical and intangible assets is the trend in their respective prices over the long run. As we've pointed out before, the price of the physical equipment that one buys with capex has been falling relative to the price of everything else by one-to-two percentage point per year over the past couple of decades. That's one of the biggest side-benefits of globalization: a dollar of capex just goes way further than it used to because of the deflationary impulse globalization has injected into the price physical goods, most of which are imported these days. We can see that in the wide divergence between the real and nominal capital spending-to-revenue ratio for U.S. companies (see Exhibit 5). In *real* terms, the solid line, the amount of capex being spent doesn't look abnormally low; in fact this cycle looks a lot like what went on during the build out of the internet 20 years ago.

[1] *Stock Selection: Research and Results* February 2019. "R&D: A Better Asset?"

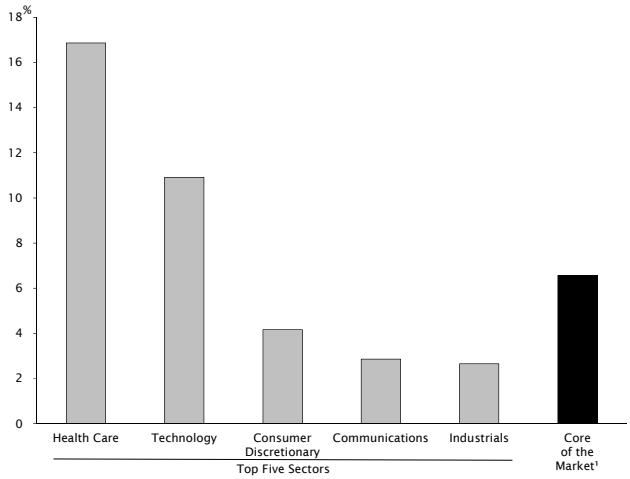
In contrast, Exhibit 6 shows the same chart for R&D expenses. The difference here is that the prices of the things one buys with R&D spending – like the salaries of highly-skilled scientists – have mostly kept pace with prices in the broader economy. In other words, companies aren't getting the same increasing bang for their buck in R&D that they have in capex. Even after adjusting for deflation in the price of capital goods the *quantity* of R&D "assets" being created has outpaced physical asset creation (see Exhibit 7).

Exhibit 3: Large-Capitalization Health Care and Technology Stocks
Aggregate R&D Expense-to-Revenues
As of February 2019



Source: Empirical Research Partners Analysis.

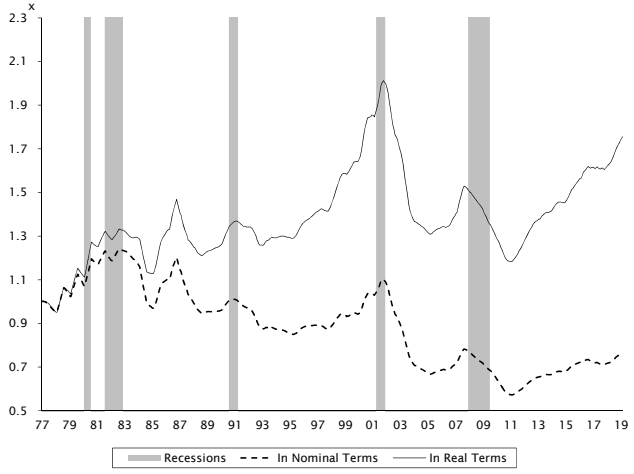
Exhibit 4: Large-Capitalization Stocks
Aggregate R&D Stock-to-Total Assets: Top Five Sectors
As of February 2019



Source: Empirical Research Partners Analysis.

[1] The core of the market excludes financials, REITs, energy and commodities.

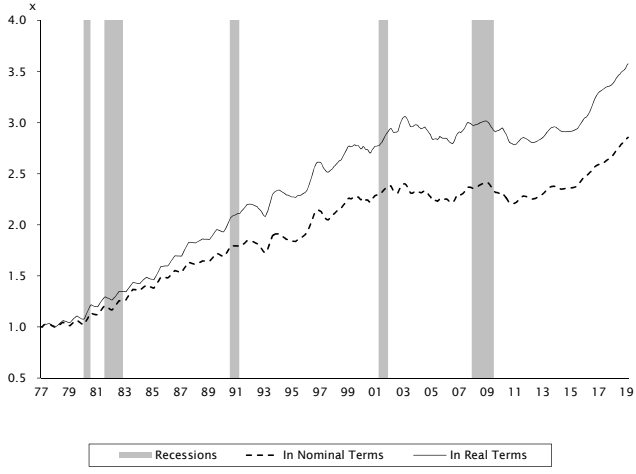
Exhibit 5: Large-Capitalization "Core" Stocks[1]
Capital Spending-to-Revenue Ratios[2]
1977 Through February 2019
(Index: Jan. 1977=1)



Source: Bureau of Economic Analysis, Empirical Research Partners Analysis.

[1] The core excludes financials, REITs, energy and commodities.
[2] Data smoothed on a trailing six-month basis.

Exhibit 6: Large-Capitalization "Core" Stocks[1]
R&D Expense-to-Revenue Ratios[2]
1977 Through February 2019
(Index: Jan. 1977=1)



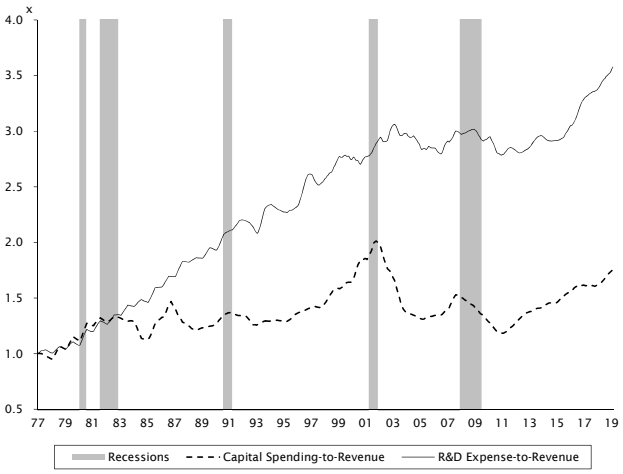
Source: Bureau of Economic Analysis, Empirical Research Partners Analysis.

[1] The core excludes financials, REITs, energy and commodities.
[2] Data smoothed on a trailing six-month basis.

