AgriFood economics centre

Working Paper 2022:2

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New perspectives on job polarization

- An investigation of industry skill structure from an urban-rural perpective

New perspectives on job polarization: An investigation of industry skill structure from an urban-rural perspective

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Abstract

With firm data and a regional perspective this study contributes with new perspectives on job polarization and firm performance. We investigate changes in e.g. employment, revenues, profits and wage costs for low, mid- and high skilled firms in urban and rural areas in Sweden 2003-2019.

Job polarization is documented when using employment data, but a corresponding polarization in revenues is less evident. As for the US, job polarization is mainly an urban phenomenon. In particular, the increase in low skilled employment (at the expense of mid-skilled employment) is solely found in the densest region: Stockholm. On the other hand, the increase in high skilled employment is relatively low in Stockholm (despite an increase in the revenue share).

The development of profits − which have increased substantially during the period − is also related to differences in the urban-rural skill structure. Because profits increase more in high skilled industries − predominantly located in denser areas − profits grow much more in urban areas than in rural areas. A decreasing wage share is the main explanation to increasing profits. Plausibly, slow wage growth for high skilled industries is related to the tax system, and particular, a change in taxation splitting rules cause labour income to be transformed to capital income. In particular, we see that newly established firms generate high profits and pay high dividends (instead of high wages to high skilled labour).

JEL classification: J23, J24, J31, L25, O33
Key words: Job polarization, rural, urban, profits, wage share, capital taxes

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1. INTRODUCTION

Technical progress is the main determinant of structural change and change in the composition of jobs in the economy. Specific for the recent trend – a process of routinization of work creating job polarization – is the geographical dimension (Autor 2019, Autor and Dorn 2013, Rossi-Hansberg et al. 2019). Recently, Autor (2019) concluded that mid-skilled blue-collar jobs and white-collar administrative support jobs, who previously complemented high skilled jobs in cities, are hollowing out in cities. Job polarization is hence a phenomenon mainly affecting cities, generating occupational change and inequality within cities and between cities and sparse areas.

Even if the development is largely related to firms' investments in technology, the job polarization literature has mainly focused on changes on the supply side of the labour market, i.e., the composition of jobs and wages. Less focus has been devoted to the demand side, i.e., firm market structures and profits. This study contributes by analysing the development of firms in cities and rural areas to document the demand side response to the technical change that has caused job polarization. We focus on Swedish limited firms and classify the firms into low, mid, and high skilled firms based on the average educational level of employees at industry level. For 2003-2019 we use data of the entire population of limited firms who employ 79 percent of the Swedish workers in the private sector. We study the aggregate change in employment, market size (revenues and share of companies) at industry level, and the change in profits (net margin), net wage shares, wage costs, labour productivity and dividends to owners at firm level.

What is the technical and economic change that spur job polarization? Automatization and computerization give firms strong incentives to replace relatively expensive routine tasks with information- and communication technology and robots, resulting in a decreased demand of mid skilled labour. For high skilled labour, which complements technology, productivity and demand increases (Autor et al., 2003; Goos and Manning, 2007). The demand for low skilled jobs ‐ jobs that are more difficult to automate ‐ are initially not affected. However, the former mid-skilled workers must relocate to other occupations which affects the supply of low and high skilled labour. For mid-skilled workers with qualifications that can be upskilled easily, they adapt and, thus, increase the supply of high skilled workers. But a significant share of mid-skilled workers has problems adapting to the new requirements and flow to low skilled

occupations, increasing the supply of low skilled labour (Acemoglu and Autor, 2011; Autor and Dorn, 2013).

Another explanation for job polarization is globalization. Trade and offshoring might push mid skilled production out of the country. However, studies do not find that globalization is responsible for job polarization in Sweden, the EU or the US (Blinder, 2009; Blinder and Krueger, 2013; Goos et al., 2014; Adermon and Gustavsson, 2015).

But why is technical progress affecting urban and rural areas differently? For the US, a main explanation is the lack of mid skilled jobs in rural labour markets (Autor, 2019). Thus, the flow of mid-skilled workers to low skilled occupations is mainly documented in US cities (Autor, 2020). Also, urban firms seem to have the biggest incentives to invest in labour-saving technologies which affects the change in job distribution between cities and rural areas (Eeckhout et al., 2021). For Sweden, Henning and Eriksson (2021) has recently analysed job polarization from a spatial perspective, and found that job polarization is, as expected, most pronounced in manufacturing-dominated municipalities. However, to our knowledge, job polarization has not specifically been studied from an urban-rural perspective for Sweden.

