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Understanding the growth and productivity impacts of persistent ‘v’ intermittent R&D and innovation engagement

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Abstract

This review draws on international research to examine whether firms that invest in research and development (R&D) and innovation consistently perform better than firms that do so only occasionally.

The review is based on the idea that steady investment in developing knowledge and creating new products and processes can help firms build skills, strengthen their position against competitors, and improve productivity over time. But persistent R&D may also carry risks: firms could become too focused on one approach and remain tied to technologies that are no longer up to date. Which effect is stronger?

Overall, international research points to a “persistence premium”: firms that consistently invest in R&D and innovation tend to perform better. However, the size and reliability of this advantage vary across studies. Firms that conduct R&D regularly generally have higher productivity and faster productivity growth than those with occasional or no R&D. Evidence linking regular R&D to firms’ sales or employment growth is less consistent.

Research also suggests that firms that innovate regularly tend to outperform those that innovate only occasionally across productivity, profitability, and employment growth, and sometimes in sales growth. The results vary by type of innovation: regular efforts to develop new products often yield greater performance benefits than ongoing efforts to improve production processes.

It is difficult to draw firm conclusions from international research because studies define and measure persistence in different ways, making direct comparisons challenging. The size of the advantage also appears to depend on firm characteristics, including size and growth patterns. Some evidence suggests the effects may be stronger for small and medium-sized enterprises (SMEs). The research is drawn mainly from Spain, Italy, Sweden, and other countries; robust evidence from the UK remains limited and dated.

For policymakers, the findings suggest that sustained investment in R&D and innovation may yield higher economic returns than one-off or sporadic efforts. However, the limited UK evidence and the possible role of public support in encouraging firms to persist point to a need for further research. This could use linked, long-term data on UK firms to better understand how sustained innovation affects growth and productivity.

1. Introduction

This review considers one central question: to what extent can differences in firm performance be explained by the persistence of firms' engagement with R&D and/or innovation? Does persistent engagement with R&D enable firms to accumulate technological knowledge and capability, allowing them to establish technological leadership in a particular niche market (Simon, 1996; Bergek et al., 2013)? Or does persistent engagement with R&D create lock-in or myopia, which may reduce firms' ability to adopt new technological opportunities (Cabagnols, 2006)? Likewise, do persistent innovation strategies – the market introduction of new or improved products or services – enable firms to establish a position of market leadership (Clausen et al., 2012)? Or does repeated innovation create successive disruptive effects that negatively affect growth and productivity (Bergek et al., 2013)?

Lööf et al. (2012) provide early evidence on the relationship between persistent R&D and firm performance among Swedish firms: "persistent-R&D firms are different …They are considerably larger and more export-oriented, they are more skill intensive, have higher sales and value added per employee, and, in contrast to the other two, they typically belong to a multinational company group. Employing a strategy of persistent innovation efforts implies that the firm maintains its heuristics and routines of innovation practice" (Lööf et al., 2012, p. 185). Controlling for these structural factors, Lööf et al. (2012) find that firms with persistent R&D have 13% higher labour productivity than firms with no R&D and 9% higher labour productivity than firms with intermittent R&D. Firms with persistent R&D also demonstrate higher productivity growth rates. To what extent are these early findings consistent with more recent studies, particularly for UK firms?

Cefis and Ciccarelli (2005) provide early evidence for the UK on the relationship between persistent innovation and profitability. Using a patent-based indicator of innovation persistence, they compare the distributions of profitability across persistent innovators, other innovators, and non-innovating firms. Echoing the result of Loof et al. (2012), they find: "the persistent innovators group has a higher mean, median and maximum value of the profit variable than the non-innovator group. The innovator group is between the two" (Cefis and Ciccarelli, 2005, p. 47). However, their econometric estimates of the magnitude of the profitability effect of persistent innovation range from 1.1-38.0% depending on the specification adopted and are statistically insignificant in a number of models.

