Individual and Institutional Ownership, Firm Age and Productivity

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Abstract

Total factor productivity represents a dimension of output that cannot be attributed to factors of production; it is unique to the firm, and central to its competitiveness. We posit that ownership structure plays a key role in productivity. However, ownership structure has an effect on productivity which changes with a firm's age. Ownership structure that is optimal for new firms may not be optimal for older firms. We here consider the impact of ownership structure as defined by shares of individuals' versus (broadly defined) institutional ownership. Our empirical counterpart draws on the UK company data for 2008-2017, obtained from the Orbis database. Our key explanatory variables are the joint share of the individual owners in equity and its square, but we also control concentration of ownership indices, along with a range of other firm-level characteristics. Applying fixed effects models along with instrumenting ownership with regional level variables, we found that new companies with majority individual owners and minority institutional owners outperform others. As firms age, however, these differences begin to disappear, with individual owners losing their control-related advantage. The results of the relative advantage of individual owners in the early stage is consistent with the property rights theory, which emphasises that residual control rights should remain with those whose investment is critical. It can be argued, however, that for whom the investment is critical changes as firm ages. Our managerial implications emphasise ownership competence in optimising ownership structure, which should evolve along the stages of the life-cycle of the firm.

1. INTRODUCTION

Total factor productivity (TFP) is an unfailing predictor of a firms' competitiveness, survival, and post-entry growth (Farinãs & Ruano, 2005). Furthermore, as established by Aiello & Ricotta (2016), 85% of TFP variability is explained by firm-specific factors, as opposed to regional and country level factors. Among firm-specific factors, type of ownership features prominently. Evidence suggests that firms under different types of ownership - individual ownership and institutional ownership - show varied patterns of productive performance. A review by Boyd &

Solarino (2016) concludes that institutional ownership is positively associated with performance. This conclusion, however, does not account for the age of firms: it can be argued that an ownership structure optimal for new firms may not be optimal for older ones from the point of view of competitiveness and productivity.

Our approach which considers ownership effects conditioned by the age of firm is not novel; it builds on recent work by Cucculelli et al. (2014) and Bartz & Winkler (2016). Our contribution, however, is in the focus on details of equity distribution between the two major categories of owners: individuals and institutions (the latter including not only institutional financial investors but also any other ownership by organisations). This approach enables us to emphasise insights from the property rights theory (Hart, 1995; Driffield et al., 2016) while maintaining focus on a broad cluster of theories related to governance (transaction costs, agency, trust), entrepreneurship theory as well as the resource-based view.

We propose the following rationale to explain why firm age in conjunction with ownership structure matters for productivity. Young firms have special needs for flexibility, which ownership control by individuals may be conducive to. This point is also often highlighted in the literature on family firms (Steier, 2001). In this phase of the firm's life cycle, individual ownership is likely to come with a high level of trust among owners. This facilitates effective and speedy decision-making, e.g. through learning-by-doing processes and experimentation, leading to creation of new opportunities along the development path of the new venture (Alvarez & Barney, 2007).

At the same time, we observe that ownership restricted to individuals may present disadvantages. Knowledge, networks and access to resources may be constrained. Overreliance on the owners' own competences may lead to oversights. Therefore, we argue that a composite ownership structure in which individual ownership is combined with institutional ownership may effectively combine flexibility with the additional non-redundant knowledge as well as with access to resources and networks that institutional investors bring in. In line with property rights (incomplete contracts) theory (Hart, 1995; Driffield et al., 2016), we posit that under optimum conditions, in the early stage, the ownership structure should assign control rights (majority stake) to individual owners, with minority stakes allocated to institutional owners, since it is the individual owners' contribution to the firm's competitiveness that is more unique and critical. At the same time, institutional investors bring in complementary competences.

However, the advantages of majority individual ownership may diminish over time, and the advantages of institutional ownership may increase. In this sense, findings in the literature summarized by Boyd & Solarino (2016) on the superior performance of firms with dominant ownership stakes by institutional investors seem applicable to older firms only. Our research posits the question of whether for young firms specifically would the most effective approach be a structure based on majority individual ownership combined with minority share by institutional investors?

Thus, our research connects the dimensions of the individual ownership and the age of a company in explaining the heterogeneity of productivity outcomes at the firm level.

Furthermore, our paper also adds to the policy discussion of the role of mid-sized businesses (in the UK: 'Brittelstand' – i.e. companies between £10m and £100m turnover), an exemplar of

productive prowess in some countries (Germany, Sweden, and Finland). As we document, it is the ownership (and the age) of firms that is the key issue here. Focusing on the criterion of size is misleading. This is in line with the literature recognising that the German Mittelstand firms are not only defined by size, and therefore, the term is not just a synonym for small and medium-sized enterprises. Instead, their ownership and governance is distinct. They rely on clearly identified, hands-on, private, often family, ownership (Berlemann & Jahn, 2016; Pahnke & Welter, 2019). Our results on the UK indicate that in the business policy discussion that employs the concept 'Brittelstand', the focus on size is misplaced, as it is the owners who are the key to productivity, especially for young firms. This will come as no surprise for entrepreneurship scholars (Foss et al., 2021), and has implications beyond the UK.

