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The abrdn Innovation index

The search for innovation superstars series – Paper 3

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abrdn.com

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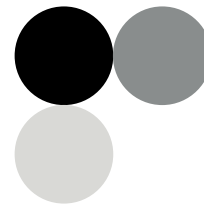


Executive summary

- We are excited to introduce the abrdrn Innovation Index, a tool to help us rank listed US companies on how successfully they are using innovation to outperform their peers. The tool can complement our existing stock selection processes.
- The index is built from millions of data points for listed US companies across a range of innovation indicators which are associated with higher productivity. This is true of R&D, intangible investment, patenting and the quality of these in those sectors in which firms are patenting the most.
- These relationships are found regardless of other firm characteristics – like size or sector, and business cycle effects over the past two decades– which makes us confident that we have uncovered at least some of the innovation activities which set companies apart from their peers.
- At the top of the Index are many of the big names and sectors we might expect, with Tech firms rising strongly through the ranks over the past two decades. A strong culture of innovation has underpinned the success of these names.
- However, looking at the majority of companies across the Russell 3000 Index – the top 3000 companies in the US by market capitalisation – allows us to cast our net wider and identify a larger and more diverse range of companies which are successfully innovating. This includes both famous innovators like Amazon and Microsoft and less well-known companies, such as Halliburton and Stericycle, which may not appear innovative at first glance but score well across our measures.
- We can also track the journey of companies through the Innovation Index over the past 20 years, helping us understand how some have transformed themselves into market leaders and how they maintain this position.
- Firms higher up in our Index have significantly outperformed the broader market, and in the next and final paper of our Innovation Series we will discuss how we can use these insights alongside our company-level expertise to identify budding innovation superstars.



The abrdn Innovation Index – a tool to spot innovators

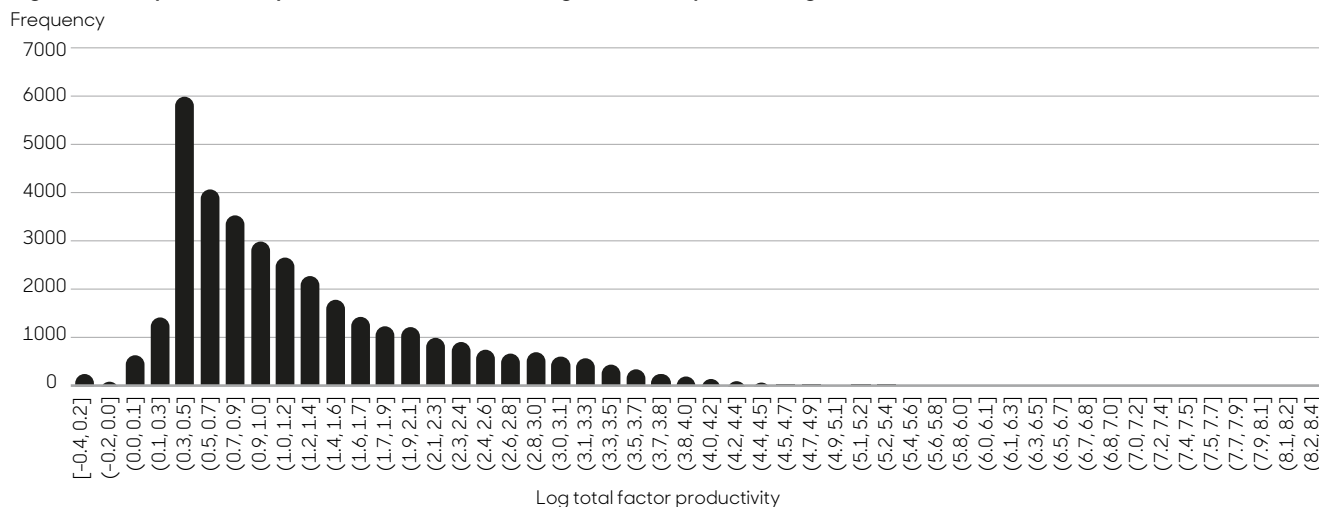


The abrdn Innovation Index forms the culmination of our Spotting Innovation Superstars series of papers.

We started this work by asking how to systematically benchmark innovation at the firm level. Our solution was to build a new measure of firm performance, based on how productive companies are compared to their peers. This metric captures the impact of a range of innovation – process, product and business model – into tangible advantages against other companies. And it does so in a way which filters the noise of other measures of firm performance, such as profits. You can read more about this work, and what it tells us about innovation in the corporate sector [here](#).