The studies by Lööf et al. (2012) and Cefis and Ciccarelli (2005) suggest a positive relationship between persistent R&D/innovation and performance - the "persistence premium" - but also highlight related methodological and measurement issues. In particular:

- R&D persistence and innovation persistence are not the same. Firms may conduct R&D but fail to introduce innovations, or innovate without conducting R&D (Zhang, 2024). The review therefore considers R&D persistence and innovation persistence separately.
- Firm-level heterogeneity is considerable and may play a significant moderating role on the R&D/innovation to performance relationship. Other firm-specific characteristics – e.g. skills – may also have a significant moderating role.
- Aspects of firm performance (growth, productivity, profitability) may have different relationships to R&D/innovation due to varying impact time lags and measurement challenges. Previous studies have shown that firm performance metrics are only weakly correlated.
- Measuring R&D/innovation persistence is not straightforward, and studies using either survey-based (Lööf et al., 2012) or patent-based measures (Cefis and Ciccarelli, 2005) show little consistency.

- Varied estimation approaches may suggest different R&D/innovation-to-performance relationships, making generalised statements about causality and effect size less straightforward.

2. R&D persistence, growth and productivity

A large number of studies focus on the links between R&D and productivity or other aspects of firm performance. For example, Bond and Guceri (2017) compare the performance of large R&D-performing plants in the UK with that of non-R&D-performing firms and find that productivity is 14% higher in R&D performers. However, their analysis does not distinguish between persistent and intermittent R&D activity and therefore provides no insight into the added benefits of R&D persistence.

This section therefore focuses only on the relatively small number of studies that explicitly distinguish between persistent and intermittent R&D activity (Table 1), and omits any systematic consideration of studies that model the average return to R&D (see Kafouros, 2005; Rogers, 2010, for early reviews). We also exclude studies that focus on the persistence of performance outcomes (as a result of R&D) rather than on the performance effects of persistent R&D. For example, Anagnostopoulou and Levis (2008) suggest that UK-based R&D-performing firms earn more persistent returns. We also exclude papers that link the persistence of R&D to innovation outcomes only, rather than to measures of firm performance (e.g. Ipinnaiye et al., 2026; Labeaga et al., 2021).

We identified four studies (including Lööf et al., 2012) which directly compare the returns to intermittent and persistent R&D (Table 1). Three of these studies, which adopt diverse methodological approaches, suggest a positive persistence premium from R&D. In addition to Lööf et al. (2012) discussed earlier these are:

- Mañez, Love, & Terra (2026), using Spanish data, find that accumulated R&D experience supports productivity growth, although the relative benefits of continuous versus punctuated R&D vary across firms. This productivity growth, in turn, supports future R&D persistence.

- Muinelo-Gallo & Martínez (2018), using survey data for Uruguay, demonstrate a virtuous circle with persistent R&D having strong innovation benefits which, in turn, influence productivity.

In contrast, Altuzarra (2024), using Spanish panel data, finds that R&D persistence has a weak negative relationship with subsequent growth, an effect which is stronger among faster-growing firms.

Table 1: Studies relating R&D persistence (intermittent vs persistent) to aspects of business performance

Authors	Data Overview	Performance measures	Measure/ definition of persistence	Econometric Approach	Key empirical results
Lööf et al. (2012)	Swedish CIS data matched with register data, 1997-2006	Value added per employee; sales per employee and exports per employee	Persistent R&D firms - reported recurrent R&D activity throughout 2002–2004; Occasional R&D firms - reported R&D activity during the period but not continuously.	Dynamic panel data models with lagged dependent variables	Compared with non-R&D firms: Persistent R&D firms exhibit approximately 13% higher labour productivity**.** Occasional R&D firms exhibit approximately 4% higher labour productivity**.** Persistent R&D firms achieve approximately 2.3% higher annual labour-productivity growth than non-R&D firms.
Mañez, Love & Terra (2026)	Survey data on Spanish manufacturing firms, 1992-2023	Total factor productivity	R&D persistence measured by the duration of continuous R&D spells. Previous cumulative R&D experience is measured by years of prior R&D activity	Discrete-time proportional hazard models of R&D spell duration and panel models of productivity	Cumulative R&D experience is positively associated with productivity. A 10% increase in R&D duration spell is associated with a 0.91% increase in productivity (Table 8). Productivity, in turn, supports subsequent R&D persistence for SMEs. The relative productivity benefits of continuous R&D vary by firm size are greater in larger firms (Table 8).
Muinelo-Gallo & Suanes Martínez (2018)	Survey data on manufacturing firms in Uruguay, 2001-2009. Balanced panel	Log productivity (sales per employee)	Persistent R&D: R&D undertaken in all three survey waves; occasional R&D: R&D undertaken in one or two of the three waves.	Ordered probit in expanded CDM model with predicted R&D persistence in the productivity model	Persistent R&D influences innovation which in turn influences productivity. Persistent engagement in R&D increases the likelihood of innovation, but innovation persistence is observed only for product innovation, not process innovation. No systemic effect sizes are reported.
Altuzarra (2024)	Unbalanced panel for Spanish manufacturing, PITEC 2005–2016	Turnover growth during 2013–2016	Firms that conduct R&D over eight consecutive years (2005–2012)	Conditional quantile regression and unconditional quantile regression	Results vary with the estimation method and across the growth distribution. CQR estimates suggest some positive R&D persistence effects among low- to medium-growth firms, but no positive effect among faster-growing firms. UQR estimates indicate no significant overall relationship between persistent R&D and subsequent sales growth.