In fact, if anything R&D spending is suffering from declining productivity. A couple of academics have estimated the number of patents obtained by U.S. publicly-listed companies per dollar of *real* R&D spending, and the chart makes for somewhat depressing reading because it's down by (60)% since the 1980s (see Exhibit 8). The same academics also estimated how much the market value of a firm increases by for a ten percentage point increase in R&D stock-to-assets and for one additional patent per million dollars of R&D stock (see Exhibits 9 and 10). The results are clear: accumulated R&D has become less valuable over time because of its diminishing productivity but having something to show for all that spending, namely patents, has become *more* important to firm value.

Another academic also tackled the issue of intangibles recently and found some equally interesting results. Specifically, he studied how well earnings and book equity explain firms' market values, after splitting companies into cohorts based on their industry-relative intangible-intensity (see Exhibit 11). The key result is that earnings and book equity are worse at explaining market value in firms with high intangible-intensity, see the grey bars in the chart. The author plausibly argues that this is because earnings (and the retained earnings that comprise much of book equity) are meaningless in firms with lots of R&D because the required expensing of that spending ends up artificially depressing earnings. As a result earnings are a poor indicator of success in firms with big R&D budgets.

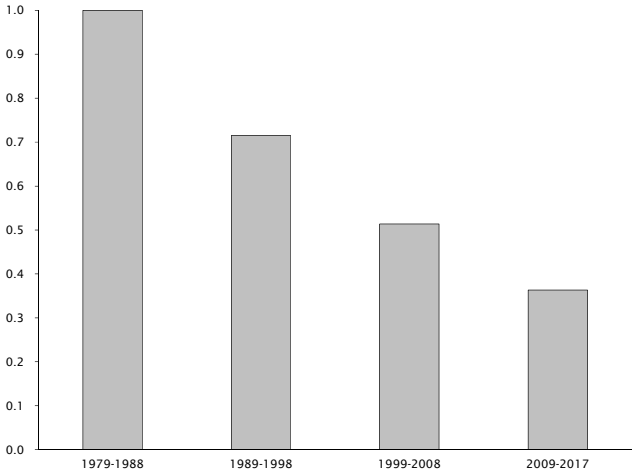
Exhibit 7: Large-Capitalization "Core" Stocks[1]
***Real* R&D Expense-to-Revenue and**
Capital Spending-to-Revenue Ratios[2]
1977 Through February 2019
(Index: Jan. 1977=1)



Source: Bureau of Economic Analysis, Empirical Research Partners Analysis.

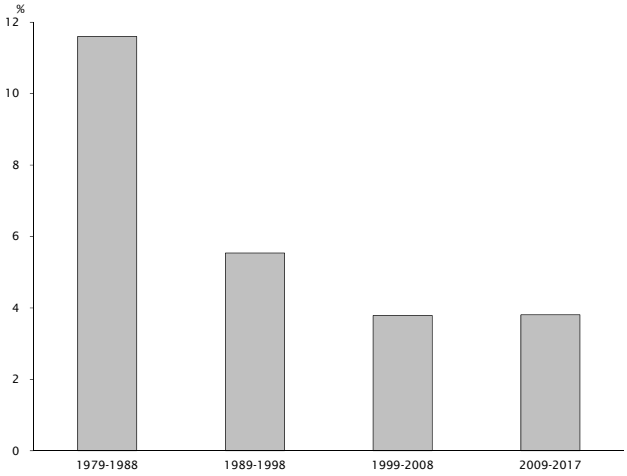
[1] The core excludes financials, REITs, energy and commodities.
[2] Data smoothed on a trailing six-month basis.

Exhibit 8: U.S. Publicly-Listed Companies
Number of Patents-to-*Real* R&D Expense
(Index: 1979-88=1.0)
1979 Through 2017



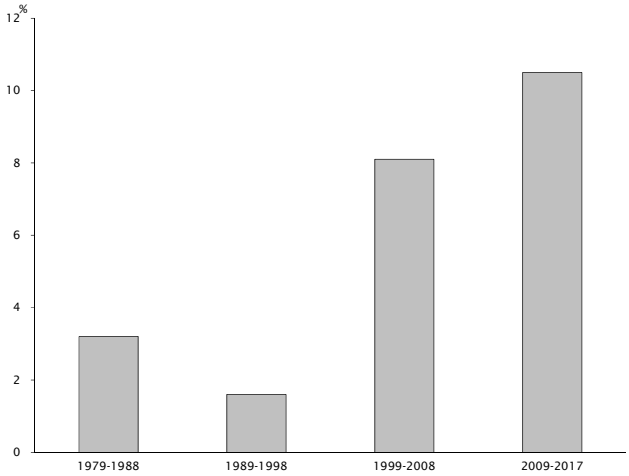
Source: Lee, J., and Hyunkyeong Lim, 2019. "Market Value of Patents: Evidence from the U.S., 1976-2017." Working Paper. Empirical Research Partners Analysis.

Exhibit 9: U.S. Publicly-Listed Companies
Estimated Increase in a Firm's Market Value for a
Ten Percentage Point Increase in R&D Stock-to-Assets
1979 Through 2017



Source: Lee, J., and Hyunkyeong Lim, 2019. "Market Value of Patents: Evidence from the U.S., 1976-2017." Working Paper.

Exhibit 10: U.S. Publicly-Listed Companies
Estimated Increase in a Firm's Market Value for One
Additional Patent Per Million Dollars of R&D Stock
1979 Through 2017



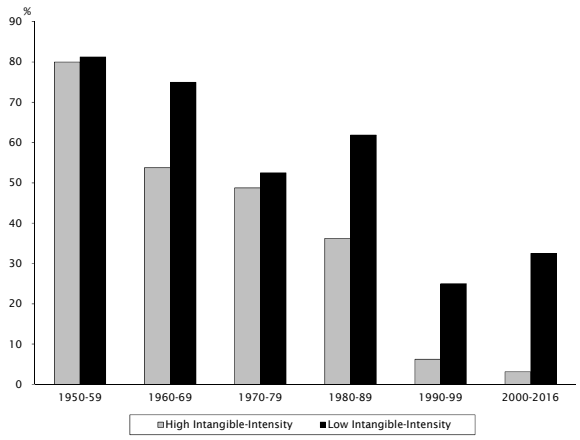
Source: Lee, J., and Hyunkyeong Lim, 2019. "Market Value of Patents: Evidence from the U.S., 1976-2017." Working Paper.

