ANALYSIS

Divergence of productivity growth in Finnish companies

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Growth and productivity studies are paying increasing attention to the role of the most successful firms on the one hand, and the weakest on the other, in shaping the overall growth and productivity of an economy. In many countries, productivity growth, job creation and increasing market shares and profits are concentrated to a small number of firms, while most firms are only moderately successful. Development in Finnish companies is somewhat different from these internationally observed trends: divergence of productivity growth is only found in certain sectors; markets have not concentrated as in many other countries; and the corporate sector's profit share had not grown by 2016. However, employment and output growth in Finland seem to be concentrated to a relatively small group of gazelle firms, as is the case in other countries.

Productivity growth has been low both in Finland and many other OECD countries for a long time. Following the financial crisis, the growth of total factor productivity and labour productivity has almost come to a standstill in Finland. Figures describing the entire economy do not necessarily reveal the reasons for strong or weak economic developments. In recent years, much attention has been paid to very successful and quickly growing companies known as gazelle firms and superstars, as well as to poorly doing zombie firms, and attempts have been made to assess the impact these firms have on an economy's productivity and growth.

International research literature has made a number of observations indicating a divergence in the performance of companies, where a relatively small number are very successful, while the majority are performing on a mediocre level.

Firstly, it has been noted that the most successful companies have continued to grow during and after the global financial crisis, while other companies have seen very little growth in productivity (see, for example, Andrews et al. 2017). Differences between companies would appear to be increasing, one of the potential reasons for this being that the technology and expertise mastered by frontier companies have not been adopted so well by other companies.

Secondly, job creation seems to be concentrated to a small group of rapidly growing firms, while average firms have a relatively small effect on employment growth (Coad et al. 2014, Henrekson & Johansson 2010, Vanhala et al. 2016).

A third argument is that digitalisation and globalisation can create a competitive advantage for the sector's most productive and largest companies, leading to a small number of companies in control of most of the market. As a consequence of the profit growth of these large companies the profit shares of their entire sectors have grown. This has consequently reduced the average income share of labour (see Autor et al. 2017a, b, Hall 2018a, b).

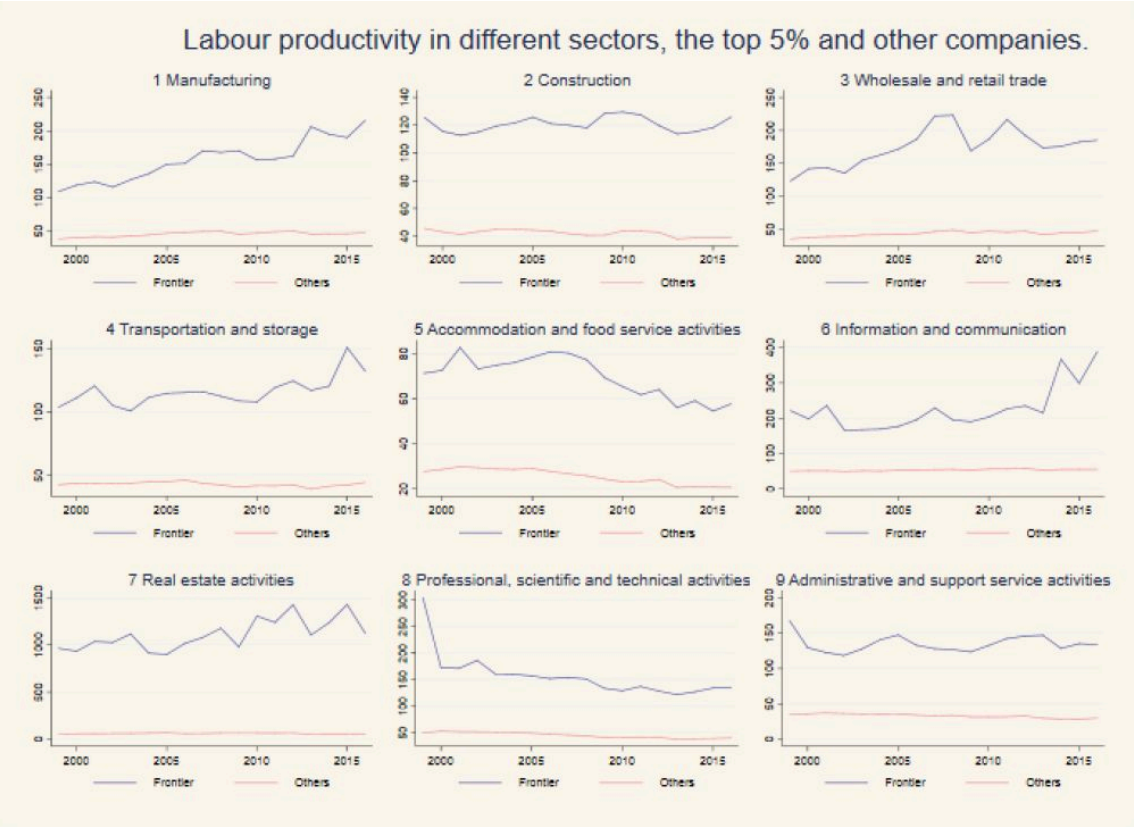
An analysis of Finnish firm-level data from 1999 to 2016 would indicate that the development of Finnish firms is partly different from the trends discovered in international research: divergence of productivity growth is only found in certain sectors; markets have not concentrated as in many other countries; and the corporate sector's profit share had not grown by 2016. On the other hand, employment and output growth in Finland seem to be concentrated to a relatively small group of gazelle firms, as is the case in other countries, too. The analysis also indicates that the tails of the firm distribution are important for the overall economic development.