3. Innovation persistence, growth and productivity

In this section, we consider studies that examine the relationship between innovation persistence and firm performance. Again, we focus on those that compare the performance impacts of persistent and occasional innovation (Table 2).

Malerba et al. (1997) frame this contrast in terms of Schumpeter's alternative patterns of innovation: occasional or intermittent innovation is equated with creative destruction, and continuous innovation with creative accumulation. Other distinctions in modes of innovation have also been considered in the literature, such as the distinction between a DUI (Doing, Using and Interacting) mode, an STI (Science, Technology and Innovation) mode, and a TEI (Territorial Embeddedness Innovation) (Nunes and Lopes, 2015), which may be inter-related with persistent or occasional innovation.

Early evidence on innovation persistence, its determinants and its consequences is summarised in Le Bas and Scellato (2014). They also emphasise the variety of approaches used to examine the innovation persistence–performance relationship, with particular focus on patents versus survey-based innovation indicators, econometric methods, and the types of innovation involved (e.g. product versus process). Each of these factors significantly shapes the key results across the nine studies identified here.

Overall, the international evidence – based largely on Italian or Spanish firm-level data – provides considerable, although not uniform, evidence of a positive persistence premium in innovation (Table 2):

- Bogliacino et al. (2017) use CIS and matched performance data to highlight the impact of persistent innovation on turnover per hour worked in Italian firms. In their analysis, occasional product innovation has no productivity effect
- Kumar & Sundarraj (2016), in a study of global technology businesses, find that both occasional and persistent innovation (measured by patenting) influence market value and profitability, although these effects are larger in persistent innovators.
- Deschryvere (2014) examines the 'virtuous circle' between R&D growth and turnover growth for Finnish firms and finds evidence of a positive association only for continuous innovators. The analysis here is based on CIS data (continuous innovation defined as occurring in two consecutive CIS waves), and the modelling is done separately for firms engaging in continuous and occasional innovation.
- Iandolo & Ferragina (2019) use Italian survey data and identify positive links between innovation persistence and growth in Total Factor Productivity (TFP). These effects complement persistent exporting, although the strength of these complementarities differs by firm size.
- Bianchini & Pellegrino (2019) examine how innovation persistence affects employment growth in Spanish manufacturing firms. They find no significant employment-growth effects from persistent process innovation (measured by the hazard rates of ending an innovative spell) but do find a significant positive effect from persistent product innovation. This positive effect is also evident in patent-based measures of persistence.

Other studies provide more mixed evidence.

- Guarascio Tamagni (2019), using Spanish survey data, finds that persistence of innovation (across seven of the 10 previous years), whether measured by R&D,

patents, or product or process innovation, has no significant positive relationship with subsequent sales growth.

- Altuzarra (2024), using Spanish panel data, finds that innovation persistence (patents, product or process innovation) has no significant effect on subsequent growth across all firms. A weak positive relationship is evident among slower-growing firms, although this result depends on the estimation method used.