Another way of demonstrating that is to assume we can perfectly predict a firm's earnings surprise in the next quarter. How much would such clairvoyance be worth? It turns out the answer depends on a firm's R&D intensity: knowing an upcoming earnings surprise would generate (40)% less alpha in a firm with high intangible-intensity compared to a low intensity firm (see Exhibit 12). That again suggests that reported earnings are a less meaningful metric when they're being artificially lowered by the forced expensing of R&D.

Patents: A Tangible Intangible

All of this got us thinking about better ways to measure the value of a firm's R&D efforts. As we showed in recent research a good starting point is to consider a firm's capitalization-to-R&D stock ratio. In a knowledge-driven world that can represent a better price-to-book ratio of sorts. However, if the academics are right and the productivity of R&D stock is declining then some firms that look cheap relative to their R&D stock might be that way for a reason – namely they're spending prodigiously on research but don't have much to show for it. Think Big Pharma for example.[2] Instead of measuring the stock of accrued innovation in sunk cost terms an alternative approach is to consider the most tangible output of that spending: patents.

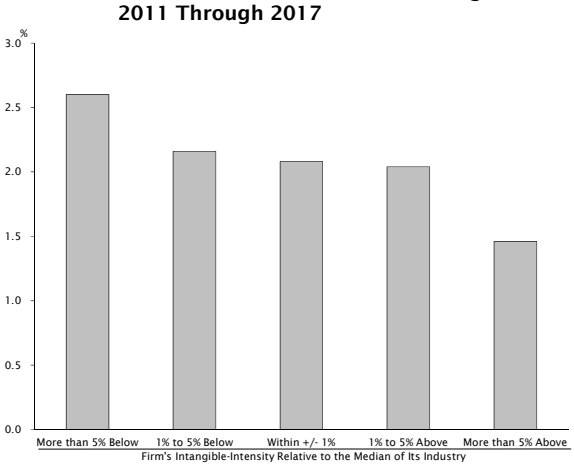
Exhibit 11: U.S. Publicly-Listed Companies
Earnings Relevance by Intangible-Intensity[1]
1950 Through 2016



Source: Barunch Lev, 2018. "Intangibles." Working Paper.

[1] Earnings relevance computed as the R-squared from a cross-sectional regression of three-month *forward* capitalization on earnings and book equity. Intangible-intensity is a firm's R&D plus SG&A divided by total assets, relative to the median of its industry.

Exhibit 12: Publicly-Listed U.S. Companies
Relative Returns to a Perfect Foresight Prediction
of Positive Earnings Surprises[1]
Measured Over Two-Month Holding Periods
2011 Through 2017



Source: Barunch Lev, 2018. "Intangibles." Working Paper.

[1] Strategy assumes one bought firms that ultimately delivered a positive earnings surprises at two months before the announcement date and sold after the announcement. Returns are size-adjusted. Intangible-intensity is a firm's R&D plus SG&A divided by total assets.

Do investors misprice patents? An indirect way to test that is to first try to value a firm's patent base and then construct a valuation ratio based on that. That's an approach academics have tried, but the assumptions required are usually heroic because estimating the profits a patent will generate in the future is mostly guesswork. Instead, we prefer a more direct approach: does the market accurately price patent *news* when it comes out? If stocks with positive patent news tend to outperform over the long-run then investors are might be consistently *undervaluing* the importance of patents to the long-term success of the firms.

Here we lean on the work we've been doing on news sentiment as part of our ongoing Big Data initiative. One of the vendors we use, RavenPack, automatically detects thousands of different events pertaining to stocks in real-time. These can range from obvious events like earnings announcements to (thankfully) rare events like having your executive kidnapped! One such news event is patent news, and Exhibits 13 and 14 show the share of such news events for the top ten industries and individual companies. No surprises here.

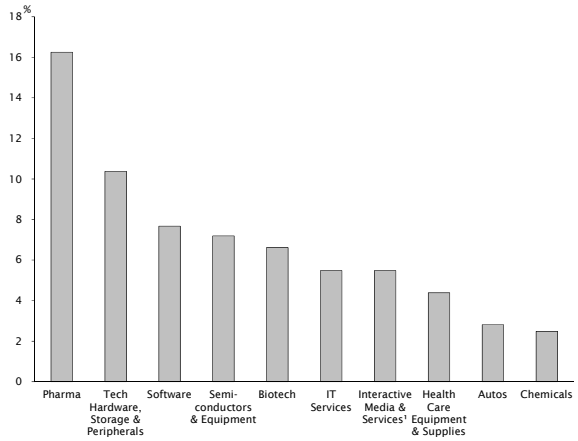
Most of the patent news that's captured by the media tends to be positive because the two most common stories are about patents being awarded and filed, both of which are scored as positive by definition (see Exhibit 15). Negative news, which includes stories about expiring patents, rejected filings, or revoked patents is fairly rare and makes up only about 16% of patent-related news flow.

As we showed in our earlier research, the biopharma industry is one part of the market where investors have consistently *underpriced* positive patent news (see Exhibit 16).[3] Pharma and biotech stocks with positive patent news have outperformed their respective industries by about +6 percentage points on average over the following year. On the other hand, biopharma stocks with negative patent news have mostly tracked their industry peers, but again the negative news sample is small so we shouldn't put too much weight on that result.

[2] *Stock Selection: Research and Results* July 2018. "Pharmaceuticals: A Better Defensive Prescription?"

[3] *Stock Selection: Research and Results* August 2018. "Big Biotech, Big Free Cash Flow Yields and Big Data."

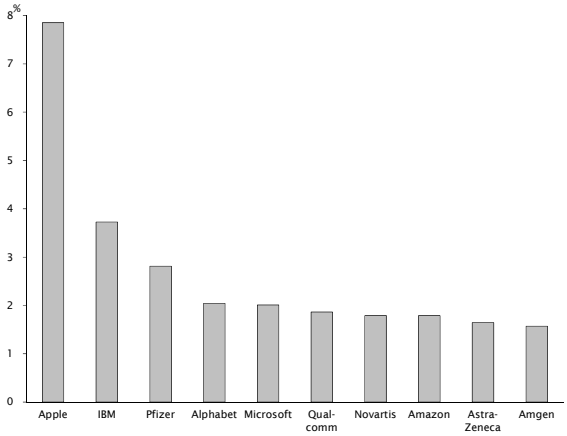
Exhibit 13: Large-Capitalization Stocks
Share of Patent News Events: Top Ten Industries[1]
2000 Through February 2019



Source: RavenPack, Empirical Research Partners Analysis.