Significant differences in productivity

The rate of both total factor productivity and labour productivity have almost come to a standstill

in Finland after the financial crisis. Yet these figures that describe the aggregate economy hide the fact that firms operating in the corporate sector are very heterogeneous. The productivity differences of Finnish companies are considerable, and dispersion of labour productivity both within and between sectors is high and asymmetrical. In Finland and elsewhere, the number of companies with relatively low productivity is high, while only a few companies reach very high productivity. The small number of high-productivity companies is manifested as a relatively long tail of the productivity distribution (Chart 1).

Chart 1.



Are the best firms diverging from the rest?

Slower productivity growth has often been attributed to lack of innovation and a slowing down of technological progress. However, recent studies have found that the most successful companies have continued to grow during and after years of crisis, while other companies' productivity growth has been very low (see, for example, Andrews et al. 2015, 2016). This raises the question whether the problem really is scarcity of innovations and new technologies or perhaps that they are not being diffused sufficiently from the frontier to other companies. Has technological

diffusion perhaps diminished?[1] Any policy conclusions will depend on where the problem actually lies.

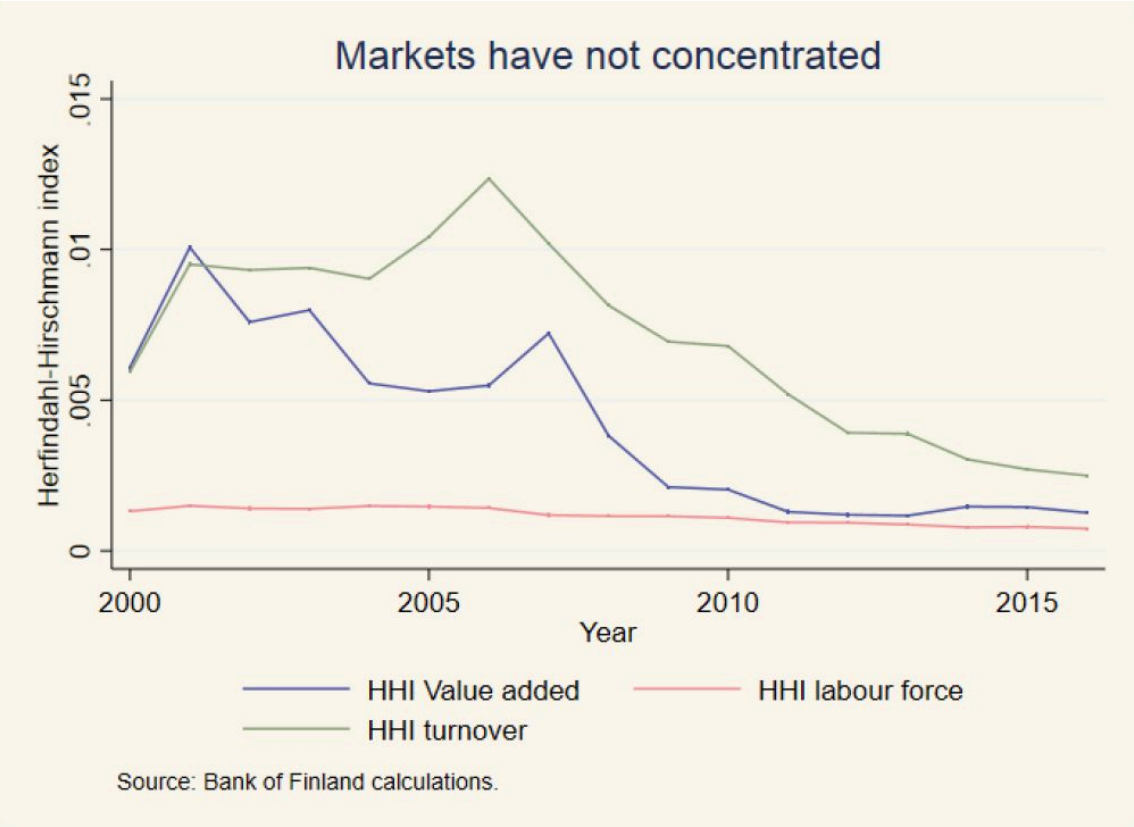
The divergence of productivity growth can be analysed by means of Statistics Finland's firm-level financial statement statistics in which, following OECD studies, in each sector (at the two-digit level) the top 5% of firms in terms of labour productivity can be classified as frontier firms. The productivity growth of these companies are compared to the productivity growth of other companies in their sectors. The OECD studies based on international firm-level data show that the productivity in frontier firms has approximately tripled within the manufacturing sector and more than quadrupled within the service sector between 2001 and 2013, while productivity in other companies has grown only by a little over 5% in the same period. Analysis by the Competitiveness Research Network (CompNet) has similar results.[2]

A more detailed analysis of Finnish firm-level data indicates that a divergence development does not apply to the economy as a whole – there are significant differences across sectors (Chart 2). The divergence of the most productive companies from other companies is apparent mainly within manufacturing and in the information and communications sector, but otherwise productivity growth in frontier firms has been similar to that in other companies.

On the basis of the the Finnish firm-level data, divergence of frontier firms in manufacturing from other companies seems to have been more pronounced than the estimate based on the OECD's cross-country data.[3] The divergence development slowed down in the years following the financial crisis, with no growth in the aggregate economy, until an upswing started in 2012.

Studies on divergence development have raised a concern that productivity growth is limited to a very small group of companies. The problem here has not been a lack of innovative companies, but rather weakened innovation diffusion down from the frontier firms. The problem in Finland, apart from manufacturing and the information and communications sector, is actually that not even the best companies have seen quick productivity growth.

Chart 2.