Recent evidence also reinforces the importance of heterogeneity in the innovation persistence–performance relationship. Triguero et al. (2014), using Spanish manufacturing data, find positive employment effects from persistent process innovation, particularly among SMEs, while persistent product innovation has no significant effect. Bartoloni and Baussola (2018), using Italian data, link persistence in both technological and non-technological innovation to firm performance, while Hendrickson et al. (2021), using linked Australian firm-level data, find stronger sales, employment, value-added and profit growth among more persistent innovators, particularly young SMEs.

Table 2: Studies relating innovation persistence (intermittent v persistent) to aspects of business performance

Authors	Data Overview	Performance measures	Persistence measures	Econometric Approach	Key empirical results
Cefis and Ciccarelli (2005)	267 UK manufacturing firms, 1988-92; financial data matched with patents data	Operating profit margin (profit per sales)	Innovation is measured using patents. A persistent innovator does not remain more than two consecutive years without filing a patent application.	Dynamic panel models and Bayesian models.	Persistent innovators show higher profitability than other innovators and non-innovators, although estimated differences vary across specifications. Profit differentials also persist over the longer run.
Muinelo-Gallo & Martínez, (2018)	Survey data on manufacturing firms in Uruguay 2001-2009. Balanced panel	Log productivity (sales per employee)	R&D persistence if continuous R&D, or occasional if in 1 or 3 of the three survey waves	Ordered probit in expanded CDM model with predicted R&D persistence in the productivity model	Persistent R&D influences innovation which in turn influences productivity. Persistent engagement in R&D increases the likelihood of innovation, but innovation persistence is observed only for product innovation**,** not process innovation. No systemic effect sizes are reported.
Bianchini & Pellegrino (2019)	Spanish manufacturing firms survey data 1991-2012	Employment growth and its persistence	Product, process innovation and patenting. Measured by hazard rates of stopping innovating	Dynamic panel modelling and system GMM	Persistent product innovation is associated with increased growth (+5-6%pp). Persistent process innovation has no effect. Patents also generate persistence benefits. Effects are stronger for SMEs.
Guarascio & Tamagni (2019)	Spanish survey data on manufacturing firms	log difference in sales during 2000-2012	If it engaged in the innovation activity (R&D, patents, product, process) for at least 7 consecutive years out of the 10-year period 1990-1999.	OLS, quantile regressions, GMM	Persistent innovators showed no statistically significant sales-growth advantage relative to other firms regardless of how persistence is measured. Holds for all firm sizes.

Iandolo & Ferragina (2019)	Three waves of survey data on Italian manufacturing firms	Total factor productivity	Innovate over all three surveys	GMM, separate estimation for persistent and intermittent exporters	Persistent innovation is linked to faster productivity growth and enhances the effects of persistent exporting. Persistent innovators enjoy approximately 5.9% annual productivity growth premium**.** Effects differ by firm size.
Altuzarra (2024)	Unbalanced panel for Spanish manufacturing, PITEC 2005–2016	Turnover growth during 2013–2016	Firms that innovate (product, process, patents) over eight consecutive years (2005–2012)	Conditional quantile regression and unconditional quantile regression	Results depend on both the persistence measure and estimation method. Persistent patenting shows some positive association with subsequent growth, particularly among lower-growth firms, while persistent product and process innovation generally show no significant growth premium. UQR estimates are weaker overall.
Bogliacino, Lucchese, Nascia & Pianta (2017)	Italy, ISAT-CIS data match for manufacturing, 1998-2006 (3 waves)	Turnover per hour worked	Three groups: (1) no product innovation (2) product innovate in one or two CIS waves (3) product innovation in all waves	3 equation model: turnover per hour, innovation turnover and innovation investment	Persistent innovation has a positive and significant effect on turnover per hour worked. A 10% increase in innovative investment by persistent innovators is associated with a 2.4% increase in turnover per hour (Table 4). Occasional innovation has no significant effect. Any 'virtuous circle' of innovation to performance only operates for persistent innovators.
Kumar & Sundarraj (2016)	Listed global technology companies, panel data (400)	Market value, profitability, stock returns	Patent count data weighted by citations. Innovators where 10+ patents Persistent: Top 5% in patent count and 20+ years old	Panel data regression models	Persistent innovators outperform occasional innovators. Both types of innovators outperform non-innovators in terms of profitability and market value. Effect sizes are unclear.
Deschryvere (2014)	R&D Survey, CIS and Registry data for Finland 1998-2008	Turnover and employment growth	Persistent innovators report innovation two consecutive waves. Other innovators occasional. Product	VAR models run separately for continuous and occasional innovators	R&D growth is only linked to sales growth for continuous product and process innovators. Feedback from sales growth to R&D growth is less systematically linked to innovation persistence. These results are largely