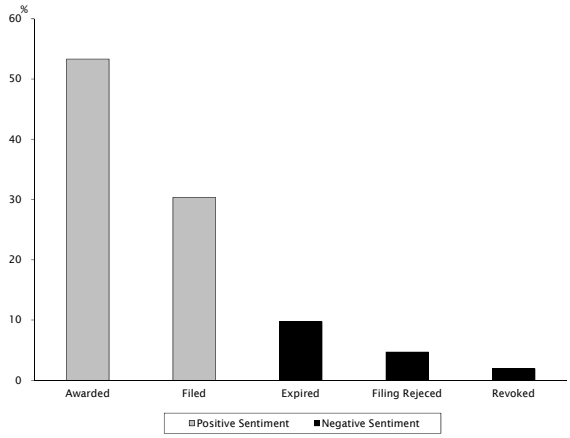
[1] Prior to the introduction of the Communication Services sector the Internet Software & Services industry is used.

Exhibit 14: Large-Capitalization Stocks
Share of Patent News Events: Top Ten Companies
2000 Through February 2019



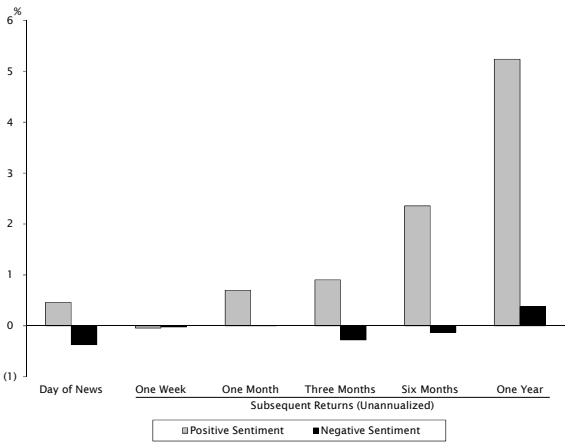
Source: RavenPack, Empirical Research Partners Analysis.

Exhibit 15: Large-Capitalization Stocks
Share of Patent News Events by Sentiment and Type
2000 Through February 2019



Source: RavenPack, Empirical Research Partners Analysis.

Exhibit 16: Large-Capitalization Pharma and Biotech Stocks
***Industry*-Relative Returns Following Patent News Events[1]**
Measured Over One-Week to One-Year Holding Periods
2000 Through February 2019



Source: RavenPack, Empirical Research Partners Analysis.

[1] Returns are relative to the capitalization-weighted returns of each stock's industry.

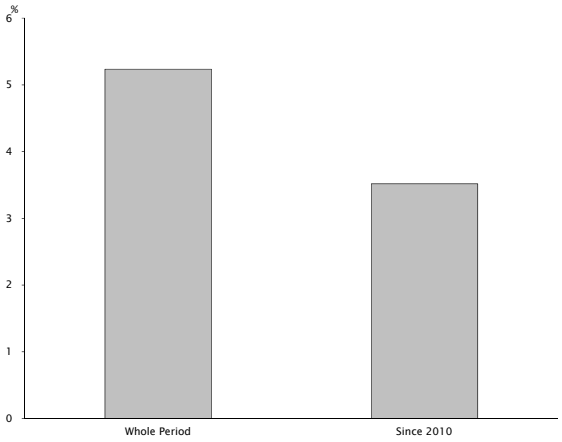
The magnitude of the outperformance following positive patent news has moderated a bit in the post-Crisis era but is still economically meaningful (see Exhibit 17). It's interesting to note that the volume of patent news events has been steady in last decade, at about 30-40 per year (see Exhibit 18). That's around the same size as our large-cap biopharma universe, meaning the average stock typically has at least one patent announcement each year that's picked up on by the media.

The average sentiment associated with news about biopharma patents steadily declined over the 2000s, as the space matured and innovation was harder to come by (see Exhibit 19). Commensurate with that, the multiples investors were willing to pay for the stocks slid too. Recently there's been a rebound in positive patent news flow, something that's a bit at odds with the largely stagnant multiples in the space. A bull argument for the sector could be that a favorable shift in the patent pipeline has yet to be fully appreciated by the market.

Within health care it's not just biopharma where investors have underappreciated the long-term value of positive patent news. In medical devices, another space we wrote on recently, stocks with positive patent news have outperformed their industry peers by an average of +7 percentage points over the following year (see Exhibit 20).[4]

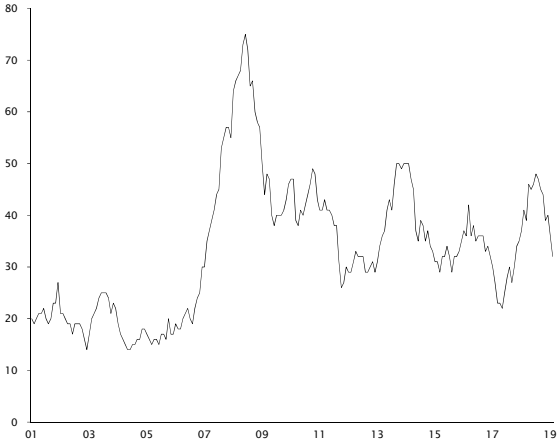
[4] *Stock Selection: Research and Results* January 2019. "Medical Devices: Better Big Growers or High Risk Patients?"

Exhibit 17: Large-Capitalization Pharma and Biotech Stocks
***Industry*-Relative Returns**
Following *Positive* Patent News Events[1]
Measured Over One-Year Holding Periods
2000 Through February 2019



Source: RavenPack, Empirical Research Partners Analysis.

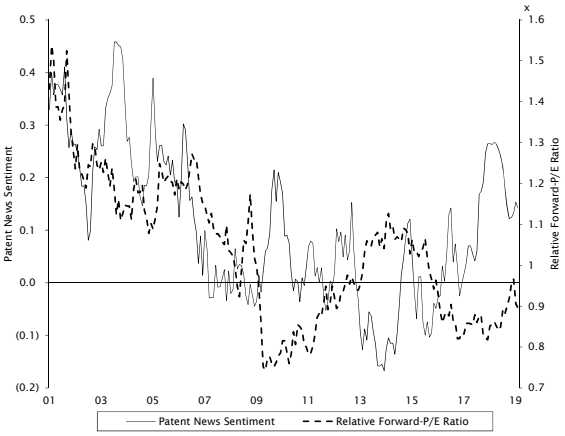
Exhibit 18: Large-Capitalization Pharma and Biotech Stocks
Number of Patent News Events in Prior Year
2001 Through February 2019



Source: RavenPack, Empirical Research Partners Analysis.