Next, we asked how to predict in real time what was driving this outperformance. To answer this question, we built a huge database with millions of data points on innovation indicators such as patents, R&D spending, intangible investment and financial firepower, all of which have been shown to drive successful innovation. This work and a discussion of what innovative firms look like can be found [here](#) (See figure 2 for a list of these innovation indicators).

Figure 1: Our productivity measure identifies a vanguard of outperforming firms in the Russell 3000 Index



Source: Eikon, Bloomberg, abrdn as of 2022.



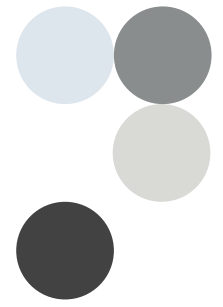


Figure 2: Innovation measures and controls

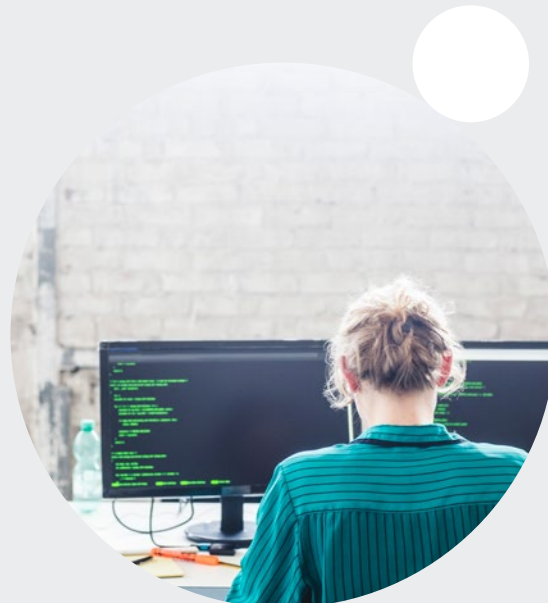
	Variable	Description
Traditional Innovation Measures	Intangible Assets Share	Intangible assets divided by total assets
	R&D per Employee	R&D expenditure divided by number of employees
	R&D to Assets	R&D expenditure divided by total assets
Financing Innovation	Debt to Equity	Debt to equity
Patents Database	Cumulative Patent Portfolio ¹	20 year rolling sum of filed patents
	Patent Scope ¹	Scope of a patent equals the number of distinct 4 digit subclasses in the patent document, normalised according to the maximum scope value of patents in the same cohort, these cohorts defined by year of filing and technology field.
	Family Size ¹	Number of patent offices which a patent has been filed at normalised by max value exhibited by other patents in same year and tech cohort.
	Backward Citations ¹	Citations per patent normalised according to max value received by patents in that year, and tech cohort. Includes self citations.
Controls	Number of Employees	Total number of employees in workforce
	Sector & Year	The sector that a firm is in and the year

Note: all data sourced from Refinitiv, Worldscope database apart from those marked with¹ which were sourced from the OECD's patent statistics.

In this paper we bring these two databases together to build the abrdn Innovation Index. This tool teases out those innovation activities driving firm productivity performance, while making sure that other characteristics like sector or size are not clouding this relationship. The upshot is that we can rank companies in terms of how successfully they are, and have been innovating against their peers, and spot the superstars, and those on their way to becoming superstars.

Shining a light on the innovation process

Our work draws upon a huge volume of data, which allows us to better isolate the complex innovation process and what drives it. The productivity database contains estimates of each firm in the Russell 3000 Index for every year since 2000. And the innovation proxy database contains multiple indicators of innovation activities for these firms, not to mention other firm characteristics such as their financial position, size, export focus and sector. This incredibly rich dataset has the advantage of looking across a wide cross-section of firms and sectors, through multiple business cycles. It is this depth which allows us to tease out the relationship between innovation and productivity using a statistical model. We find that firms' spending on R&D and intangible investments, and their patenting and the quality of these filings, all drive stronger productivity, even when we control for a range of other firm characteristics.