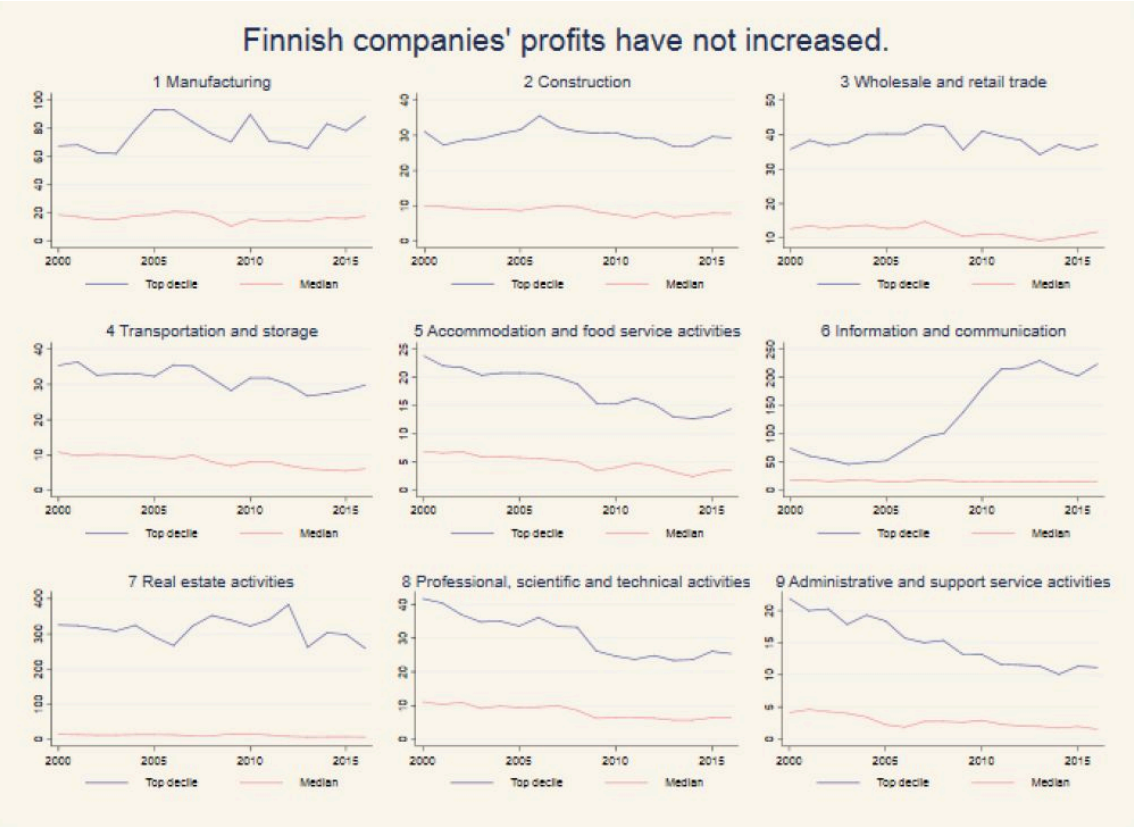


The gazelles create the jobs

Companies differ from each other not only in terms of productivity but also in the number new jobs or value added created. New jobs are typically created by a small group of rapidly growing companies, while average companies have a small effect on job creation (Coad et al. 2014, Henrekson & Johansson 2010, Vanhala et al. 2016). Similarly, we can observe how the growth in value added is concentrated to a small group of companies.

The proportion of fast-growing gazelle firms in Finland – that is, firms with employment increasing by over 20% annually – has varied over the business cycle, but has remained at about 5% in the long term.[4,5] The share of gazelle firms of employment and value added in the data has been somewhat higher, but declined after the financial crisis (Chart 3). This would indicate that gazelle firms are on average smaller than previously, meaning that they also create fewer new jobs. Since the data only extend to 2016, it is not possible to observe whether a shift has occurred during the recent years' upswing.

Chart 3.



37% of new jobs in Finland are created by gazelle firms (Table 1). The remaining new jobs are created by a larger group of companies that grow at a slower rate. Similar figures have been presented in the United Kingdom and Sweden, for example.[6]

The share of output and output growth by gazelle firms follows a similar pattern. Gazelle firms account for about 10% of value added, but 34% of the growth of value added.

The role of very fast growing firms is of great importance to the growth of employment and output in Finland, as it is in other countries as well. However, quick growth of companies is generally only temporary and difficult to predict, a fact we should be conscious of from an economic policy viewpoint. If economic policy is primarily aiming to improve the growth environment of companies, this does not play a major role. On the other hand, picking the winners is difficult in light of this result (see more in Vanhala et al. 2016).

Table 1.

Effect of growth of companies on output and employment rate					
	Companies, %	**Jobs, %**	**Output, %**	**New jobs, %**	**Output growth, %**
Contracting	27 (26)	26 (26)	24 (24)	−74 (−56)	−69 (66)
No change	4 (5)	5 (6)	5 (5)	−2 (−1)	−1 (−0)
Reasonable growth	16 (23)	23 (24)	25 (27)	16 (16)	21 (21)
Quick growth	10 (12)	10 (10)	12 (12)	21 (20)	26 (25)
Very quick growth	5 (8)	10 (7)	8 (8)	37 (37)	34 (34)
Growth rate unknown	40 (26)	28 (27)	26 (24)	28 (27)	22 (20)
Total	**100**	**100**	**100**	**100**	**100**
The categories have been defined as follows: the three-year average annual growth rate of contracting companies is less than −1%, that of stable companies between −1 and +1, growing 1–10%, quickly growing 10–20% and very quickly growing more than 20%. The figure in brackets denotes companies with more than 10 employees.					