The few studies of the demand side of job polarization (using firm level data) have focused on between industry and within firm job polarization. Harrigan et al (2021) has shown for France that job polarization occurs because of between industry changes in firm size. That is, occupational employment shares within firms did not change, instead mid-skilled firms grew more slowly than both low- and high skilled firms. However, for Sweden Heyman (2016) finds that job polarization is caused by both between industry changes and within firm adjustments. Böckeman et al. (2019) finds for Finland that routine occupations hollow-out at the firm level.

This study also contributes to the related literature on the distribution of incomes between capital and labour. The automatization of tasks is suggested as an explanation for a decrease in labour's share of national income (Autor and Acemoglu, 2016)[1]. Specifically, Acemogu and Restrepo (2020) raise that biases in the US tax code favor capital over labour and result in excessive automatization, i.e. technology investments that are "just productive enough to be adopted and cause (labour) displacements, but not sufficiently productive to bring about

[1] Other explanations are capital accumulation (Karabarbounis and Neiman 2014, Piketty 2014), the rise of superstar firms (Autor et al. 2017, Kehrig and Vincent 2017), and the overall productivity slowdown ().

powerful productivity effects (p.204)". The result is automatization that is higher than socially desirable creating inefficiencies and significant decrease in the wage share. A falling wage share is documented in most countries since the 1980s, and at industry level this has been related to growth in total factor productivity (see Autor and Salomon, 2018). However, the decline in the wage share is mainly observed for manufacturing, for low- to mid-skilled workers (IMF, 2019) and for sectors more specialized in routine-intensive activities (Dao et al., 2007).

In Sweden taxation splitting rules in combination with large differences between marginal tax on labour and capital (Waldenström, Bastani och Hansson, 2018) increase the incentives to push up profits and decrease wage costs. Converting labour incomes to capital incomes has largely increased dividends for limited firms (with few stockholders) in Sweden. Thus, an exhaustive investigation of the firms' dividends and wage shares provides a broader understanding of the profitability of Swedish limited firms.

2. TECHNICAL CHANGE AND INDUSTRY PERFORMANCE

But does the latest technological change affect industry performance, e.g. revenues, profits and labour wage shares? Several factors affect industry performance. Even for industries in the same skill category, revenues and profits may evolve in different directions due to a combination of factors. In this brief overview we focus on mechanisms raised in the job polarization literature, and specific institutional characteristics of the Swedish labour market, and hypothesize on the expected impacts on industry performance. Although the impact on industry performance is genuinely unclear, it largely depends on adjustments to the price of low, mid and high skilled labour and changes in output prices. Below we discuss the expected impacts of job polarization on mid, low and high skilled industries, and if the impacts are expected to differ regionally.

2.1 Mid-skilled industries

Because the job polarization hypothesis originated from the effects of technological change on mid skilled industries, this is where we begin. Mid-skilled industries are assumed to be routine-task intense, and automatization and digitalization enhance labour productivity. As already pointed out by Baumol (1967), this lowers the firms' wage costs and output prices, increasing the demand of their products. Thus, revenues of mid-skilled industries do not have to be significantly affected by technical change, even if the size of the industry may decrease in terms

of jobs provided.[2] In different mid-skilled industries, revenues and profits are affected differently depending on the price elasticity of demand and (labour market) institutions. In Sweden, the wage-setting model with collectively decided wages, implies inflexible wages. Thus, even if the expected wage response to changes in labour productivity differs between industries, the collective decided wage evolves the same for all industries. Also, the overall wage response to technical change is uncertain because the composition of mid-skilled job change: likely, it is the least productive and least paid jobs that disappear (Acemoglu and Autor, 2011; Böhm, 2017). In sum, we expect employment to decrease in the industry whereas the effect on total revenues is uncertain. At the firm level, we expect labour productivity to increase and the wage share to decrease whereas the effects on profits and wage cost per worker is uncertain (see Table 1).

2.2 Low-skilled industries

For low skilled industries, automatisation have small impacts on labour productivity. However, automatisation might have an indirect effect on the demand for low skilled services. The complementarity between manufacturing goods and services has such implications (Goos et al., 2014): hence, when the demand of manufacturing goods increases because of a fall in output price, the demand of services may increase.[3] Another reason to an increased demand of services is the overall growth in productivity and incomes. When household incomes increase, the share of services in consumption tend to increase (Kongsamut et al., 2001; Boppart, 2014). These demand factors push up prices of services and raise the revenues and profits of low skilled industries. But because of an inflow of mid-skilled labour due to the automatisation of mid skilled tasks, wages do not have to increase, which could, otherwise, put a downward pressure on profits. In Sweden, however, the increase in the low skilled labour supply is mainly from low skilled immigration and not from a flow from the pool of mid-skilled workers (Gustavsson, 2019).[4] In sum, we expect employment and revenues to increase in low-skill industries. At the firm level we expect increased profits but the effects on wage costs per worker, wage shares and labour productivity are uncertain or small (see Table 1).