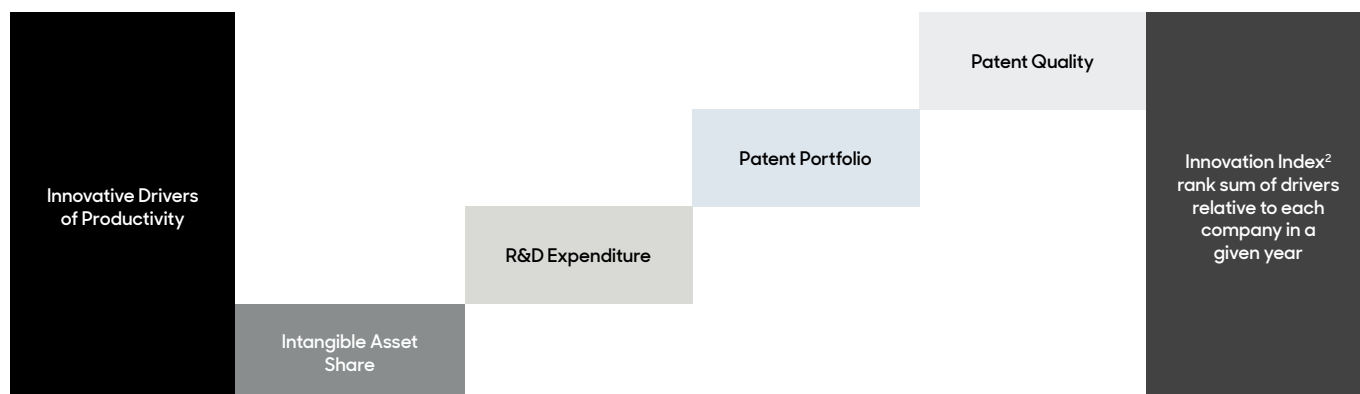
Building an Index

Our data work has helped us to tease out the attributes associated with successful innovation, while controlling for a whole host of factors which might distort this signal. But how can we use these results to tell us really interesting things about individual firms? This is where our Innovation Index comes in.

We have ranked companies according to how intensively they are carrying out the innovation activities we measure every year, and weighting these by how important they are in driving productivity. The result is a ranking of firms, with those higher up the scale doing more across our weighted innovation indicators.

Importantly, it is worth noting that we don't include the financial indicators, or other firm characteristics in this aggregation. The Index purely measures the boost to productivity performance we might expect from a company's various innovation activities. The Index therefore helps to distil all these efforts into a single score, and makes them more easily comparable across the Russell 3000 index.

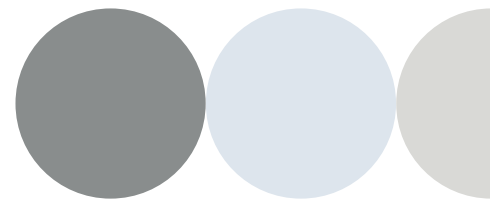
Figure 3: Building an Innovation Index



Source: abrdrn as of 2022.

² Summed innovation contribution scaled between 0 and 100 in given year, top company = 100, bottom = 0.

Passing the smell test



A glance at the top of the Index throws up some familiar names. In the most recent iteration Microsoft, Qualcomm, Intel and Apple make up the top four listed companies, with Amazon and Oracle also present in the top 15 positions. Compared to these Facebook sounds like a bit of a laggard at 51st place, but it still falls within the top 3% of all companies in our sample and does have lower intangibles investment than those above it.

These findings match our prediction that giant companies would be among those near to or at the top of the pile. Overwhelmingly it is their patenting which provides the strongest contribution to their high ranking, underlining the importance of this as a signalling measure that breakthroughs are being made; and of course as a mechanism to protect the intellectual property contained in such breakthroughs.

Pharmaceutical companies are also represented in the top echelons of the Index, with Pfizer appearing in the top 20. However, in general there is a tilt towards electronics companies, which is again perhaps not a huge surprise given the high levels of innovation carried out in this sector. Medtronic, Boston Scientific, Texas Instruments and Broadcom all highlight how different these companies can be, even if sitting in the same aggregate sector.

But where are the surprises? A company from the mining sector, Halliburton, perhaps looks a little odd at first glance given that this is a sector people might not associate with high levels of innovation. But this company provides a range of technical services for energy companies which require significant expertise in extraction and engineering. The other company which may seem surprising is tool maker Stanley Black & Decker; despite the company's intangible asset share being the largest contributor to its innovation standing, it also has a large quantity of product-related patents.

Figure 4: Innovation Superstars



Size represents ranking, larger = high ranking; bold is the top 5 companies in the index.