According to studies, factors leading to companies growing fast typically include high productivity, a high investment rate, a high capital-labour ratio, low unit labour costs (high productivity explains low unit labour costs), and high profit share (for example, Fernandes et al. 2017, OECD 2009, Bartelsman et al. 2017). The Finnish firm-level data points to the same background factors. Employment has increased the most in high productivity firms with a low labour cost share. Firm growth is fastest in limited liability companies, and faster in university cities than elsewhere in the country.[7]

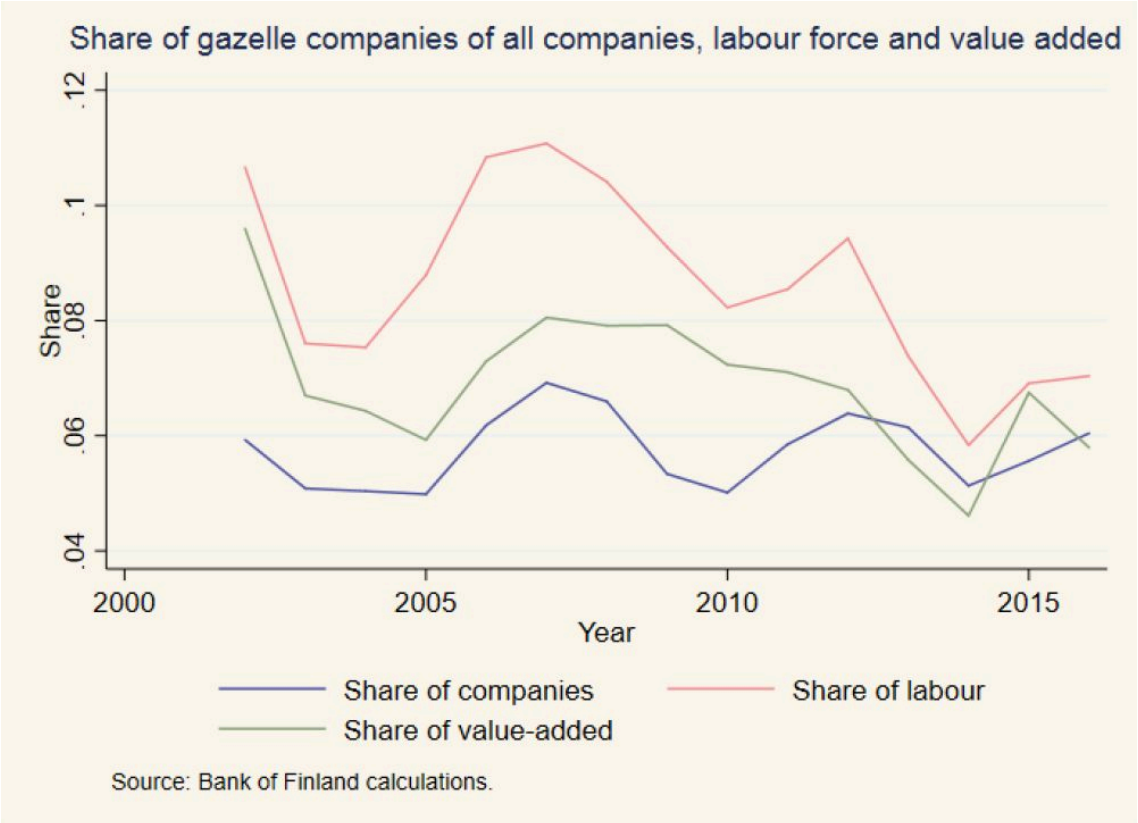
Are markets and profits becoming concentrated?

Economic megatrends – digitalisation and globalisation – may create a competitive advantage for the most productive and biggest companies in a sector. Sectors may evolve to "the winner takes most"-markets, in which one or a few firms in a sector effectively control the market and reap most of the profits. This can create 'superstar companies' with large profits but low labour costs in

relation to value added and net sales (see Autor et al. 2017a, b, Hall 2018a, b). Such development may be explained by new competitive online platforms enabling easy comparison of prices and quality, and increased use of information-intensive commodities, the production of which has high fixed costs but low marginal costs.

The concentration of markets can be analysed with a number of indicators. The Herfindahl-Hirschmann (HHI) index is a commonly applied measure of market concentration, calculated from the market shares of individual companies.[8] Market share is typically measured as a company's percentage of the sector's value added or net sales, but it can also be measured as a percentage of the labour force within the sector. The closer the index value is to zero, the more diverse the market is. Measured in terms of value added or net sales, the HHI has decreased between 2001 and 2016, while in terms of employment rate the decrease has been low (Chart 4). With reference to Finland, the HHI does not support the hypothesis of market concentration.