[1] Returns are relative to the capitalization-weighted returns of each stock's industry.

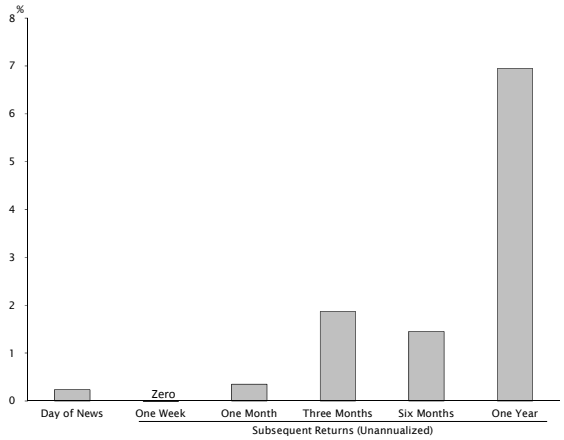
Exhibit 19: Large-Capitalization Pharma and Biotech Stocks
Average Sentiment of Patent News Events in Prior Year
and Relative Forward-P/E Ratio[1]
2001 Through February 2019



Source: RavenPack, Empirical Research Partners Analysis.

[1] Forward-P/E ratio based on capitalization-weighted data.

Exhibit 20: Large-Capitalization Medical Devices
Industry*-Relative Returns Following *Positive
Patent News Events[1]
Measured Over One-Week to One-Year Holding
Periods
2000 Through February 2019



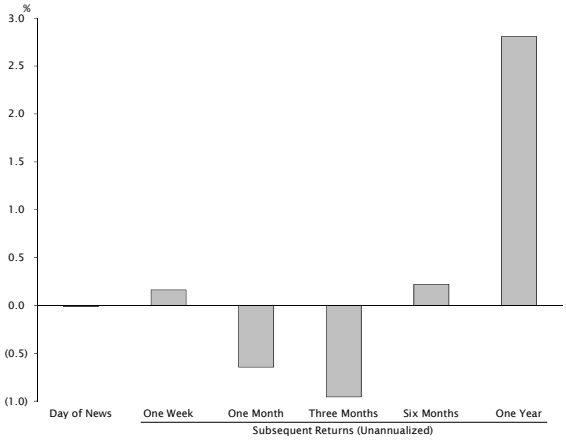
Source: RavenPack, Empirical Research Partners Analysis.

[1] Returns are relative to the capitalization-weighted returns of each stock's industry.

What about outside of health care? Semiconductor issues with positive patent news have also outperformed their peers on average over the next year, albeit with about half the alpha that we see in health care (see Exhibit 21). Expanding the analysis to all patent-intensive industries reveals that tech hardware manufacturers show a similar post-event drift, whereas interactive media (formerly internet software), software and IT services haven't seen much of a boost from favorable patent news (see Exhibit 22). The fact that positive patent news is most significant for health care issues makes sense: that's the industry where patent protections are most rigorous, often guaranteeing competition-free sales for at least the early life of a product.

We looked at what happens if a stock with positive patent news also screens as cheap on our R&D stock-to-capitalization metric (see Exhibit 23). It turns out that's a winning combination: stocks that have both attributes have outperformed their industry by almost +10 percentage points on average over the subsequent year, see the left-hand grey bar in the chart. It seems positive patent news can sometimes be the catalyst investors need to rerate a firm's R&D base. It's worth noting that this isn't just the value effect in disguise. We repeated the exercise using book-to-price and our composite valuation super factor, see the black and white bars. In both cases there was no difference in the performance of positive patent news stocks across the valuation quintiles; patent news boosts stocks whose R&D is trading at a discount but isn't much of a catalyst for cheap stocks in general.

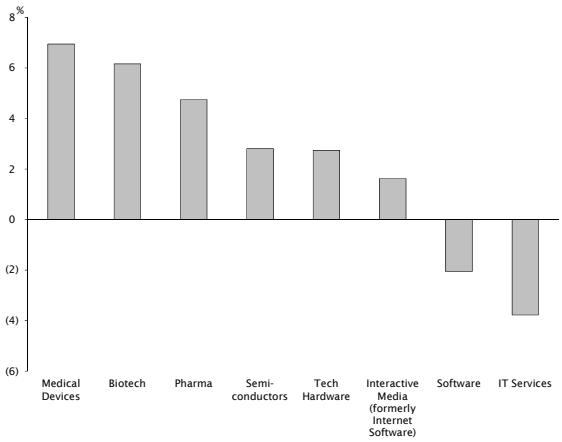
Exhibit 21: Large-Capitalization Semiconductor & Equipment Stocks *Industry*-Relative Returns Following *Positive* Patent News Events[1] Measured Over One-Week to One-Year Holding Periods 2000 Through February 2019



Source: RavenPack, Empirical Research Partners Analysis.

[1]Returns are relative to the capitalization-weighted returns of each stock's industry.

Exhibit 22: Large-Capitalization Stocks *Industry*-Relative Returns Following *Positive* Patent News Events[1] Measured Over One-Year Holding Periods 2000 Through February 2019

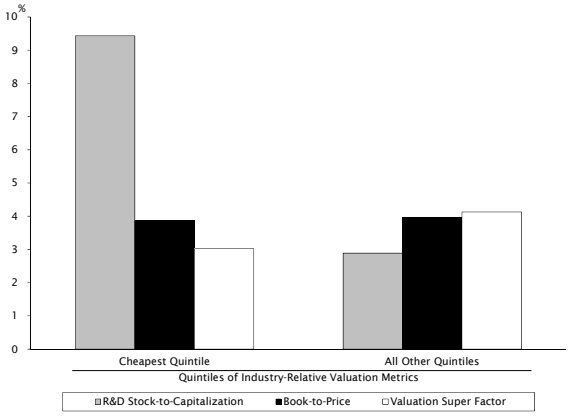


Source: Empirical Research Partners Analysis.