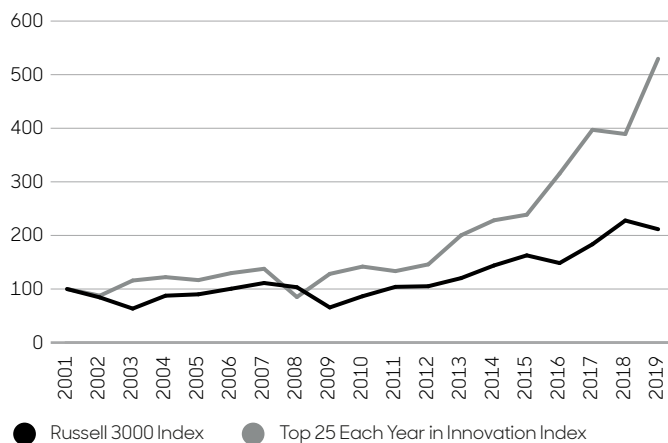
Strong returns on innovation?

A natural question is how this Innovation Index might help us to spot companies which could outperform the broader market.

To test this, we modelled how a company's performance in the Innovation Index might influence their returns, along with their financial position and a host of other firm controls including trends in the market towards certain style biases. We found evidence that a higher ranking was consistent with stronger equity returns.

We can illustrate this more practically by looking at how the companies in the top of our Innovation Index perform against the broader market. Figure 5 shows the return profile for an equally weighted portfolio of the top 25 companies from our Innovation Index in every year since 2000. The results show an extraordinary outperformance of this group compared to the Russell 3000 Index as a whole, with this gap really starting to become extended through the 2010s.

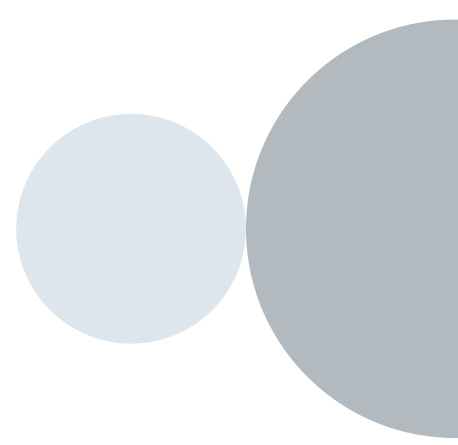
Figure 5: Companies higher up in our Index deliver stronger returns on average



Source: Eikon, abrdrn as of 2022.

Certainly, this suggests that companies are being rewarded for delivering sustained innovation; those which reach the upper echelons of the Index tend to maintain their positions, which is consistent with our expectations at the start of this series. Indeed, in the first paper we sketched out a model to show that innovation which raises productivity should at the same time boost profitability, which – via real earnings and reratings based on better future growth – should help deliver stronger returns.

Hidden gems



We can filter these data in different ways to uncover a wide range of perhaps more unexpected innovation success stories.