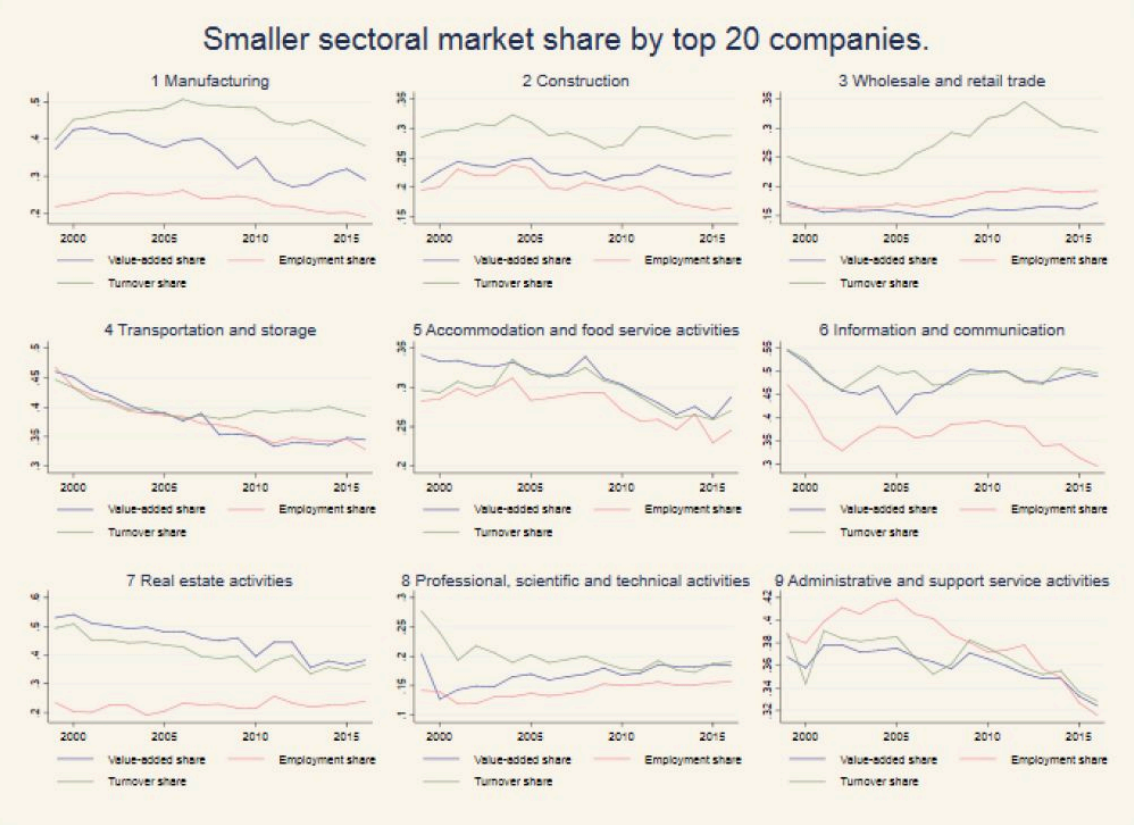
Chart 4.



Another way to look at market concentration, used by Autor et al. (2017a, 2017b), is to select a group of each sector's largest companies (at the two-digit sector level) each year and analyse how their market shares change. The market share of the 20 largest companies in Finland does not

seem to have increased as a rule between 1999 and 2016, although some increase can be observed in wholesale and retail trade, for example (Chart 5). Although the market share of the 20 largest companies within manufacturing seems to have reduced, there are major differences within manufacturing. For example, the market share of the top 20 companies within "manufacture of computer, electronic and optical products" has fallen dramatically after 2006, but in most industrial sectors, the market share has remained relatively stable or actually increased.

Chart 5.



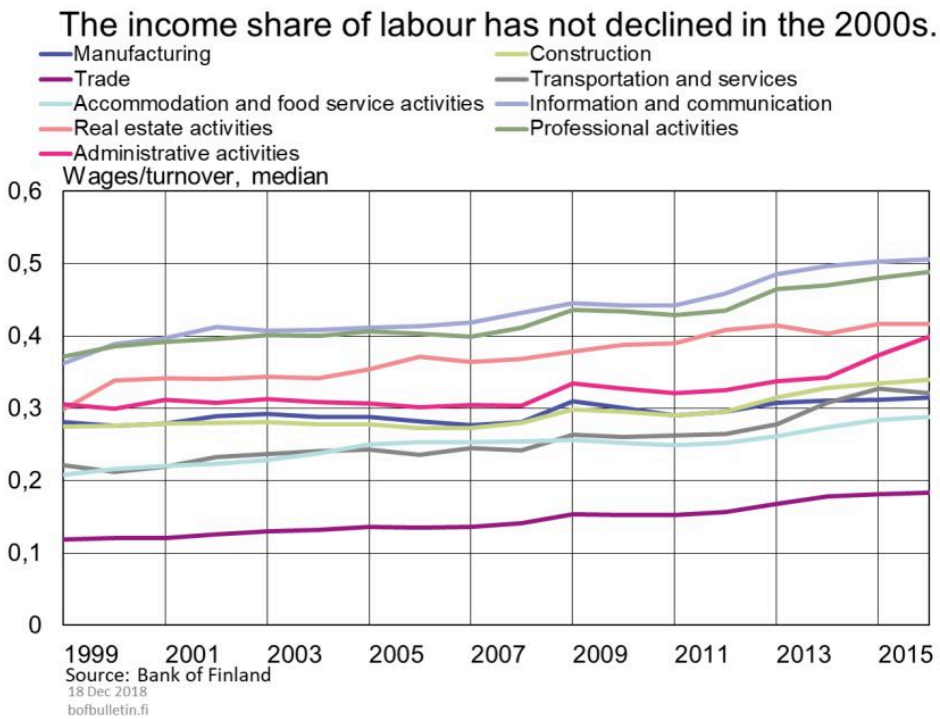
As markets have become more concentrated in the hands of fewer companies in many countries, the average markup between prices and production costs has also risen, meaning that companies' profits have increased on average. According to De Loecker and Eeckhout (2017), average price markups have increased in the United States since the 1980s. According to Diez et al. (2018), the phenomenon is global and very noticeable in developed economies. According to Autor et al. (2017a, b), the average increase of profits can be attributed to the "superstar phenomenon", with markets becoming concentrated and the big players' profits growing large. This increases the average profits of the private sector and reduces the labour share.