Overall, we find that young firms tend to benefit the most from dominant individual ownership combined with institutional minority ownership. This suggests that new firms are most productive when they are able to take advantage of a pool of owners with complementary competences through better access to knowledge transfer as well as to financial resources, while at the same time maintaining the flexibility advantages that come with dominant control by individual, entrepreneurial owners. Nevertheless, this effect of the ownership structure does not hold for older firms. Indeed, for older firms, a higher share of institutional ownership leads to enhanced competitiveness.

We next motivate our research question starting with policy angle, proceed to theory, spell out our hypotheses, declare our methods, present and discuss the results, and finally conclude.

2. THEORETICAL BACKGROUND: OWNERSHIP, AGE; ENTREPRENEURIAL FIRMS

Firm ownership is a key concept of more than one governance theory (Cucculelli et al., 2014). First, while some entrepreneurship theories emphasise entrepreneurial attitudes and strategies, others place ownership at the core of the 'entrepreneurial firm' (Bartz & Winkler, 2016). Stress on ownership is characteristic for the Austrian School approach to entrepreneurship (Foss & Klein, 2015). The typical contrast is with state ownership, which plays a major role in some economies; Du & Mickiewicz (2016) for example emphasise private ownership as one of the constituting dimensions of entrepreneurship. Second, parallel to this, ownership is often considered in conjunction with management; here firms that combine ownership with management are contrasted with firms characterised by the classic agency problem of separation of ownership and control (Maug, 1998; Filatotchev & Mickiewicz, 2006; Cucculelli et al., 2014). Combining rights to make decisions with rights to claim residual value creates strong incentives, while on the other hand, this situation is also characterised by a higher degree of risk that the owners-managers need to bear (Tirole, 1988). This produces interesting trade-offs. Third, the economic theory of property rights comes into play. Here the key question is not that of the distribution of control between owners and managers, but between different owners: in order to achieve efficient outcomes, the dominant ownership should be allocated to those whose contribution is most significant (Hart, 1995; Driffield et al., 2016). In this respect, property rights theory is the key theoretical lens that we apply in this paper. Fourth, however, arguments

parallel to agency theory and property rights theory, yet focused more on organisational issues, relate to the relative advantages of autonomous smaller firms versus larger integrated business organisations. This is the transaction costs theory as introduced by Coase (1937) and developed further by Williamson (1985). And last but not least, a wide line of research on family firms focuses on the benefits of flexibility and on the low costs of governance that come from owners bound by trust (Mickiewicz & Rebmann, 2020) and social linkages (Cucculelli et al., 2014). These aspects are typically represented by a family structure, and indeed most of private businesses are family-owned. However, the same effect of trust between friends, which makes governance easier, bring a similar effect, as for example documented in the history of companies such as Apple. This argument can be seen as extending the agency theory: family ownership of firms alleviates principle-agent problems and hiring trusted family members decreases concerns about opportunistic behaviour (Zahra et al., 2004). Alternatively, the idea can be expressed as an extension of transaction cost theory: trust and lower risk of opportunism between family members reduce transactions costs; that is enable adoption of less costly governance structures and facilitates access to a wider range of resources by the family firm. Trust between individuals may also imply more innovation, as trust is particularly important for intangible assets (Calabrò et al., 2019). In turn, innovation feeds into competitiveness and productivity.

There are also other channels that may give firms owned by individuals an edge; these additional channels are not captured well by the more economically oriented theory. In particular, firms owned by individuals may also attract more trust from other stakeholders, including clients. This is described in the literature as the phenomenon of humanisation, where family firms are perceived as characterised by stronger human values, the perception of 'real' people, friendliness and warmth. This leads to perceptions of more personal relationships, hence to more loyalty by customers (Beck & Prügl, 2018; Eddleston et al., 2010).

Yet, is individual ownership always good for performance? If so, we would need to accept, for example that the way UK corporate governance and ownership structures had evolved, towards the stronger role of institutional investors, has negative implications. This would be consistent with the UK firms lagging behind French and German firms in terms of productivity (Aiello & Ricotta, 2016). But the problem may be more complex, and the role of institutional investors may need to be further qualified, and it is here that we intend to make a contribution. Considering the impact of ownership structures on productivity, we will start with Roe's (2008) observation that: 'the … problem comes in two main varieties. One variety is of diversion, while the other is of competence'.

The first of these issues, the diversion of resources, shrinking, or outright stealing by managers, may be alleviated either by strong monitoring, or trust structures that are likely to accompany individual ownership. At the same time, individual ownership, including family ownership, is often associated with continuity and stability, therefore, long-term orientation (Cucculelli et al., 2014). However, stability may also have negative aspects. As argued by Roe (2008), change is important, and in particular, change in management may also be important: 'Managers might not be up to running the firm, either because one or another manager never was up to the task (their selection was a mistake) or more plausibly because changed circumstances made the incumbent manager no longer fit for this company' (ibid., 373). This argument can be generalised

and linked to evolving specific ownership advantages, in line with the property rights theory. The relative value of the ownership advantages can evolve over time (Driffield et al., 2016), and in our case, along the life cycle of the firm.