[2] If the demand for products of these industries is elastic, a price-productivity effect may even expand the overall labour demand in these industries (Acemoglu and Restrepo, 2020).
[3] Acemoglu and Restrepo (2020) assumes this to be a productivity effect: expanding the economy and increasing the demand and wages for labour in non-automated tasks.
[4] During 1975–1990 in Sweden, low-paid public jobs among women also increased (Adermon and Gustavsson, 2015).

2.3 High-skilled industries

Finally, for high skilled industries automatisation and technological growth increase labour productivity and potentially profits. Higher wages could potentially offset part of the increase in profits, but since wage inequality is not increasing in Sweden (Bengtsson et al, 2014) profits and capital returns are likely to increase significantly. Thus, for high skilled industries we expect employment and revenues to increase. At the firm-level we expect labour productivity, the wage share and profits to increase whereas the effect on wage costs per worker is unclear.

Table 1. Expected changes in industry and firm level variables when technical change causes job polarization

Variable	Mid-skill industry	Low-skill industry	High-skill industry
Industry level:			
Employment	-	+	+
Revenues	Unclear	+	+
Firm level:			
Wage cost (per worker)	Unclear	Unclear	Unclear
Profit	Unclear	+	+
Wage share	-	-	+
Labour productivity	+	Unclear, small increase	+

2.4 The regional perspective on job polarization

The productivity improvements may be different for industries mainly located in urban areas and industries mainly located in rural areas, and therefore job polarization may have different effects on revenues and profit in rural and urban areas. However, since e.g. the manufacturing industry is spread across the country, the regional impact of automatisation is difficult to predict. In cities agglomeration effects increase productivity (see e.g. Glaeser och Gootlieb, 2009), which should cause profits to increase more in cities for high skilled industries. To sum up, the net effect on the relative changes in firm performance is uncertain.

3. DATA

This paper uses data from the database FRIDA (FöretagsRegister och IndividDAtabas). We use annual data for 2003-2019 for the full sample of private limited firms. This type of firm makes up almost 43 percent of the Swedish firms and employ almost 2.6 million workers which

corresponds to 54 percent of the employment in Sweden, and 79 percent of the employment in the private sector.[5] Hence, this study covers a large part of the work force in Sweden.

Excluding firms with a revenue below SEK 100,000 (about €10,000) removes 38 percent of the firms but only 1.5 percent of the workers of private limited firms. Another 2 percent of firms are removed because their profits are, either, very high or very low in relation to their revenues.[6] This is mainly a problem when analysing profits, but with the intention to keep a constant sample we remove these firm from the start. However, dividends are often collected by passive holding firms and in the analysis of dividends the full sample of firms is included.

To divide firms into low- mid and high skilled firms we use the Longitudinal Integration Database for Health Insurance and Labour Market Studies (LISA) which includes all individuals 16 years of age and older. By using the workers' education level and their workplaces' SNI (The Swedish Standard Industrial Classification) codes[7] we calculate for more than 800 industries (at the five digit level of the SNI code) the mean education level at industry level for the year 2007. Next, we divide the industries into low- mid and high skilled industries, where each group contains one third of the Swedish workers. Note, that in the job polarization literature worker occupation is used to divide workers into skill groups.[8] This is not appropriate in this study, even if we can break down the occupational structure at industry and firm level, we cannot break down outcomes (e.g. revenues, profits, labour productivity, wage shares, wage costs and dividends) within firms or industries.[9] Firms are thus discretely categorized into skill groups based on their industry code. A pure industry-based skill classification implies a somewhat different translation of job polarization than a pure occupation-based classification, even if the industry and occupational structure largely overlap.

The distribution of private limited firms with different skill levels is shown for 2003-2019 in Figure 1. Figure 1 shows that limited firms are over-represented in the low skill group and

[5]These figures are somewhat overestimated because some workers may work in more than one limited liability firm.

[6] This implies exceptionally high net margins. This is mainly firms with low revenues (close to the revenue threshold), where extraordinary events push up their net margin.

[7] SNI is identical to the classification of economic activities in the European Community (NACE).

[8] Most common is to use wages to separate the workers into skill groups. In Nordin (2022), who studies job polarization at the industry level for Sweden, the educational structure seems to be better than the wage structure to divide industries into skill groups. Also, education is generally a better measure of qualifications than wages. Wages – a proxy of marginal productivity – is probably used because many datasets lack education levels.