When viewing the difference between real value added and real labour costs in the Finnish firm-

level data over 2000–2016, the only sector with an increase is "Information and communication".[9, 10] No major change has occurred in other macro sectors, or if anything, there has been a slight decline (Chart 6). Likewise, when analysing the ratio of wages and salaries in proportion to companies' net sales, we detect a small increase in wages and salaries (Chart 7), contrary to what Autor et al. (2017a, b) has observed in many OECD countries. Similar results have been presented by Laine (2018), observing, by means of a different method and data, that the ratio between changes in factors of output unrelated to productivity developments and the consequent real output changes has remained relatively stable or narrowed, meaning that companies' market power has remained relatively stable in Finland.

The time spans of the research findings often differ from each other significantly. For example, the study by Autor et al. (2017a, b) states that the greatest changes in market shares and profits took place between 1960 and 1990. On the other hand, major changes in the 2000s can be seen mostly in the United States. This is why it is relatively difficult to identify the fundamental reasons for these changes. Are they related in general to more open markets, lowering of barriers to trade or globalisation and digitalisation, and to related changes in market structures?

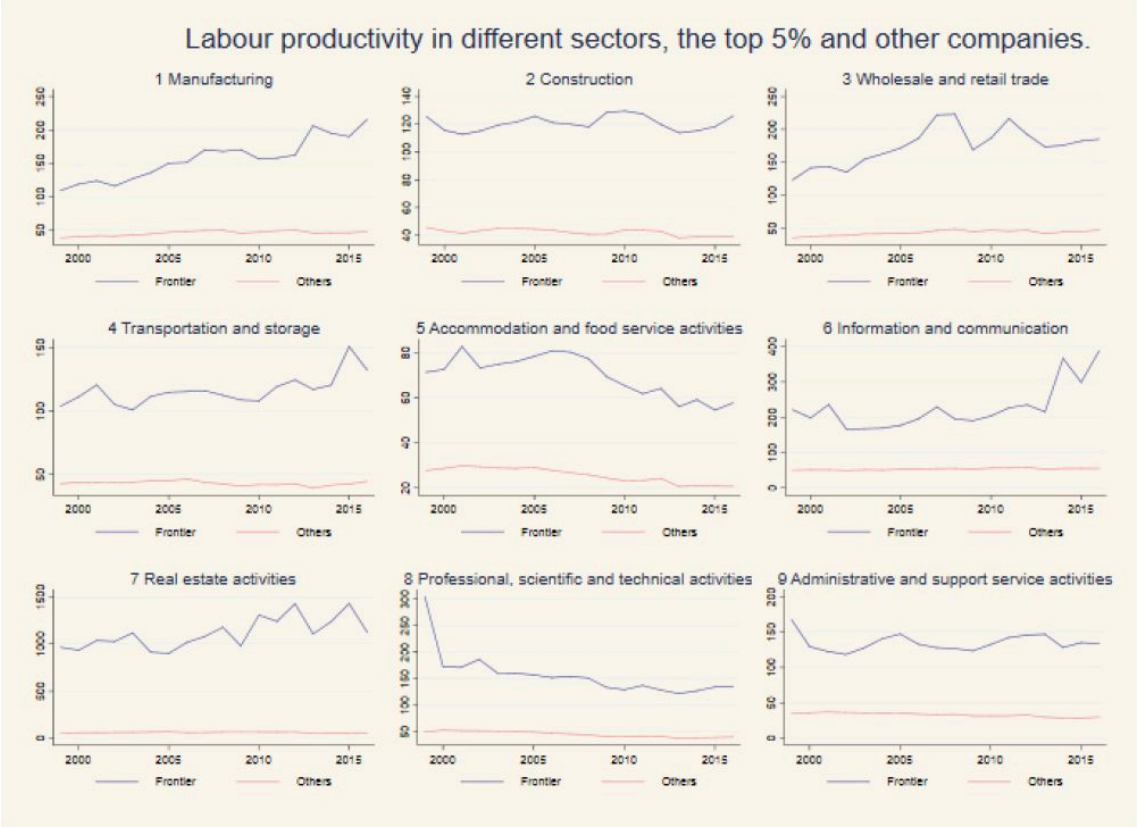
Chart 6.



Finnish firm-level data indicates that a similar concentration of market shares and profits that has

occurred in the United States and many other OECD countries does not seem to have taken place in Finland (see Autor et al. 2017a). This would indicate that Finnish markets have not become less competitive. However, the data does not reveal the reason for this diverging development. It may be that the Finnish market is too small for any superstars to emerge.

Chart 7.



How do the tails of the firm distribution affect aggregate development?

The successful and unsuccessful companies in the corporate distribution will naturally affect the entire economy's productivity, employment rate and growth through their activity. But we can also ask whether these companies affect the operation of other companies, that is, whether they constitute any externalities on other companies?

Following prior research literature (such as Caballero et al. 2008, Adalet McGowan et al. 2017) and the analysis on Finnish zombie firms (Vanhala & Virén & Nurmi 2018a), the effects of successful and unsuccessful companies in the firm distribution on aggregate ouput and

employment growth can be assessed, in addition to firm-level data, by utilising evaluated sectoral shares of these firms. The analysis focuses on the one hand on gazelle firms which, measured in terms of number of workers or value added, for three-year periods have an average annual growth rate of more than 20%, and on the other hand on zombie firms, whose interest coverage ratio (the ratio of operating income to interest expenses) is less than one (EBIT/interest < 1), for three consecutive years. A sectoral analysis is justified because if a considerable part of the sector's workers, capital, output or sales is in the hands of gazelle firms or low-profit companies, this will affect the development of the entire sector and the growth potential of other companies. To verify this phenomenon, we use the firm-level panel data to estimate a model in order to evaluate growth in the 2000s.[11] Growth in employment or output is explained by whether a company is a gazelle/zombie or a non-gazelle/non-zombie and how large the share of gazelle or zombie firms is in the sector's capital or employment (multiplied by a dummy variable describing the non-gazelle/ non-zombie firm). That is, our diffusion model is based on the following specification:

$$\Delta \log\_y_t = \beta_{i0} + \beta S_{Zt} + \beta S_{Gt} + \theta' \text{controls} + u_{it}$$

in which y stands for the firm's performance indicator (either growth rate of real value added, growth rate of employment, or growth rate of real labour productivity). The explanatory variables are the gazelles' (subscript G) or zombies' (subscript Z) shares of employment or output value of the corresponding sectoral values. The control variables consist of calendar years, sectors (at the two-digit sector level), the company's age and legal form, and a geographical indicator for university cities, with the entire capital region added.