Considering the life cycle of the firm, when the latter moves from the initial stage to the stage of expansion, the 'Penrosian effects' (Penrose, 2009[1958]) may emerge. That is, over-reliance on within-family trust structure may constrain growth and performance (Arregle et al., 2017). More generally, Shi et al. (2015) observe that 'there is a danger of the "strong-tie effect". It implies over-reliance on the family-based networks when seeking valuable information, acquiring resources, and evaluating business opportunities. In other words, it makes business network structures of the firm too narrow, and opportunities are likely to be ignored in case they originate with remote sources, for which an established trusting relationship is not in place. Furthermore, over-reliance on the family-based competences may lead to extra costs, or even productivity failure. All this implies in turn, that extending ownership towards the institutional owners may come with a benefit: access to new skills, new knowledge, and new networks. Combining these two insights, we may posit that the optimum ownership structure is where majority and control rights are retained by individual owners, yet institutional owners are also present.

What we suggest furthermore is that circumstances change with the age of firms. As new companies evolve, the initial new venture idea (Davidsson, 2016) takes both more precise shape but is also modified by responding to the environment within which the firm expands. This makes the governance problem two dimensional. Controlling stakes by individual owners should be particularly helpful at the beginning of the company's life cycle, that is when the activity is still most fluid, and speed and clear decision making is critical. This issue has been well recognised in research on family firms, as cited above. The competitive advantage of such firms is often the strongest when it comes to new ventures: ownership is well-identified, facilitating strategic decision making, and it is based on trust 'imported' from the family into the venture (Peng & Jiang, 2010; Steier 2001; Zahra et al., 2004; Mickiewicz & Rebmann, 2020). Nevertheless, these competitive advantages against other firms may become less important over time. Other business organisations, when they mature, may also develop their own internal structures of trust and cooperation, making strategic management less costly.

Furthermore, as argued above, individual ownership, especially when family based, may exhibit too much stability, making change difficult (Shi et al., 2015). Again, these negative effects of overreliance on a narrow circle of business partners or on family may become a stronger limiting factor as a company matures. In particular, it may limit its ability to grow fast and, therefore, to realise any potential productivity gains it could produce. This is the 'Penrosian effect' mentioned above (Penrose 2009; Arregle et al., 2017).

Thus, we believe that this analysis related to ownership reveals an interesting tension. While control by individual owners facilitates strategic decision making and monitoring, leading to positive effects on performance, it may also have detrimental effects, due to their limited outreach in terms of knowledge and resources. Therefore, especially for young firms, having institutional investors as partners may have positive effects, facilitating access to resources and non-redundant knowledge. As argued by Cucculelli et al. (2014), it is likely that individual owners will develop competence over time. It follows, therefore, that having access to competence of

institutional investors may be particularly important at the early stage of the firm's life cycle, when the competence of the individual owners is still underdeveloped.

We aim to disentangle these aspects and explore the impact of structure of ownership as conditioned by the age of firm. We posit that the effects of individual dominant ownership combined with institutional minority ownership will be the strongest for young companies. Thus, based on the discussion so far, we propose the following two hypotheses:

H1: Firms for which majority individual ownership is combined with minority institutional ownership score the highest in terms of productivity.

H2: The productivity effect of this mixed ownership structure is stronger for young firms compared to old firms.

3. RESEARCH OBJECTIVE, METHODOLOGY, AND DATA

We draw on the FAME database of Bureau van Dijk, financial accounting information of a large firm level data from the UK over the period 2008-2017. Specifically, there is information on the number of employees, on capital and the costs of material sold, as well as the costs of employees and turnover, which allowed us to derive total factor productivity (TFP). We obtained the latter using both, raw data, as well as filling the missing values with linear interpolation (the results do not change qualitatively and remain consistent). Before calculating TFP, we deflated pecuniary variables using available industry deflators provided by Eurostat to eliminate any potential industry-wide shocks. We did not apply any filtering procedure and kept all the companies for which we have our dependent variable and controls available. We also investigated potential issues with outliers: running the analysis without outliers, which means cutting top-low 1% of the distribution came with no substantial effect on results.

Further, we combined the live version of the FAME database with the Orbis Historical database that provides historical ownership records of all companies with active accounts in 2016. This allow us to follow the shares of each shareholder over the period of interest, which in turn enables us to identify different types of owners within a particular company, and the value of shares held by each owner over time. We calculate the ownership concentration index of firms according to the combined shares of equity of top five individual owners. Considering that individual (versus institutional) ownership as the key dimension is not only consistent with the Mittelstand literature (Berlemann & Jahn, 2016; Pahnke & Welter, 2019), but also with the more general literature on the ownership-performance linkages, which emphasises the contrast between the individual and the institutional investors (Boyd & Solarino, 2016).