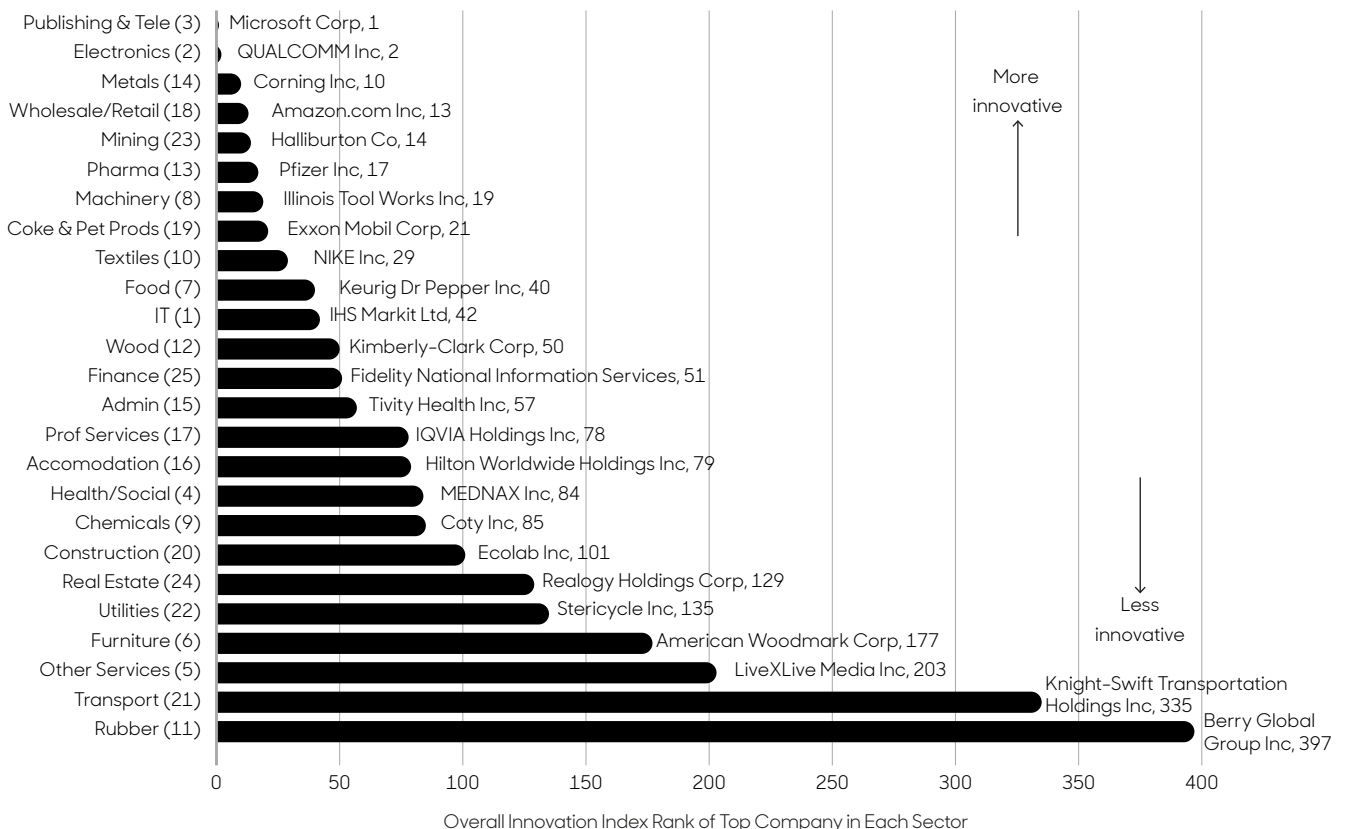
One option is to cut the data by sector, to see which firms perform best among their peers. Figure 6 shows the top performers from an innovation standpoint and how they stack up across the top companies in other sectors.

Again, one of the first impressions we can take from these results is that the tech sectors tend to be led by companies scoring very highly in the Innovation Index. But again, there are more nuanced results. Amazon sits in the retail sector, which we might not have expected to be very innovative at first glance and ranks 18th out of the 25 sectors represented. However, Amazon's business model within retail has clearly been highly innovative, and of course its commercial activities span across multiple other sectors.

We can also use these data to pick potential winners from each sector. Which means that even if we are not focusing on innovation as the prime motivator for choosing stocks, it is still possible to identify companies within potentially less-dynamic sectors that are outperforming their peers from an innovation standpoint. For example, Stericycle Inc does not make it into the top 10% of our overall Index, but is the highest ranking utility company. Given that the relative performance of sectors changes across phases of the cycle, understanding high-ranking companies within sectors that overall may not be high in the Index is a useful insight: for example, if we were positioning in a more defensive direction, but still wanted to have exposure to a relatively innovative firm in this space.

Figure 6: Top performer by sector and overall ranking in the abrdrn Innovation Index.

Sector (rank of sector on basis of median company rank)



Source: Eikon, OECD, abrdrn as of 2022.

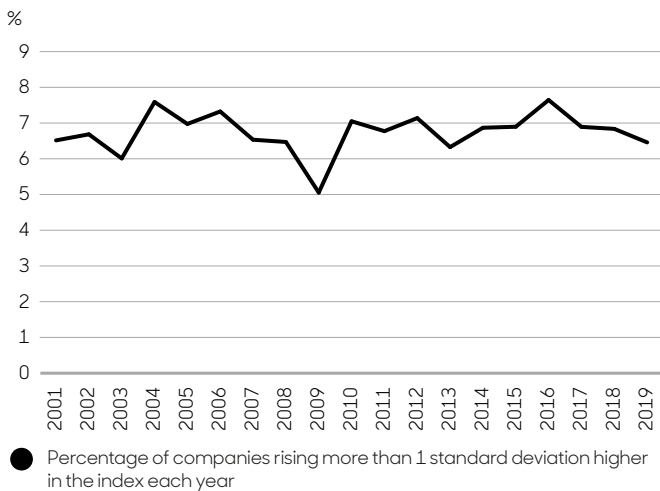
The road to the top

The top of our Index is certainly congested with large and well-established companies. However, what about the movers and shakers within the Index overall?