[9] For studies analyzing job polarization between industries and within firms (Heyman, 2016; Harrigan et al., 2021; Böckerman et al., 2019), the classification is commonly based on industries and firms' occupational structure. But these studies do mainly investigate changes in the skill structure and no other firm outcomes.

under-represented in the high skill group. Thus, even if the groups are of equal size at population level (where public workers and private workers in other types of firms are included), the skill structure is different for limited firms.

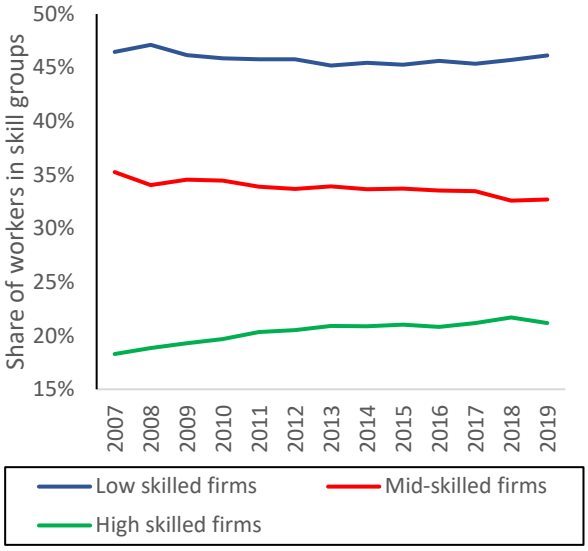

Figure 1. The development of skill-shares of workers in the limited firms. 2007-2019.

We use firm location at municipality level to define firms as rural or urban. For firms with several places of work the location is based on the location of the central office. However, it should be noted that most firms with several places of work are divided into separate firms, and this is particularly true for limited firms. We use the classification of rural and urban areas developed by The Swedish Agency for Growth Policy Analysis (Tillväxtanalys). At municipality level, Sweden is divided into six different types of areas depending on rurality-urbanity. We merge the two most rural categories into *remote rural areas* (together containing 8.6 percent of the Swedish population) and split up the most urban areas into *Stockholm* (9.4 percent) and *other metropolitan areas*[10] (22.9 percent). Ranked from rural to urban the other regional categories are: *rural areas near cities* (12.0 percent), *remote urban areas* (7.4 percent) and *urban areas* (39.7 percent).

4. CHANGE IN THE INDUSTRY SKILL STRUCTURE

4.1 National level

Does the development of skill-shares of workers in the limited firms agree with the job polarization hypothesis? To answer this question, we return to Figure 1. Figure 1 shows that the

[10] *Other metropolitan areas* include Stockholm county (except Stockholm), Gothenburg, Malmö and some sub-municipalities to Gothenburg and Malmö.

share of workers in high skilled industries increases with 2.9 percent and the share of workers in mid-skilled industries decreases with -2.6 percent in 2007-2019, which is in line with the hypothesis. However, for low skilled industries we see a small decrease, -0.3 percent, which does not support the job polarization hypothesis. However, by the end of the period, a recovery in the share of low skilled workers in limited firms is visible. These figures are in the same ballpark as the figures in Gustavsson (2017) for 2000-2013.

Are these changes related to changes in the number of firms or overall changes in industry size? According to the theoretical exploration in section 2, the development of the skill-based market structure is uncertain: even if employment develops according to job polarization, the industry size − measured as the share of firms or share of revenues − may evolve in another direction.

In Figure 2a and 2b the share of firms and the share of total revenues is reported for the industry skill groups. In figure 2a we find that low skilled firms are the most common type of firm. This is consistent with the findings for employment: Low skilled industries employ more workers than the other skill groups. More importantly, the share of low skilled firms is decreasing with 2.4 percent during the period, despite an increase in the share of revenues with 4 percent in the end of the period (see figure 2b). Thus, for low skilled industries the market share is increasing, but a decreasing share of firms indicates business consolidation. Also, increasing revenues probably explain the recent increase in the share of workers found for low skilled industries in Figure 1.