Tab. 1 – Summary statistics. Source: own research

Variables:	No of obs.	Mean	St. Dev.
Ownership share of individual owners	573,947	82.6	36
Total share of 5 individuals with largest owners	130,837	74.89	34.5
Largest ownership share of an individual	98.052	55.2	34.83
Ln of TFP (Olley and Pakes method)	573,947	4.646	2.536

Ln of TFP (Levinsohn and Petrin method)	573,947	4.663	2.534
Ln of TFP (Ackerberg et al. method)	573,947	3.229	2.191
Ln of total assets	573,791	5.589	2.997
Shareholder funds (millions of constant USD)	572,609	0.013	0.517
Tangible assets over total assets	546,196	0.241	0.291
Intangible assets over total assets	545,887	0.035	0.119
Current assets over total assets	547,413	0.644	0.326
Ln of age	573,947	2.685	0.937
Ln of turnover	573,947	5.541	2.952
Year	573,947	2012	2.519

Table 1 reports the summary statistics of the key variables. The mean ownership of all individual owners is 82.6%. Across the five largest individual owners, it is about 74.9%; while the average value of shares for the single individual with the largest equity ownership in a firm is about 55.2%. This highlights the high concentration of shares within small numbers of individual owners among firms.

Furthermore, for our dependent variable, we employ a number of TFP measures in line with alternative methods of calculation suggested in the literature by Olley & Pakes (1996), Levinsohn & Petrin (2003), Ackerberg et al. (2015). Our alternative measure of performance will be logarithmic change in turnover (based on natural logarithms), the most popular measure of performance in studies focused on growth (Nason & Wiklund, 2018), with an interpretation of the effects similar to that on TFP, as the two performance outcomes are related.

Following the relevant literature, we include control variables in the model, including namely firm size proxied by the natural logarithm of total assets, the share of tangible over total assets, the share of intangible in relation to total assets, and liquidity measure of current assets over total assets. We also derive a company age variable; on average, the firms are 22 years old, with an impressive maximum value of 884 years.

Potential endogeneity may exist since ownership structure may change in response to productivity and, therefore, we also consider instrumenting ownership share of individuals. In quest for instruments, we link the company data from Orbis with regional UK data, via location. Regional level variables are convenient instruments, because individual firm's productivity is unlikely to affect regional level phenomena. In particular, we match regional Eurostat data on the number of trade mark applications and the number of community designs by region. This provides a proxy of the scope of the regional innovation process. We posit that firms in regions with higher innovation are more likely to have thriving private business sectors and the larger pool of potential individual business owners. This is because the higher levels of skill required in the research and development of the innovations correlate with higher general business skills and capacities. Indeed, we find positive correlation between these two regional variables and the share of individual owners at firm level. At the same time, both regional variables exhibit low direct correlation with firm-level productivity.

4. RESULTS AND DISCUSSION

All computations were performed using Stata 16 software, applying xtreg and xtivreg commands for estimations, and xtivreg2 for additional diagnostic tests. Given that we have panel data, we use the fixed effects estimator, suggested by the Hausman test results, when comparing the fixed effects with the random effects model (Wooldridge, 2010). In all the models reported, we apply Ackerberg et al.'s (2015) productivity measure. At the end of this section, we briefly discuss the results based on two other productivity measures we mentioned, and the results based on growth in productivity taken as alternative dependent variable.

As the first step, we explored the pattern of association between the age of firms and productivity. In order to do it, we fully categorised the age of the firm generating annual dummy variables, and we run a productivity model using those. It appears, after controlling for individual firm effects, that the mean productivity of firms increases in the first four years of their existence, broadly consistent with the effect Cucculelli et al. (2014) identified, which they interpreted as related to the founders' teams gaining experience and skill through learning-by-doing. After that point, the effect decreases monotonically with age. It continues for a very long period of time until 150 years of firm's age where it breaks down, as the data becomes really sparse. We do not present the whole result table for the lack of space, but only visualise the coefficients until the firm's age of 60 in Figure 1 below. However, given that the data contain only companies that are observable, it is important to keep in mind potential survival bias.
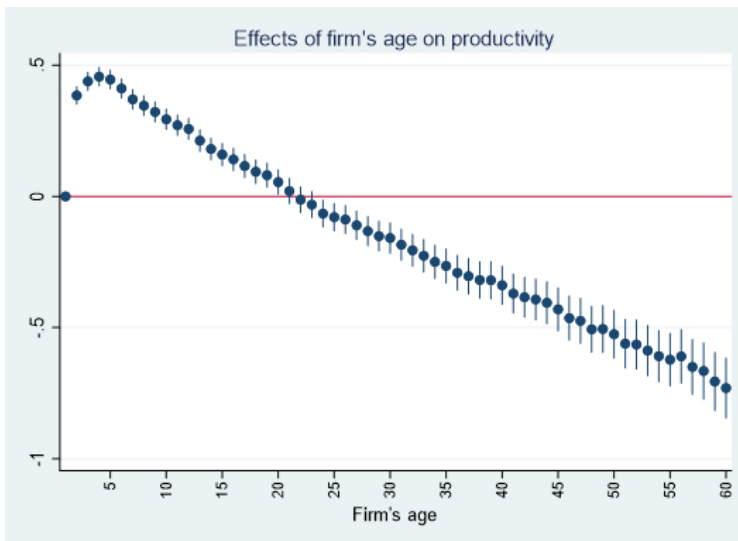