[1] Returns are relative to the capitalization-weighted returns of each stock's industry.

Another useful result is that the market's initial response on the day positive patent news comes out does tell us something about how good the news will ultimately prove to be over the long-run (see Exhibit 24). On average stocks that were up by more than +1 percentage point on the news day went on to outperform their industry by another +5.5 percentage points over the next year. In contrast, stocks that lagged on the day the news came out only outperformed by about half that amount in the following year. So investors' initial gut reaction to patent news is directionally right, but they're too conservative when pricing the long-term implications of the news.

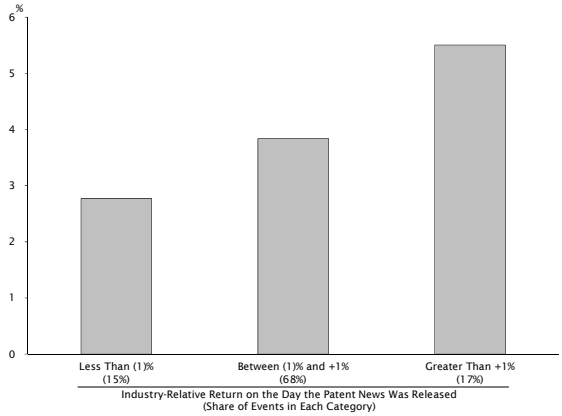
Exhibit 23: Large-Capitalization "Patent-Intensive" Stocks[1] *Industry*-Relative Returns Following *Positive* Patent News Events[2] By Quintile of Industry-Relative Valuation Metric Measured Over One-Year Holding Periods 2000 Through February 2019



Source: RavenPack, Empirical Research Partners Analysis.

[1] Drawn from medical devices, biotech, pharma, semiconductors, tech hardware and interactive media.
[2] Returns are relative to the capitalization-weighted returns of each stock's industry.

Exhibit 24: Large-Capitalization "Patent-Intensive" Stocks[1] *Industry*-Relative Returns Following *Positive* Patent News Events[2] Contingent Upon the News-Day Reaction[3] Measured Over One-Year Holding Periods 2000 Through February 2019



Source: RavenPack, Empirical Research Partners Analysis.

[1] Drawn from medical devices, biotech, pharma, semiconductors, tech hardware and interactive media.
[2] Returns are relative to the capitalization-weighted returns of each stock's industry. Returns do not include the news-day return.
[3] For news released outside of market hours the response is based on the next trading day.

Putting it all together, we do think there's some merit in scanning for patent news in biopharma, medical devices, tech hardware, semis, and interactive media as a means of identifying stocks where recent patent activity may be underappreciated by the market. Appendix 1 on page 11 lists stocks in those industries that have had positive patent news in the past six months. We've sorted them by the valuation of their R&D stock and the market's initial reaction to the news. We've also included our broader Media Sentiment indicator, that captures the tone of all news flow about a company, not just patent news.

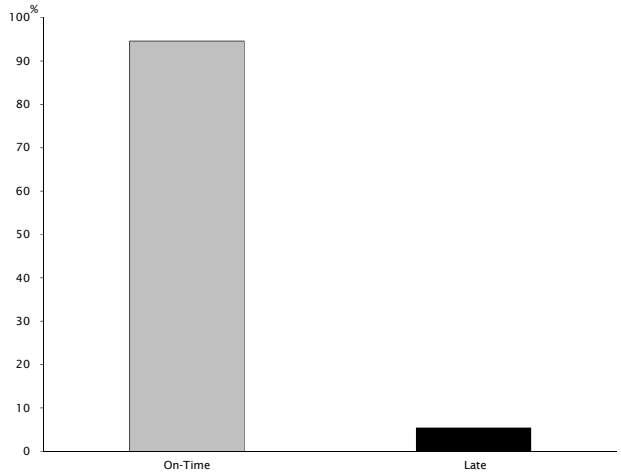
Tardy 10-K/Q Filers: Better Late Than Never?

No Sympathy for Stragglers

A client asked us to investigate if firms that file their 10-Ks or Qs late tend to underperform thereafter. We looked into that and the short answer is yes. On average about 5% of stocks in our large-cap universe will have submitted at least one late filing in any given 12-month period (see Exhibit 25).[5] Those companies have indeed gone on to underperform on average, to the tune of about (2) percentage points per year (see Exhibit 26).

We also looked at whether missing the deadline on a 10-K is worse than a 10-Q, but there wasn't much in it (see Exhibit 27). Given the sample of late-filers is small at any point in time the difference in average returns isn't really large enough to be meaningful, so a rough rule-of-thumb is that we should be circumspect towards any late-filer, regardless of the type.

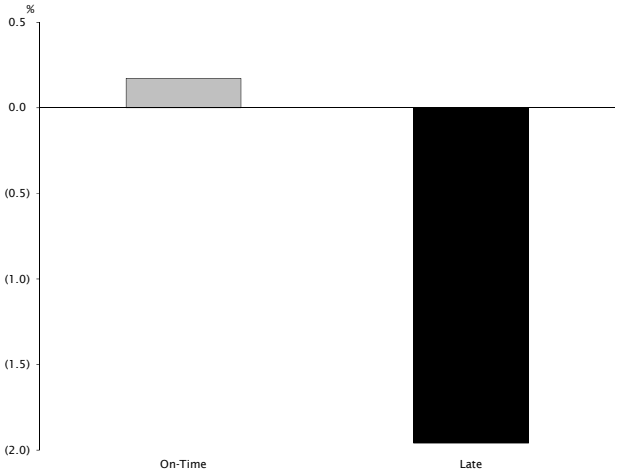
Exhibit 25: Large-Capitalization Stocks
Share of Firms Filing 10-K/Qs On-Time or Late[1]
1980 Through February 2019



Source: Empirical Research Partners Analysis.

[1] Stocks are considered late-filers if they have been late for any filing in the prior 12-months.