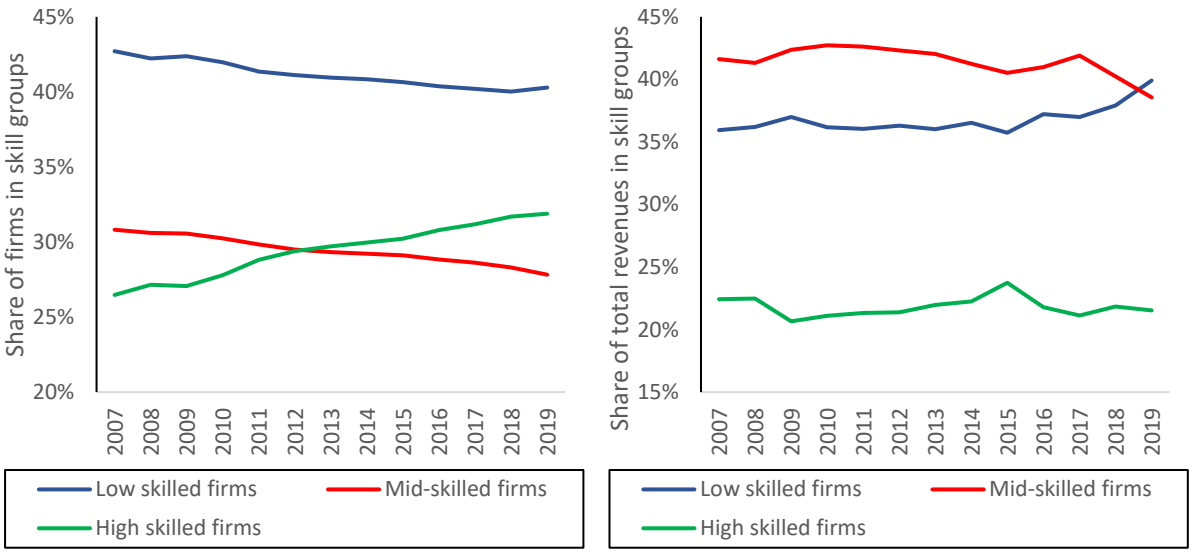

Figure 2. Changes in the skill-based market structure: share of firms and revenues. 2007-2019.

Early in the period the share of high skilled firms is lower than the share of mid-skilled firms. But during the studied period we see a distinct increase, 5.4 percent, in the share of high skilled

firms, and a distinct decrease, 3.0 percent, in the share of mid-skilled firms. By the end of the period the share of high skilled firms is higher than the share of mid-skilled firms. In terms of revenue share, the mid-skilled sector is larger than the low skilled sectors (except for 2019) and, particularly, the high skilled sectors. Moreover, relatively few firms and relatively high revenues imply (on average) large firms in the mid-skilled sector. The revenue share in the high skilled sector is low and rather constant during the period.

To sum up, the development largely agrees with job polarization, although a polarization in revenue-market size is less evident. First, the high skilled sector increase its relative share of workers and firms, but importantly, this development does not imply an overall increase in the revenue share. For the mid-skilled sector all outcomes support a decline in the market share of around 3 percent. For the low skilled sector, a tendency of business consolidation (larger firms) is found in the end of the period.

4.2 The regional level

4.2.1 Employment and revenues

If job polarization is mainly an urban phenomenon important changes may be masked on the aggregate level. In figure 3a and 3b we study the change in employment and revenues for the low skilled firms. In the appendix, regional figures (figure A1a-c) for the share of firms in the skill categories are also shown.