			and process treated separately		consistent across size bands. No direct comparison of effect sizes.
Hendrickson et al. (2021)	Australian BLADE data linking innovation-survey, administrative and tax data, 2007–08 to 2013–14; includes micro firms and all industries	Sales, value added, employment and gross operating profit growth	Four categories over three-year panels: non-innovator (0/3 years), intermittent innovator (1/3), regular innovator (2/3), persistent innovator (3/3)	ANOVA and quantile analysis; propensity-score matching with OLS outcome regressions	Persistent innovators outperform less persistent and non-innovators across sales, value added, employment and profit growth. A 10% increase in years of innovation is associated with a 5.5-5.7% increase in turnover, gross output, and value added (Table 2). Effects are strongest for simple-structured firms, particularly young SMEs; persistence effects are weaker for large complex firms.
Triguero, Córcoles, & Cuerva (2014)	Spanish manufacturing firms, ESEE panel, 1990–2008; SMEs and large firms	Employment growth	Persistence in product and process innovation, captured through current and lagged innovation activity	System GMM, estimated for the full sample and by firm size	Persistent process innovation has a positive effect on employment growth, particularly for SMEs; the effect strengthens with additional lags. Persistent product innovation has no significant employment-growth effect.

4. The persistence premium in R&D and innovation – summary and conclusions

When studies compare the performance of intermittent and persistent R&D and innovation performers, they generally indicate a positive persistence premium, although the evidence varies by performance measure, type of innovation and firm characteristics (Tables 1 and 2).

Persistent R&D may support ongoing learning about a specific technology and the accumulation of knowledge. This, in turn, may help sustain continuity in innovation and firm performance. Improved performance may, in turn, enable further investments in R&D, establishing a virtuous cycle of technology investments and performance. However, the evidence suggests that such benefits are not uniform: productivity effects appear more consistently positive than those on sales growth, while results also differ between product and process innovation and across firm-size groups.

Studies vary markedly in both their approach to measuring persistence and their empirical methodology. Measures of persistence may reflect either R&D/innovation engagement across successive survey waves or the continuity of R&D/innovation over a given number of years. Other studies measure persistence using the probability of breaking a sequence of successive periods of innovation or R&D. Estimates of both the existence and the scale of any persistence premium seem to depend strongly on the methodological approach adopted, making results from different studies hard to compare.

The evidence also suggests that the persistence premium may vary by firm size. Some studies identify stronger benefits from persistent innovation among SMEs, although smaller firms may also face greater difficulties in sustaining continuous investment in R&D and innovation, particularly in volatile markets.

Studies have largely relied on non-UK firm-level data, particularly from Spain, Italy and Sweden, with more recent evidence also available from countries such as Australia and Uruguay. Some of the datasets used are stronger than those available for the UK. For example, the Spanish innovation survey is conducted annually rather than every two years, as in the UK.

5. Next steps

There is a marked lack of UK-specific evidence on the extent of any persistence premium from R&D and/or innovation. There is also little evidence on the impact of public support for R&D and innovation and how this may influence the extent of any persistence premium. The lack of a long, annual firm-level panel with consistent measures of R&D and innovation for the UK also reduces our ability to conduct more complex analyses similar to that in Manez et al. (2026).

A workable approach, following Lööf et al. (2012) would be to focus on the UK Innovation Survey as the key data resource and develop a match with the Business Structure Database (for annual employment and turnover data). Firms could be grouped into those conducting no R&D, occasional R&D and persistent R&D. A similar grouping may be applied to innovation.