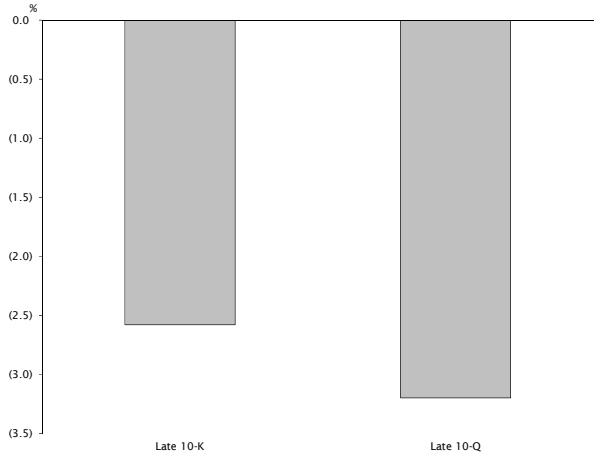
Exhibit 26: Large-Capitalization Stocks
Relative Returns to Firms Filing 10-K/Qs On-Time or Late[1]
Monthly Data Compounded to Annual Periods
1980 Through February 2019



Source: Empirical Research Partners Analysis.

[1] Stocks are considered late-filers if they have been late for any filing in the prior 12-months.

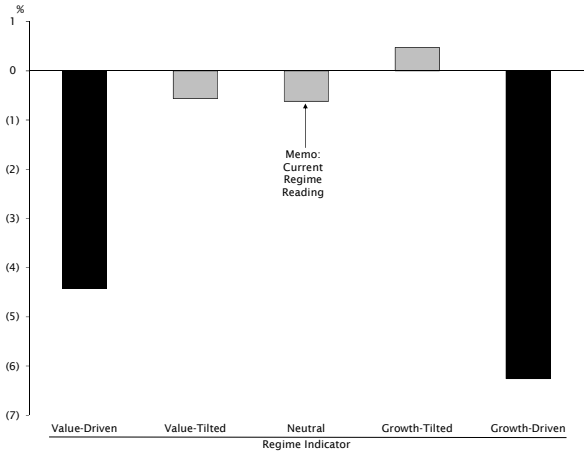
Exhibit 27: Large-Capitalization Stocks
Relative Returns to Firms Filing 10-Ks or 10-Qs Late[1]
Monthly Data Compounded to Annual Periods
1980 Through February 2019



Source: Empirical Research Partners Analysis.

[1] Stocks are considered late-filers if they have been late for a 10-K or 10-Q filing in the prior 12-months.

Exhibit 28: Large-Capitalization Stocks
Relative Returns to Firms Filing 10-K/Qs Late by Regime[1]
Monthly Data Compounded to Annual Periods
1980 Through February 2019



Source: Empirical Research Partners Analysis.

[1] Stocks are considered late-filers if they have been late for any filing in the prior 12-months.

[5] The current SEC deadline is 60 days for 10-Ks and 40 days for 10-Qs. This has changed over time and we account for that in our analysis.

One thing that did stand out in our analysis is that late-filings are particularly bad when our Regime Indicator is at an extreme: either a value-driven or growth-driven stance (see Exhibit 28 overleaf). Economically that makes some sense: when the setup is potent the signal value in missing a filing date is magnified. On the other hand, when things are meandering along in the indeterminate middle one can probably read less into a missed deadline. Currently our regime indicator is in a neutral reading, which if history is any guide hasn't been a particularly good setting for betting against late-filers. Nonetheless, for what it's worth Appendix 2 below presents the current list of firms that have missed a deadline in the last 12-months. We've sorted the list by our Failure Model, such that the worst offenders are at the top of the list.

Appendix 1: Large-Capitalization "Patent-Intensive" Stocks[1]
With Positive Patent News Events in the Past Six Months
Sorted by Industry-Relative R&D Stock-to-Capitalization and Stock Price Reaction on Patent News Day
As of Mid-March 2019

			Quintiles (1=Best; 5=Worst)										
			News Metrics				Super Factors						
				Industry-Relative									
Symbol	Company	Price	Patent News Sentiment[2] (1=Best)	Stock Price Reaction On Patent News Day[2]	R&D Stock -to- Capitalization (1=Cheapest)	Media Sentiment From All Stories (1=Best)	Valuation	Capital Deployment	Earnings Quality and Trend	Market Reaction	Core Model Rank	YTD Return	Market Capitalization ($ Billion)
Positive Patent News													
QCOM	QUALCOMM INC	$53.53	0.53	(1.2)	1	2	3	1	4	4	2	(4.9) %	$64.8
STM	STMICROELECTRONICS NV	15.64	0.53	(1.5)	1	2	2	4	3	5	3	12.7	14.2
TEVA	TEVA PHARMACEUTICAL INDUSTRIES -ADR	15.75	0.53	(2.4)	1	5	1	2	1	5	1	2.1	17.5
GOOGL	ALPHABET INC	1,149.97	0.53	0.4	2	3	4	4	4	3	4	10.0	799.9
GILD	GILEAD SCIENCES INC	63.23	0.53	(0.0)	2	5	1	2	1	4	1	1.1	81.1
NVS	NOVARTIS AG	89.68	0.53	(0.5)	2	4	3	2	3	2	2	6.7	227.6
TWTR	TWITTER INC	30.04	0.53	(0.9)	2	3	5	3	5	5	5	4.5	23.0
XRX	XEROX CORP	30.30	0.53	(1.6)	2	3	1	1	3	1	1	53.3	7.0
INTC	INTEL CORP	52.48	0.38	(2.2)	2	4	2	3	2	3	2	12.5	237.0
SYK	STRYKER CORP	187.23	0.53	2.2	3	1	5	3	3	2	4	19.4	70.1
AMGN	AMGEN INC	180.87	0.53	1.6	3	2	2	1	1	3	1	(6.4)	113.9
VRTX	VERTEX PHARMACEUTICALS INC	177.26	0.53	1.5	3	1	5	4	5	1	3	7.0	45.3
LRCX	LAM RESEARCH CORP	168.83	0.53	0.4	3	4	1	1	1	4	1	24.0	26.0
MU	MICRON TECHNOLOGY INC	38.65	0.53	0.2	3	5	1	2	4	5	1	21.8	43.3
FB	FACEBOOK INC	169.60	0.38	(0.1)	3	3	3	5	5	3	4	29.4	484.1
BIIB	BIOGEN INC	307.93	0.53	(5.2)	3	2	1	3	1	2	1	2.3	60.7
IDXX	IDEXX LABS INC	201.74	0.53	(0.3)	4	1	5	5	3	2	5	8.5	17.4
XRAY	DENTSPLY SIRONA INC	48.56	0.53	(1.2)	4	2	4	4	3	2	4	30.5	10.8
RMD	RESMED INC	101.00	0.53	(1.3)	4	2	5	2	4	4	4	(11.0)	14.5
PRGO	PERRIGO CO PLC	46.50	0.53	(1.4)	4	5	1	1	3	5	2	20.5	6.3
AVGO	BROADCOM INC	264.19	0.38	(2.5)	4	2	2	2	4	2	2	3.9	107.8
ALGN	ALIGN TECHNOLOGY INC	230.84	0.53	1.2	5	4	5	5	1	5	5	10.2	18.5
AAPL	APPLE INC	172.91	0.38	0.2	5	5	2	2	1	4	1	10.1	817.8
TSM	TAIWAN SEMICONDUCTOR MFG CO	38.20	0.38	(0.2)	5	4	3	1	4	3	2	3.5	198.1
Memo: Negative Patent News													
ALXN	ALEXION PHARMACEUTICALS INC	$128.68	(0.60)	(1.0)	3	2	5	3	5	2	3	32.2 %	$28.8
JNJ	JOHNSON & JOHNSON	138.06	(0.60)	0.3	3	3	3	3	3	2	2	7.7	367.7
MRK	MERCK & CO	79.80	(0.47)	(0.1)	2	1	3	4	1	1	1	4.4	212.2
CELG	CELGENE CORP	84.46	(0.47)	(1.6)	1	3	1	2	3	2	1	31.8	59.3
ABBV	ABBVIE INC	77.58	(0.47)	(1.3)	1	5	1	1	1	4	1	(14.8)	114.7
SNY	SANOFI	42.91	(0.49)	1.1	1	4	2	3	4	3	2	(1.2)	107.6