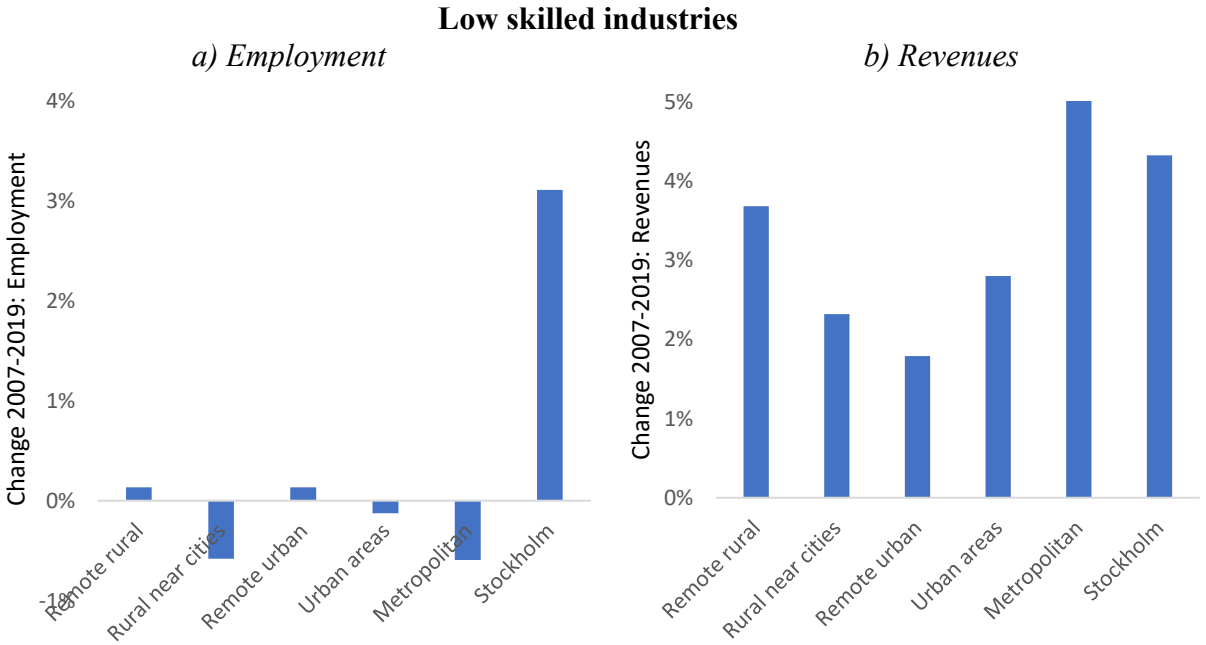

Figure 3a and 3b. Change in employment and revenues for low skilled industries, regionally. 2007-2019.

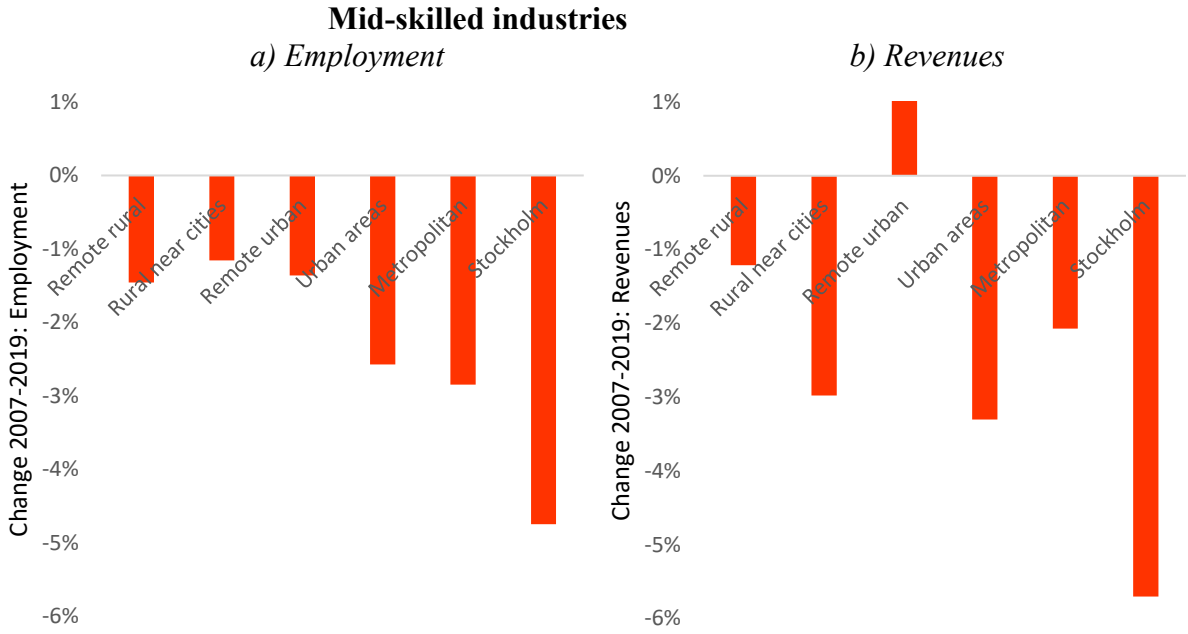

Figure 4a and 4b. Change in employment and revenues for mid-skilled industries, regionally. 2007-2019.