Fig. 1 – The effects of age of firm (categorised) on Total Factor Productivity. Source: own research

We next turn our attention to ownership. We replace the full categorisation of age by its natural logarithm to make the model more compact. We first investigated if age, size, and individual private ownership taken in their simplest form correlate with performance. In the second model, we explore a non-linear relationship of the share of individual owners with TFP in order to test

Hypothesis 1. Finally, we interact individual ownership with age to test Hypothesis 2. We find some clear-cut patterns, and the results are presented in Table 2 (Models 1-3) and visualised using Figures 2 and 3.

Interestingly, with richer modelling, as we move from linear specification of individuals' share in equity (Model 1) to its quadratic form (Model 2), and next interact it with age, the results improve. Figure 2 (based on Model 2, Table 2) suggests that for TFP, the optimum share of individual owners is just above 50%. Note that we show the graph for ownership values around its mean, no more than one standard deviation each way, as this is the range for which we have confidence in the results.

However, focusing next on Figure 3 which visualises the effects of Model 3 (Table 2), we see that the effect of ownership clearly differs for young and for older firms. For young firms (one standard deviation down from sample mean: 6 years age; that is 1.8 when expressed in natural logarithm), there is a clear non-linearity. Similar to the overall mean in Figure 2, for young firms, the optimum ownership structure seems to be to have majority stakes by individual owners (just above 50%) complemented by institutional owners' minority stakes. This is where the peak productivity comes for the young firms. However, the picture changes radically for old firms (37 years old, one standard deviation above the sample mean age, 3.6 in natural logarithm). Here, the nonlinearity is almost undetectable, and if anything, there is tendency of it to get reversed (Figure 3, upper, dotted curve).

Tab. 2 – Fixed effects models. Dependent variable: Total Factor Productivity. Source: own

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	FE Models			FE IV Models		
Natural logarithm of firm's age	0.107***	0.106***	0.137***	0.13***	-0.020	-0.187
	(0.012)	(0.007)	(0.014)	(0.015)	(0.102)	(0.294)
Share in equity of individual owners	0.008	0.080*	0.752***	1.444	11.711	23.302
	(0.010)	(0.032)	(0.132)	(1.178)	(8.215)	(26.379)
Share of individual owners squared		-0.073*	-0.576***		-14.024	-26.695
		(0.032)	(0.127)		(9.337)	(28.384)
Equity share of ind. owners x Ln age			-0.248***			-2.741
			(0.042)			(10.018)
Share of ind. owners sq. x Ln age			0.185***			3.111
			(0.040)			(10.115)
Natural logarithm of firm's total assets	0.298***	0.298***	0.298***	0.31***	0.29***	0.29***
	(0.008)	(0.003)	(0.008)	(0.014)	(0.016)	(0.022)
Shareholder equity ratio	-2.24***	-2.24***	-2.23***	-2.36***	-2.18***	-2.23***
	(0.472)	(0.211)	(0.470)	(0.475)	(0.448)	(0.489)
Tangible assets over total assets	0.118***	0.118***	0.120***	0.10***	0.083*	0.080+
	(0.027)	(0.013)	(0.027)	(0.030)	(0.038)	(0.047)

Current assets over	1.278***	1.278***	1.277***	1.29***	1.212***	1.229***
total assets	(0.031)	(0.013)	(0.031)	(0.045)	(0.054)	(0.063)
Constant	0.590***	0.590***	0.504***	-0.049	1.346*	1.636+
	(0.060)	(0.026)	(0.064)	(0.503)	(0.676)	(0.866)
Observations	249,878	249,878	249,878	211,863	211,863	211,863
R-squared	0.124	0.124	0.125			
Number of id	64,978	64,978	64,978	54,169	54,169	54,169

Notes: Year dummies are included but not reported. Robust standard errors in parentheses. *** $p<0.001$, ** $p<0.01$, * $p<0.05$, + $p<0.10$.

These results, while interesting, call for further and more stringent tests to verify their robustness. Therefore, we next apply instrumenting, based on the instruments we explained above in Section 3. Apart from instrumenting, the specifications match exactly those presented above. They are reported in Table 2, Models 4-6. While we include the first model (Model 4) that one is problematic, as the Sargan-Hansen test of over-identifying restrictions' Chi square statistics comes at 0.0785 probability level. In contrast, the other two models (Models 5-6) are of better quality; for those, the quadratic terms are instrumented by quadratic terms of instruments (Wooldridge, 2010). These two models do not fail the Sargan-Hansen test, as it is highly insignificant.