Table 2 shows the effect of gazelles on firm performance for various performance indicators and various groups of control variables, and by changing the sample size. Table 3 shows how both tails, characterized by S_G and S_Z, affect the growth of all firms, and especially non-zombie and non-gazelle firms.

Table 2.

Evaluation of gazelle firms					
S_G coefficient	**t-ratio**	**y**	**Controls**	**data**	**panels**
.787	2229.26	rva	year, age, sector, co, uni	g=0 & ls=0	w, fe
.266	677.72	rlp	year, age, sector, co,	g=0 & ls=0	w, fe

Evaluation of gazelle firms					
			uni		
.054	3.18	rva	year, age, sector, co, uni	g=0 & ls=0	no w, fe
.078	4.71	rlp	year, age, sector, co, uni	g=0 & ls=0	no w, fe
.536	252.10	rva	year, age, sector, co, uni	all	w all, fe
.393	217.72	rlp	year, age, sector, co, uni	all	w all, fe
.177	52.49	rva	year, age, sector, co	g=0, ls=0, uni=1	w, fe
–.023	5.92	rva	year, age, sector, co	g=0, ls=0, uni=1	w, fe

'rva' stands for gazelle firms' sectoral value added. 'co' refers to the type of company and 'uni' to university cities (the regional definition covers the entire capital region). In the table, 'rva' means Δlog_rva, rip = Δlog_rlp, l = Δlog_l, in which 'rva' stands for real value added, l labour and rlp real labour productivity. The number of observations is 1,525,510. g = 0 (ls = 0) indicates that the data only contains non-gazelle and non-growing companies. The latter are analogous to gazelle firms in that their growth rate was negative for three consecutive years. Similarly, gazelle firms increased in a three-year period by 100%.

The results can be summarised rather easily. Growth of gazelle firms correlates almost always positively with increased output – whether it is a case of all companies or non-zombie and non-gazelle firms. A similar correlation applies to employment and labour productivity growth.

The results are relatively clear provided data is weighted (with any company size indicator), while the results of any unweighted data can be contradictory especially with regard to productivity. In fact, ambiguous productivity effects have been typical for all empirical analyses we have carried out with Finnish firm-level data, but the same has been true with, for example, OECD productivity studies (for example, Adalet McGowan et al. 2017).

The results show hardly anything surprising about the control variables. Perhaps the only thing worth mentioning is the rather strong role of geographics in the transmission of tail effects. The effects of S_G and S_Z variables in university cities are much stronger, which would indicate that any growth shock (caused by innovation and market structure change, for example) will be felt more in

these cities. University cities are linked to externalities which, in the right circumstances, will boost and maintain growth.

Table 3.

Estimation results using a model containing both corporate distribution tails				
y	**Sz**	**SG**	**panel**	**Controls**
Δlog_rva	.162 (74.50)	.639 (248.95)	wl, fe, all	year, age, comp. form, sector, area
Δlog_rva	.136 (52.05)	.136 (63.54)[va]	wl, fe, cent	–"–
Δlog_rva	.326 (138.78)[va]	.092 (36.04)	wl, fe, cent	–"–
Δlog_l	–.029 (16.60)	.209 (98.29)	l, fe, all	–"–
Δlog_l	–.009 (4.21)	.134 (53.45)	l, fe, cent	–"–
Δlog_l	.062 (26.96)[va]	–.268 (106.63)[va]	l, fe, cent	–"–
Δlog_rlp	.178 (96.69)	.475 (218.08)	l, fe, all	–"–
Δlog_rlp	.100 (44.98)	.201 (76.78)	l, fe, cent	–"–
Δlog_rlp	.278 (127.97)	–.030 (12.66)[va]	l, fe, cent	–"–
Δlog_rva	.008 (0.53)	.156 (9.58)	fe, all	–"–
Δlog_rva	.021 (1.38)	.126 (7.57)	fe, cent	–"–
Δlog_rva	–.004 (0.99)	.147 (9.61)	re, all	–"–
$\Delta_3$log_rva	.177 (58.35)	.518 (150.52)	wl, fe, cent	–"–
$\Delta_3$log_l	.079 (26.68)	-090 (27.82)	wl, fe, cent	–"–

Estimation results using a model containing both corporate distribution tails				
$\Delta_3$log_rlp	.133 (57.25)	.320 (121.52)	wl, fe, cent	–"–

The proportion of zombie and gazelle firms has been calculated by sector at the two-digit sector level in terms of employment and value added. The group of control variables consists of dummy variables for each year, firm age, sector and geographical location. When producing weighted estimates, this is done either by companies' (median) number of employees (indicated by wl) or real capital (indicated by wk). The latter results are not reported due to lack of space, but they are very similar to the results obtained with employment weightings. 'All' means that the sample contains all observations, while 'cent' means that only non-gazelle and non-zombie firms are included. The 'va' superscript means that calculations have been made in relation to value added; the other calculations are based on the number of staff. On the last three rows, the results are from a moel where the proportional/share variables have been lagged by one year.