A key issue is how we measure persistent R&D and innovation. We suggest following the approach adopted in Jibril and Roper (2022). This would identify persistence across three consecutive UKIS waves (or more), covering overlapping three-year reference periods and spanning seven calendar years. This should be interpreted as persistence across survey waves rather than necessarily

continuous annual engagement in R&D or innovation. It should also be possible to separately identify persistence in in-house and sub-contracted R&D and to explore their differential effects.

The effect of this 'treatment' on subsequent growth and productivity could then be modelled using a staggered DID approach, with the precise estimator depending on how the onset and persistence of treatment are defined (see, for example, Callaway and Sant'Anna, 2021; Dube et al., 2025). In particular, the choice of estimator will need to reflect whether persistent R&D or innovation is treated as an absorbing state or whether firms can move in and out of treatment. Growth and turnover per employee, as a proxy for labour productivity, could be drawn from the Business Structure Database, which, as a population-level data source, maximises data coverage. Alternatively, a match with the Annual Business Survey could be considered, but it is not yet clear how large any sample overlap would be.

Potential selection issues arise here, both in terms of firms selecting into persistent R&D and innovation and because of the proposed measurement approach. As a result, any analysis should also include a sensitivity analysis, following Altonji, Elder and Taber (2005), to assess how much selection on unobservables would be required to nullify the results.

Sub-sample analysis (regions, sectors, size bands) should also be conducted to reflect firm heterogeneity. Effects of public support for R&D and innovation as measured in the UKIS should also be considered.

References

Altuzarra, A. (2024). Innovation Persistence and Firm Growth: Do They Go Hand in Hand? *Journal of the Knowledge Economy*. https://doi.org/10.1007/s13132-024-01809-z

Anagnostopoulou, S. C., & Levis, M. (2008). R&D and performance persistence: Evidence from the United Kingdom. *The International Journal of Accounting*, *43*(3), 293-320. https://doi.org/10.1016/j.intacc.2008.06.004

Bartoloni, E., & Baussola, M. (2018). Driving business performance: Innovation complementarities and persistence patterns. *Industry and Innovation, 25*(5), 505–525. https://doi.org/10.1080/13662716.2017.1327843

Bergek, A., Berggren, C., Magnusson, T., & Hobday, M. (2013). Technological discontinuities and the challenge for incumbent firms: Destruction, disruption or creative accumulation? [Article]. *Research Policy*, *42*(6-7), 1210-1224. https://doi.org/10.1016/j.respol.2013.02.009

Bianchini, S., & Pellegrino, G. (2019). Innovation persistence and employment dynamics. *Research Policy*, *48*(5), 1171-1186. https://doi.org/10.1016/j.respol.2018.12.008

Bogliacino, F., Lucchese, M., Nascia, L., & Pianta, M. (2017). Modelling the virtuous circle of innovation. A test on Italian firms. *Industrial and Corporate Change*, *26*(3), 467-484. https://doi.org/10.1093/icc/dtw045

Bond, S. R., & Guceri, I. (2016). R&D and productivity: evidence from large UK establishments with substantial R&D activities. *Economics of Innovation and New Technology*, *26*(1-2), 108-120. https://doi.org/10.1080/10438599.2016.1203525

Cabagnols, A. (2006), 'Technological learning and the persistence of innovation: A France–UK comparison based on a Cox model of duration', Revue d'economie politique, 114(2): 263–292

Cefis, E., & Ciccarelli, M. (2005). Profit differentials and innovation. *Economics of Innovation and New Technology*, *14*, 43-61.