It may appear from Models 4-6 of Table 2 that earlier support for Hypotheses 1 and 2 vanishes in terms of significance level. When we look into details however, the results are more nuanced. If we apply post-estimation tests of joint significance of the interactions, for Model 5, this test now becomes insignificant at 0.05, thus the support for Hypothesis 1 is indeed no longer there. However, for Model 6, which accounts for differences between young and old companies, the post-estimation joint test for interaction and its individual components is highly significant at 0.001. Thus, we still get strong support for Hypothesis 2. Comparing coefficients' signs of the share of individual owners in equity, its square term, and the interactions of these two and the natural logarithm of age in Model 6 (with instrumenting) with the corresponding coefficients of Model 3 (without instrumenting) in Table 2, we see the basic pattern of the difference in the optimum ownership structure between young and old firms being consistent. Namely, in both cases, the individuals' share in equity comes with positive sign, and its square term with negative sign, generating the hump-shaped relationship. However, the interactions with age come with opposite sign, implying that the hump shape of the relationship is less accentuated for old firms. And this is exactly what we see when comparing the lower and upper panels of Figure 3.
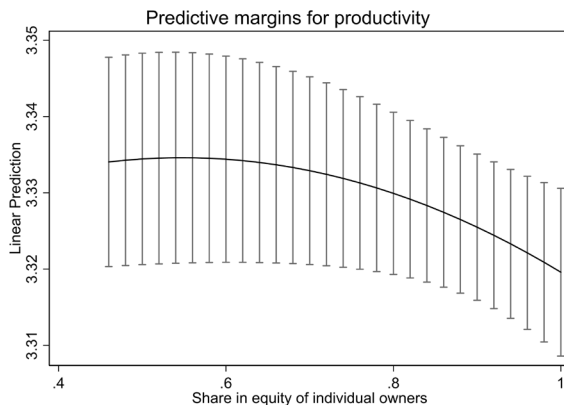
Fig. 2 – Marginal effects of share of individual owners in equity on TFP. Source: own research

Notes: Based on Model 2, Table 2. The graph shown for the range of share in equity of individual owners -/+ 1 SD from the mean.
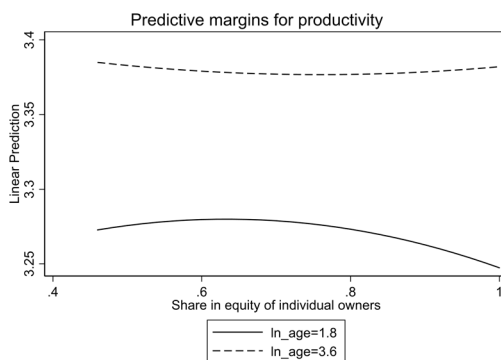

Fig. 3 – The marginal effect of share of individual owners in equity on TFP conditioned on firm's age. Source: own research

Notes: Based on Model 3, Table 2. Marginal effects are shown for two values of age of firm that are at 1 SD down from its mean (log of age =1.8, age =6), and 1 SD up from its mean (log of age =3.6, age =37).

There are more points to consider in order to verify the extent of robustness of the results. Looking more closely into distribution of ownership within the individual ownership category, a large sub-group within this category are firms with 100% individual ownership, another words, the number of observations peak at the right end of the distribution. To explore if this does not drive our results, we rerun the three core models, but this time with 100% individual ownership omitted. The results presented in Models 1-3 of Table 3 are consistent with our key findings discussed above.

Tab. 3 – Fixed effects models. Dependent variable: TPF. Robustness checks. Source: own research

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Without single owners			Indices of concentration added		
Natural logarithm of firm's age	0.140***	0.140***	0.157***	0.009	0.004	0.004
	(0.016)	(0.009)	(0.016)	(0.014)	(0.017)	(0.017)
Equity share of individual owners	0.037**	0.070+	0.658***	0.161**	0.234**	0.419
	(0.013)	(0.036)	(0.140)	(0.060)	(0.086)	(0.259)
Equity share of individual owners squared		-0.037	-0.381**			-0.150
		(0.038)	(0.141)			(0.161)
Equity share of ind. owners x Ln age			-0.22***			
			(0.044)			
Share of ind. owners sq. x Ln age			0.133**			
			(0.044)			
Equity share of 5 largest ind. shareholders				-0.002**	-0.002*	-0.003
				(0.001)	(0.001)	(0.003)
Equity share of 5 largest ind. shareholders sq.						0.000
						(0.000)
Equity share of largest individual shareholder					-0.001*	-0.002+
					(0.000)	(0.001)
Equity share largest individual shareholder sq.						0.000
						(0.000)
Natural logarithm of firm's total assets	0.287***	0.287***	0.287***	0.348***	0.352***	0.352***
	(0.010)	(0.003)	(0.010)	(0.011)	(0.014)	(0.014)
Shareholder equity ratio	-2.02***	-2.02***	-2.01***	-13.87**	-12.246*	-12.243*
	(0.438)	(0.216)	(0.438)	(4.250)	(5.144)	(5.143)
Tangible assets over total assets	0.159***	0.159***	0.160***	0.073*	0.082*	0.082*
	(0.032)	(0.016)	(0.032)	(0.035)	(0.041)	(0.041)
Current assets over total assets	1.291***	1.291***	1.291***	1.274***	1.271***	1.271***
	(0.036)	(0.014)	(0.036)	(0.048)	(0.058)	(0.058)
Constant	0.548***	0.547***	0.498***	0.638***	0.599***	0.595***
	(0.074)	(0.031)	(0.076)	(0.076)	(0.094)	(0.097)
Observations	196,354	196,354	196,354	118,781	88,961	88,961
R-squared	0.117	0.117	0.117	0.155	0.150	0.150
Number of id	48,052	48,052	48,052	36,396	28,127	28,127