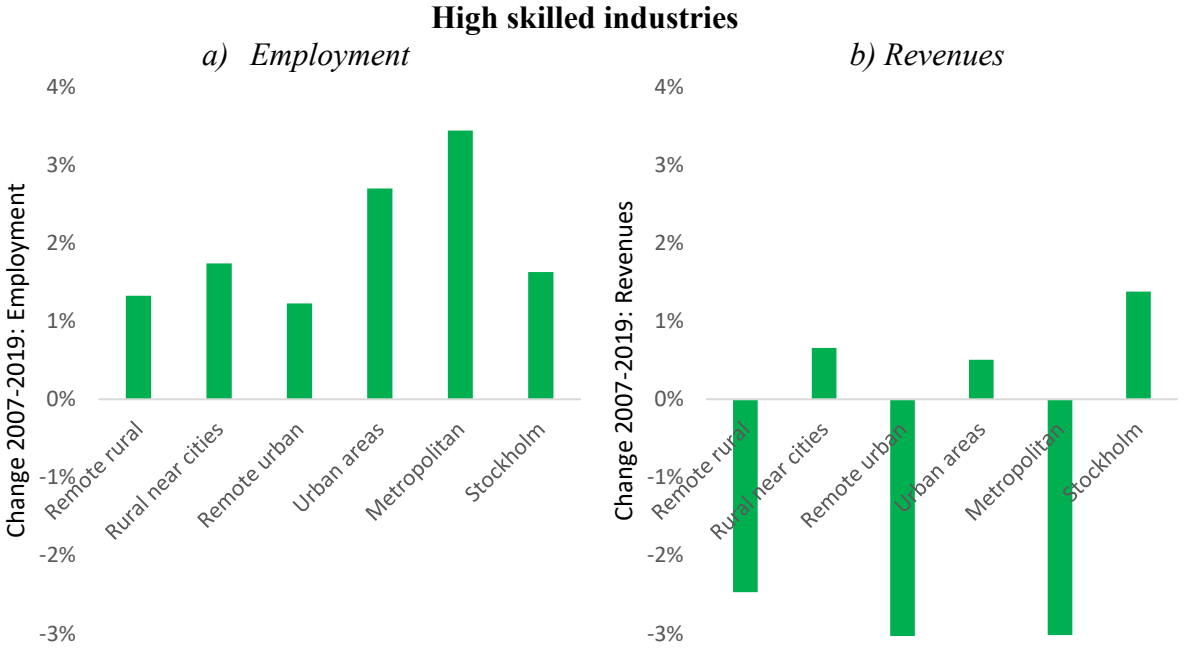

Figure 5a and 5b. Change in employment and revenues for high skilled industries, regionally. 2007-2019.

We show with bars (which are easier to interpret here) the regional changes in 2007-2019. The change is measured as the within regional change in structure. For example, for employment in *Stockholm,* Figure 3a documents that employment in low skilled industries grew relatively to other industries in *Stockholm* in 2007-2019. Thus, *Stockholm* stands out with its large increase in employment for low skilled industries. In the *Other metropolitan areas* (labelled "Metropolitan" in Figures), low skilled employment is decreasing somewhat. In terms of revenues, the low skilled industries grew in all regions: the documented large increase, of

around 2-5 percent, is however higher for the most rural areas and the metropolitan areas (including Stockholm). To conclude, there is an expansion of low skilled industries among limited firms, but in terms of employment it is only documented in Stockholm.

For mid-skilled industries a general decrease is found for all regions for employment as well as revenues (Figure 4a and 4b). The decrease in employment is larger for denser areas, but for revenues the urban-rural gradient is less clear (although the decrease is largest in Stockholm).

In Figure 5a and 5b we study the regional development for the high skilled industries. Employment is increasing in all areas: most for *Urban areas* and *Other Metropolitan areas*. Revenues, on the other hand, show mixed results. There is a small increase for Stockholm, and an economically significant decrease, around 3 percent, for *Remote rural*, *Remote Urban* and *Remote urban areas.*

4.2.2 Wage cost

The next step is to examine changes in wage costs. In figure 6a-c, we report the inflation adjusted change in per-worker wage cost for 2007-2019. For low skilled industries the wage cost grow in all regions, most in the *Other Metropolitan* areas (22 percent) and least in *Stockholm* and *Urban areas (*around 10 percent). For mid-skilled industries the wage cost grow more in urban areas than in rural areas: for urban areas the average wage costs increased with almost 15% and for rural areas the increase is around 5-10 percent. For high skilled industries the increase in the wage cost is small. Notably, for *Urban areas* and *Other metropolitan areas* the change in the real wage cost is negative.