Note that firm growth is not only dependent on the proportion of quickly growing companies, but also on the growth of the share of zombie firms (Table 3). One possible interpretation is the following: A positive growth shock increases the performance of top companies, creating more jobs and increasing their output and market share. Most other companies also benefit from the same growth factors, although their performance does not improve at quite the same rate as in the gazelle firms, owing to delays in starting or lack of resources. But there are always failures as well that can be characterized by the zombie category. Typically, but not always, their proportion will rise, also improving the performance of other companies. Some of them may recover with time, but otherwise they will either close down or go bankrupt (see Nurmi et al. 2018b).

The results in the table mainly show the simultaneous effect of the tails of the firm distribution on annual growth. For the diffusion hypothesis, it would be of essence to see how the growth in the proportion of the tails affects long-term growth (with a lag). Although our data are not suitable for an analysis of the effects of long-term growth, we can nevertheless state that the dynamic effects of gowth in the tail shares on three-year growth are similar to the immediate effects (Table 3). So this does not seem to be a case of short-term growth effects of temporary disturbances in demand.

A problem is that we cannot say much about the factors underlying gazelle and zombie firms. For example, the growth of gazelle firms is not an exogenous variable but the result of various background factors, and consequently the proportional growth of such companies may vary considerably during, say, different stages of the business cycle. The growth of gazelle firms may be the result of technological innovation, more open markets, macroeconomic development, taxation

changes etc. It is clear that at least across different sectors, the extent and nature of changes caused by a range of factors may vary considerably.

Conclusion

We can deduce from the Finnish firm-level data that the divergence that has been reported internationally does not seem to apply fully to Finland. It is mostly within manufacturing and the information and communication sectors that the frontier firms have diverged from other companies, but this trend is not found in other services. What is more, the concentration of market shares and corporate profits into the hands of a handful of large companies – which is the case in the United States, for example – does not occur in Finland. On the other hand, employment and output growth in Finland seems to be concentrated to a small group of gazelle firms, as is the case in other countries, too.

Growth and productivity studies have paid attention to the role of the most successful and the weakest companies for aggregate economic growth and productivity. The tails of the firm distribution have been found to be significant to the aggregate economy in Finland, too. What is more, changes in the proportion of the best and the weakest companies seem to be linked.

It is very difficult to affect companies' structures and distributions with economic policy measures, and this would not even seem meaningful. Structural changes affecting corporate structures should nevertheless be monitored only for the reason that they can help predict changes in aggregate output and productivity. If, for example, companies' size distribution does not change at all, major growth cycle can hardly be expected.

It is understandable that growth in the proportion of firms with particularly low financial performance will increase pressure for intervention by the authorities. Such concerns may be justified because of, for example, immediate employment effects or because debt-ridden businesses are an obvious problem to macroprudential stability. This is why we should also be able to separate the poorly performing companies that are the "natural" result of better companies growing bigger and taking over the market from those which are chronically low performers and despite scraping a profit end up more in debt.

The number of companies in Finland that are growing very fast is relatively low, but their economic significance is much larger than their proportion of firms. On the other hand, the phase of quick growth by these companies tends to be rather short. It is typical of the companies whose output increased in three years by an annual 20% that only 10% we able to maintain the same speed of growth for another two years. What is more important is whether the growth of these companies is reflected on other companies. Results show that the growth of companies growing at

a very fast rate correlates positively to the success of other companies in the sector and that training and research play a key role in this diffusion. This may be the most important channel by which public authorities may boost corporate growth.

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Notes

1. The ECB's President Mario Draghi touched on this subject in his speech on 13 March 2017, ECB-MIT conference for innovation and Policy "Fostering Innovation and Entrepreneurship in the Euro Area". ↑

2. CompNet is short for the Competitiveness Research Network, founded in 2012. ↑
3. We have tried to follow the OECD research methods as closely as possible. Pajarinen et al. (2017) find that divergence in manufacturing is weaker, possibly due to the use of a more truncated labour productivity distribution and partly due to the use of a different dataset. ↑
4. In research literature, gazelle companies are generally defined as those whose annual growth in three years averages more than 20%, see for example OECD DynEmp (Criscuolo et al. 2014), Fernandez et al. (2017). ↑
5. It should be noted that corporate growth may be the result of organisational change, such as corporate fusions and corporate restructuring, where in the latter a part of a business group may be spun out as a growth company. In these cases, the number of jobs does in fact not increase, as jobs are simply transferred from one company to another. In contrast, 'true' growth companies refer to companies whose expansion is also met with jobs growth. However, the data used in this analysis do not allow for such a distinction to be made. ↑
6. According to for example Nesta (2009), some 50% of all new jobs were created by 6% of the companies in Great Britain in 2000–2008, and according to Daunfeldt et al. (2013), the fastest-growing 6% companies created 42% of the jobs in Sweden in 2005–2008. ↑
7. The estimated regression formula is as follows: in which lc stands for labour costs, lv for net sales, yo for university city and oy company form. ↑
8. The Herfindahl–Hirschmann is defined as the sum of the squares of the market shares of the firms within the industry. The index formula is in which MSi in the company's market share. The index can have values between 0 and 1. Values close to zero indicate a very diversified market, containing a large number of small businesses, while values approaching 1 indicate a concentrated market with very few companies. In the extreme case, if the market is run by a monopoly, the value is 1. ↑
9. Both variables are deflated by sectoral GDP deflators with a base year 2005. ↑
10. According to national accounts data, companies' profits have increased especially in 2017. ↑
11. The estimated formula is equivalent to what is used by Caballero et al. (2008) and Adalet McGowan et al. (2017) in their studies. ↑

Key words

companies/firms, growth, productivity