Notes: Year dummies are included but not reported. Robust standard errors in parentheses. *** $p<0.001$, ** $p<0.01$, * $p<0.05$, + $p<0.10$.

In addition, we test our findings' sensitivity to controlling for concentration of ownership. Specifically, as reported in Table 3, Models 4-6, we first complement the total share of all individual owners (we use the same variable as in previous estimations) with the total share of the five largest individual shareholders; here, both are in the simplest, linear form (Model 4). We then further add the share of the largest individual owner, again in linear form (Model 5) as well as make all these effects nonlinear (Model 6). In the first two models, the impact of the total share of individual owners come as highly significant and positive, and the impact of the two concentration measures come as significant and negative. This is interesting, as it suggests simply that having more owners, and, therefore, diversity and broader access to skills and resources, is good for productivity.

In Model 6 of Table 3, we add the square terms for all three ownership variables: share in equity of all individual owners (our key measure, as used before), share of the largest individual owner, and share of the five largest individual owners. Post-estimation significance tests show that the linear and quadratic terms are now jointly marginally significant below the 10% level for total individual ownership, insignificant for the ownership share of the five largest owners, but significant again below 5% for the share of the largest individual owner. When we visualised the latter effect to see more clearly what is taking place with the impact of concentrated ownership, we saw unambiguously a negative effect of concentrated ownership represented by the share of the largest individual owner. However, when the share of the largest owner increases, the additional loss in productivity becomes smaller (the curve flattens; graph not reported due to space constraints).

It is also interesting to ask what happens in terms of our core effect of total equity share by individuals. It appears that by adding two concentration indices in Model 6 of Table 3, we finally destroyed our result regarding the optimum mixture of individual and institutional ownership as defined by the situation in which individuals hold slight majority of shares, still allowing for significant minority of institutional owners, as in our hypotheses. When we presented the marginal effects on a graph, it suggested instead that once we control for concentration of ownership, the more individual ownership the better.

But is this in fact the case? What we have estimated is constrained by the smooth second order polynomial functional form imposed on our data. Thus, as the final step, we have run a model equivalent to Model 6 in Table 3, except for the focus on replacing the linear and quadratic term in total equity share of individuals with a dense grid of dummies that represent the intervals in total equity share of individuals, categorised in order to proxy for any unknown functional forms. The results are visualised in Figure 4 below.
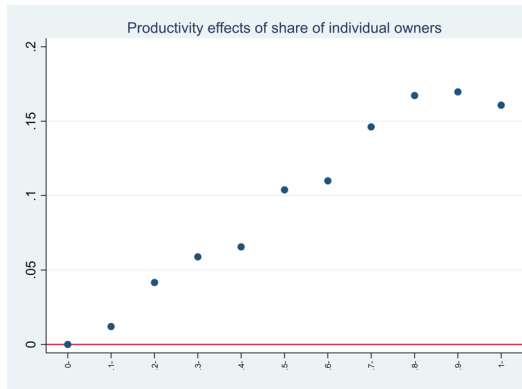
Fig. 4 – The effects of the share of individuals in equity (categorised) on TFP. Source: own research

What we see now is that even when we continue to control for the two concentration measures of ownership and their quadratic terms, the non-monotonic pattern related to the total share of individual owners re-emerges, only it now shifts to the right. Thus, both the optimum mixture of type of ownership (the dominant individual combined with the minority institutional) and concentration matters for productivity, taken alongside each other. Furthermore, there is a remarkable jump in productivity effects after the individual owners gain a clear majority (represented in Figure 4 by 0.5, that is, 50%). Yet, the productivity starts to fall as the share of institutional owners decreases approaching zero (the share of individual owners becomes close to 1 or 100%). It is clear from the graph why a smooth approximation that produces a monotonic positive effect of individual ownership works better. Yet such an approximation is unable to capture a turning point at the right-hand side: minority institutional ownership is what works best enhancing productivity. This is only visible when we allow for a more flexible modelling categorising ownership share into a dense grid.

While in the results so far we applied Ackerberg et al. (2015) measure of productivity, we obtained exactly the same results illustrated in Figure 4 when using either the Olley & Pakes (1996) or Levinsohn & Petrin (2003) method. But these results do not extend to growth (as measured by the first difference in the natural logarithm of assets, between current and previous year values). The dummies representing the levels of individuals' ownership shares are no longer significant, even though the peak point is still at 90% of individuals' ownership. We also experimented with replacing annual dummies with time modelled as single continuous variable (in a natural logarithm form). The results presented in Figure 4 did not change, except for the fact that the peak value at 90% of individual owners' share in equity was actually even more contrasted with the neighbouring values.