We can cut the data to show which companies are making progress year in and year out, even if they have yet to break into the top ranks. This could help us spot examples of firms which are at an earlier stage of their innovation journey, making breakthroughs which will take time to crystallise into rapid growth and further investment.

Generally, the share of companies rising strongly in any given year tends to be fairly low. In Figure 7 we measure the share of companies which increase in rank by more than 1 standard deviation each year we have data for – this measure of churn in the Index suggests that it takes time for companies to move up the ranks.

Figure 7: Slow churn in the top



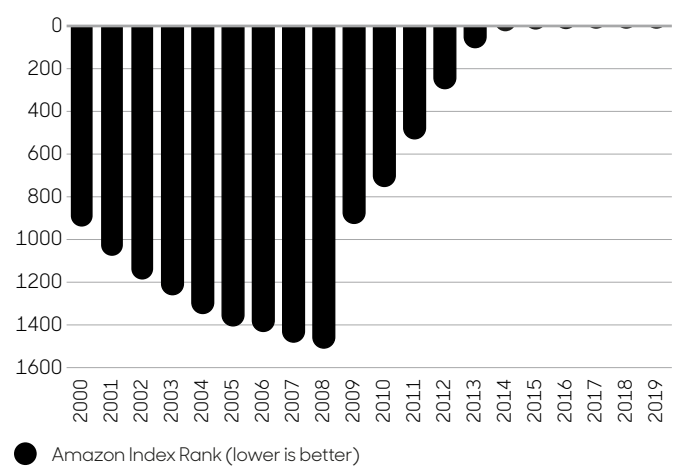
Source: Eikon, OECD, abrdrn, as of 2022.

Amazon's journey shows this well. Back in 2000, Amazon was a midranking company in our Innovation Index. It was engaged in R&D, intangible investment and patenting, but all at relatively modest levels, helping explain its unremarkable position on the leader board. Its position actually worsened in the early 2000s ahead of the financial crisis. However, from this point onward we started to see meaningful increases in patenting at Amazon, and while R&D and intangible spending as a share of assets remained fairly steady, the absolute levels of spending

increased alongside the strong growth of the company. Sure enough, this led to rapid progress in Amazon's ranking to near the top by 2015, where it has since cemented itself. We all know the success that accompanied this migration in terms of market cap and equity performance.

This very high-profile example highlights the importance of paying attention to emerging innovators. While not every company will follow Amazon's path, there is likely information in a company which is making rapid and sustained progress up our Innovation Index and this could serve as a way to spot firms with significant growth potential.

Figure 8: The rise and rise of Amazon



Source: Eikon, OECD, abrdrn as of 2022.

A complementary tool for stock selection



In our Spotting Innovation Superstars series we were looking for a way to systematically measure innovation, and find early indicators to spot when firms were innovating successfully. The Innovation Index achieves this objective. Our bespoke databases and cutting-edge research have enabled us to confidently isolate this opaque process, and identify in real time those companies doing it best.

It seems clear that the market is rewarding these stronger performers. However, there are some enhancements we can make to this analysis to gain even deeper insights into which firms look best placed to lead the next rounds of innovation. Indeed, we are open that there are certain innovation activities that we just can't measure in this work. Despite our big data approach to capturing the innovation process, there are still a range of factors that we haven't been able to pin down. We find that a sizeable portion of productivity performance among firms is unexplained in this research, which in practical terms means there are innovation indicators we should be monitoring, but are missing; and innovation indicators which we are aware of but can't capture reliably in high-quality data across a large number of companies.

Fortunately, we can use our Innovation Index as a powerful complement to our company experts, who can bring more detail on companies, sectors and importantly portfolio construction. In our next and final paper we will discuss how we bring together the big picture approach of our Innovation Index and the expertise of equity investment teams to add even more rigour in the search for innovation superstars.



"In our Spotting Innovation Superstars series we were looking for a way to systematically measure innovation, and find early indicators to spot when firms were innovating successfully."

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