Clausen, T., Pohjola, M., Sapprasert, K., & Verspagen, B. (2012). Innovation strategies as a source of persistent innovation. *Industrial and Corporate Change*, *21*(3), 553-585. https://doi.org/10.1093/icc/dtr051

Deschryvere, M. (2014). R&D, firm growth and the role of innovation persistence: an analysis of Finnish SMEs and large firms. *Small Business Economics*, *43*(4), 767-785. https://doi.org/10.1007/s11187-014-9559-3

Guarascio, D., & Tamagni, F. (2019). Persistence of innovation and patterns of firm growth. *Research Policy*, *48*(6), 1493-1512. https://doi.org/10.1016/j.respol.2019.03.004

Hendrickson, L., Taylor, D., Ang, L., Cao, K., Nguyen, T., & Soriano, F. (2021). The impact of persistent innovation on Australian firm growth. *Prometheus, 37*(3), 241–258. https://doi.org/10.13169/prometheus.37.3.0241

Iandolo, S., & Ferragina, A. M. (2019). Does persistence in internationalisation and innovation influence firms' performance? *Journal of Economic Studies*, *46*(7), 1345-1364. https://doi.org/10.1108/JES-04-2019-0152

Ipinnaiye, O., Lenihan, H., Mulligan, K., Doran, J., & Roper, S. (2026). Innovation success in small and larger firms: Does persistence and diversity in R&D matter when building a unique knowledge base? *Journal of Technology Transfer*, *51*(3), 1564-1600. https://doi.org/10.1007/s10961-025-10209-7

Jibril, H and Roper, S (2022) Of chicken and eggs: Exporting, innovation novelty and productivity. Working Paper No. 027, The Productivity Institute.

Kafouros, M. I. (2005). R&D and productivity growth: Evidence from the UK. *Economics of Innovation and New Technology*, *14*(6), 479-497. https://doi.org/10.1080/1043859042000269098

Kumar, V., & Sundarraj, R. P. (2016). Schumpeterian innovation patterns and firm-performance of global technology companies. *European Journal of Innovation Management*, *19*(2), 276-296. https://doi.org/10.1108/EJIM-05-2015-0034

Labeaga, J. M., Martínez-Ros, E., Sanchis, A., & Sanchis, J. A. (2021). Does persistence in using R&D tax credits help to achieve product innovations? *Technological Forecasting And Social Change*, *173*, Article 121065. https://doi.org/10.1016/j.techfore.2021.121065

Le Bas, C., & Scellato, G. (2014). Firm innovation persistence: a fresh look at the frameworks of analysis. *Economics of Innovation and New Technology*, *23*(5-6), 423-446. https://doi.org/10.1080/10438599.2014.895511

Lööf, H., Johansson, B., Andersson, M., & Karlsson, C. (2012). R&D strategy and firm performance: What is the long-run impact of persistent R&D? In M. Andersson, B. Johansson, C. Karlsson, & H. Lööf (Eds.), *Innovation and Growth: From R&D Strategies of Innovating Firms to Economy-wide Technological Change* (pp. 182–208). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199646685.003.0009

Mañez, J. A., Love, J. H., & Terra, A. L. (2026). Cumulative versus punctuated patterns of R&D learning, productivity and R&D persistence. *Small Business Economics*. https://doi.org/10.1007/s11187-026-01235-2

Muinelo-Gallo, L., & Martínez, M. S. (2018). Persistence and economic efforts of technological innovations: a dynamic and sequential analysis of Uruguayan manufacturing firms. *Economics of Innovation and New Technology*, *27*(8), 671-694. https://doi.org/10.1080/10438599.2017.1389119

Nunes, S., & Lopes, R. (2015). Firm Performance, Innovation Modes and Territorial Embeddedness. *European Planning Studies*, *23*(9), 1796-1826. https://doi.org/10.1080/09654313.2015.1021666

Rogers, M. (2010). R&D and productivity: using UK firm-level data to inform policy. *Empirica*, *37*(3), 329-359. https://doi.org/10.1007/s10663-009-9111-x

Simon, H. (1996). *Hidden champions - lessons from 500 of the world's best unknown companies*. Harvard Business School Press.

Triguero, A., Córcoles, D., & Cuerva, M. C. (2014). Persistence of innovation and firm's growth: Evidence from a panel of SME and large Spanish manufacturing firms. *Small Business Economics, 43*(4), 787–804. https://doi.org/10.1007/s11187-014-9562-8

Zhang, H. L. (2024). Non-R&D innovation in SMEs: is there complementarity or substitutability between internal and external innovation sourcing strategies? *Technology Analysis & Strategic Management*, *36*(5), 916-930. https://doi.org/10.1080/09537325.2022.2065979

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