Finally, the included control variables delivered the expected signs. Firm size measured by total assets always had a positive and significant effect on TFP, i.e. firms that are able to scale up perform better, which is consistent with Aiello & Ricotta (2016). In terms of the composition of assets, tangible assets matter: the sign representing the share of tangible assets in total assets is always positive and significant. Regarding finance, debt supports productivity, which, as

indicated by the negative sign on the coefficient of equity ratio, is always significant. This is consistent with the classic corporate governance view on the disciplining role of debt (Harris & Raviv, 1990). Liquidity, as proxied by the ratio of current assets to total assets, has a positive and significant association with productivity, as it can indicate a scope for more flexibility in a company's strategy. This would be worth exploring further, given that the results on the liquidity-performance links in the literature are ambiguous (Komala & Nugroho, 2013). And finally, the annual effect suggests a persistent period of worse results after the global financial crisis, given that the benchmark year is 2008 and that all subsequent annual dummies come with negative sign. In addition, in 2016, the year when the Brexit referendum result was announced, the results were particularly bad, presumably due to increased and unexpected uncertainty.

5. CONCLUSIONS

The issue of ownership is important, yet complex and multidimensional. First, concentrated individual ownership does not seem to bring positive effects on productivity, quite the contrary. When interpreting this outcome, it is important to take the context into account. Our results are based on the UK, where governance is relatively strong; for environments in which corporate governance systems are weaker, ownership concentration may turn out more important, consistent with the classic corporate governance view (Shleifer & Vishny, 1997).

Secondly, while much of the literature stresses the advantage of institutional ownership over ownership by individuals (Boyd & Solarino, 2016), we argue that mixed ownership (majority by individuals, minority by institutional owners) may be beneficial. This is because it combines the effective monitoring and flexible management that comes with individual ownership with access to new resources and competences which institutional ownership may bring.

Thirdly, strong and robust empirical evidence supports the finding that the positive effect of mixed ownership may be most critical for new companies. Very generally, ownership structures matter more for new firms. We find that optimum ownership structures for new companies are those where private individual owners hold majority stakes, but are not sole owners. Our result suggests that entrepreneurs should actively seek to attract institutional investors as minority shareholders early on, as this comes with tangible benefits for performance. By doing this, the entrepreneurs will exhibit what Foss et al. (2021) call 'ownership competencies' and especially 'timing skills', i.e. they will demonstrate the capacity to choose the right time to modify the ownership structure. Yet we would also be the first to propose that more research is required here.

We started with the policy-oriented discussion of well-performing German Mittlestand companies, emphasising individual private ownership of these companies. We argued that while comparisons with the UK had been made in the past, these focused on size, and missed the key dimension of ownership, partly because the data on the latter are more difficult to acquire and process, and are typically time-invariant when available (Cucculelli et al., 2014). We also observe, after Morck (2007), that specifically for the UK, individual owners tend to dispose of their shares relatively quickly, and, therefore, less UK businesses are controlled by families or concentrated individual owners. Interestingly, our results suggest that this may not be such a

bad thing after all, provided that attracting institutional investors does not come with transfer of majority (control) rights away from individual investors. Thus, our tentative conclusion is that the developed entrepreneurial finance sector in the UK is a good thing, and if anything, its role should be enhanced, consistent with recent policy proposals (Elert et al., 2019). The sources of relatively low productivity in the UK need to be searched for elsewhere, maybe in self-inflicted Brexit-related macro uncertainty, which has discouraged investment.

The implication for managerial practice emphasises what Foss et al. (2021) call 'ownership competencies', i.e. we offer a recommendation for the founders of new ventures not to take the initial ownership model as given, but to actively search for attracting investors. The latter will bring in not just finance, but also expertise and other resources that enhance performance.

Last but not least, we need to investigate further the differences and relationship between the set of firms with individual owners and the family firms. Should all firms owned by individuals be considered family firms or is there a residual category which deserves more attention? After all, Steve Wozniak and Steve Jobs were not family. Furthermore, we need more understanding of ownership versus management in young firms. One reason why ownership structure may be more critical for young compared to older firms is because founders have a more direct impact on young ventures. But does this impact come exclusively through management? In this context, Cucculelli et al. (2014) challenge the conventional wisdom that transferring management to outsiders enhances performance. On the contrary, the results suggest that retaining its own management is associated with the better performance of companies that mature. It is here that our results may offer a further qualification: it may be that the recipe for high performance is to retain the link between dominant ownership and management, yet at the same time to allow minority ownership by institutional investors.

Overall, our main take-away point would be the recommendation that minority institutional investors add value early on, although retaining majority control by entrepreneurs is critical, as this preserves the key advantage of flexibility. For older companies, dominant ownership by individual owners becomes less important. More generally, it is the contrast between new and old companies that requires more research.

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