Source: RavenPack, Empirical Research Partners Analysis.

[1] Drawn from medical devices, biotech, pharma, semiconductors, tech hardware and interactive media.
[2] When a company has had multiple patent news events in the past six months the latest is used.

Appendix 2: Large-Capitalization Stocks
Filing a Late 10-K or Q in the Past Year
Sorted by Failure Model Rank and Capitalization
As of Mid-March 2019

			Late Filing Details			Decile Ranks (1=Best; 10=Worst)											
						Select Failure Model Factors											
Symbol	Company	Price	Type	Fiscal Quarter Ending	Days Late	Gross Cash Flow Yield	Free Cash Flow-to-Enterprise Value	Capital Spending Growth	Change in Common Shares Outstanding	Free Cash Flow Margin	10-K/Q Disclosure Model	Arbitrage Risk (1=Lowest 10=Highest)	Media Sentiment	Short Pressure	Sector ETF Flows and Equivalent Volume	**Failure Model Rank**	Market Capitalization ($ Billion)
MRVL	MARVELL TECHNOLOGY GROUP LTD	$18.68	10-Q	Jul 18	3	8	5	10	10	2	10	8	10	8	1	**10**	$12.3
FTI	TECHNIPFMC PLC	20.98	10-K	Dec 17	32	10	10	9	3	10	na	9	10	6	7	**10**	9.5
NTNX	NUTANIX INC	34.48	10-Q	Apr 18	3	10	9	10	10	9	8	10	10	9	5	**10**	6.3
BHF	BRIGHTHOUSE FINANL INC	37.62	10-K	Dec 17	15	na	na	na	4	na	8	10	8	8	1	**10**	4.4
XRAY	DENTSPLY SIRONA INC	48.56	10-K	Dec 17	14	8	8	7	4	6	4	10	4	5	7	**9**	10.8
NWSA	NEWS CORP	12.80	10-Q	Mar 18	1	3	4	10	7	8	10	2	8	6	9	**9**	7.5
INVH	INVITATION HOMES INC	23.44	10-K	Dec 17	28	8	na	na	7	na	1	3	2	8	10	**8**	12.2
BIO	BIO-RAD LABORATORIES INC	303.86	10-K	Dec 17	46	9	8	1	8	7	9	10	1	2	7	**7**	9.1
AGR	AVANGRID INC	48.30	10-K	Dec 17	25	3	9	1	6	9	6	5	9	8	8	**6**	14.9
SYMC	SYMANTEC CORP	21.95	10-K	Mar 18	149	4	2	9	9	2	10	8	3	3	6	**6**	14.0
CPRI	CAPRI HOLDINGS LTD	43.58	10-Q	Dec 17	4	2	1	9	3	3	8	10	6	5	2	**6**	6.7
PPG	PPG INDUSTRIES INC	109.63	10-Q	Mar 18	49	6	6	6	1	6	5	3	1	8	9	**5**	25.9
ULTA	ULTA BEAUTY INC	306.39	10-K	Jan 18	2	7	6	2	3	5	9	4	3	4	2	**5**	18.2
TER	TERADYNE INC	38.75	10-Q	Mar 18	1	5	3	5	1	3	2	9	4	8	1	**5**	7.1
EQH	AXA EQUITABLE HOLDINGS	19.86	10-Q	Sep 18	4	na	na	na	1	na	na	6	3	8	2	**3**	10.5
M	MACY'S INC	23.09	10-K	Jan 18	3	1	1	7	8	7	10	10	8	9	1	**3**	7.1
VMW	VMWARE INC -CL A	169.13	10-Q	Jul 18	2	7	4	3	9	1	8	7	2	8	6	**2**	69.5
TJX	TJX COMPANIES INC	50.72	10-K	Jan 18	3	6	4	5	4	6	9	2	2	1	4	**2**	62.8
ROST	ROSS STORES INC	89.06	10-K	Jan 18	2	6	4	5	3	5	6	3	5	3	3	**2**	33.0
KR	KROGER CO	24.47	10-K	Jan 18	2	1	4	4	1	9	10	9	10	8	9	**2**	19.5
TSCO	TRACTOR SUPPLY CO	90.39	10-Q	Mar 18	1	6	6	5	3	7	2	5	5	2	1	**2**	11.0
AVGO	BROADCOM INC	264.19	10-Q	Apr 18	5	4	2	1	6	1	na	8	4	2	6	**1**	107.8
ATUS	ALTICE USA INC	21.50	10-K	Dec 17	5	1	2	7	2	3	3	8	2	9	5	**1**	15.2
AAP	ADVANCE AUTO PARTS INC	151.77	10-Q	Mar 18	12	5	3	4	4	7	5	8	2	4	1	**1**	11.0
FL	FOOT LOCKER INC	60.08	10-Q	Jul 18	3	3	1	2	2	7	10	7	1	7	1	**1**	6.8

Source: Empirical Research Partners Analysis.