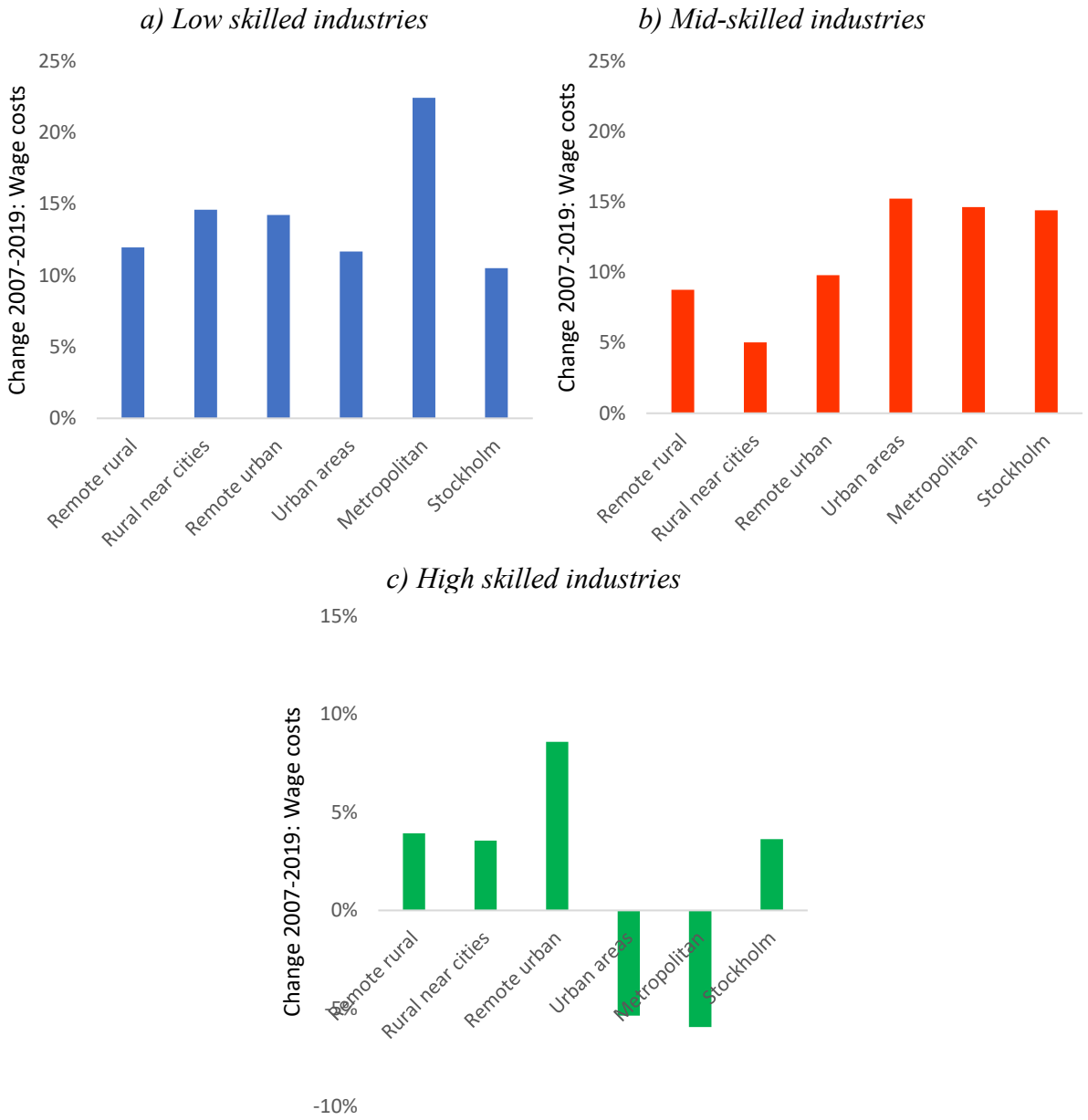

Figure 6a-c. Change in per-worker wage cost (adjusted for inflation) for low, mid- and high skilled industries, regionally. 2007-2019.

Why is the increase in the wage cost larger for low skilled and mid-skilled industries than for high skilled industries? In the next section, the relatively low growth rate in the wage costs for high skilled industries is scrutinized further.

The pattern of increasing employment (see Figure 2a) and a relatively low growth rate in wages for low skilled industries in Stockholm is caused by an expansion of jobs in commerce and, hotel and restaurant.

5. CHANGES IN FIRM PERFORMANCE INDICATORS

Next, firm profit (measured as the net margin), labour productivity and net wage share are analysed in three steps. The net margin is measured as the ratio between profit and revenue. Labour productivity measures as the ratio between value added and the number of workers, and the net wage share is measured as the ratio between total labour costs and net value added.[11]

First, we analyse the national change in these outcomes, second, we analyse the outcomes regionally, and finally we add the skill perspective. Each step provides important knowledge for the overall understanding of the development of the firm performance indicators.

5.1 The national level

Figure 7 shows a large growth in labour productivity. Since 2003 labour productivity has increased with 22 percent. The net margin has followed a comparable increase from around 7 percent to almost 15 percent. The net wage share has, however, decreased from 76 to 63 percent. A decreasing net wage share for Sweden has not been observed earlier (see e.g., KI, 2018 and Waldenström, 2020). The reason could be that net wage shares are often calculated at an aggregate level. In Figure 7, the decreasing net wage share is calculated by averaging the net wage share at firm level. At the aggregate level a decreasing net wage share is not observed (see Table A2). Thus, the decreasing net wage share is caused by small firms with a small impact on aggregate figures.[12]

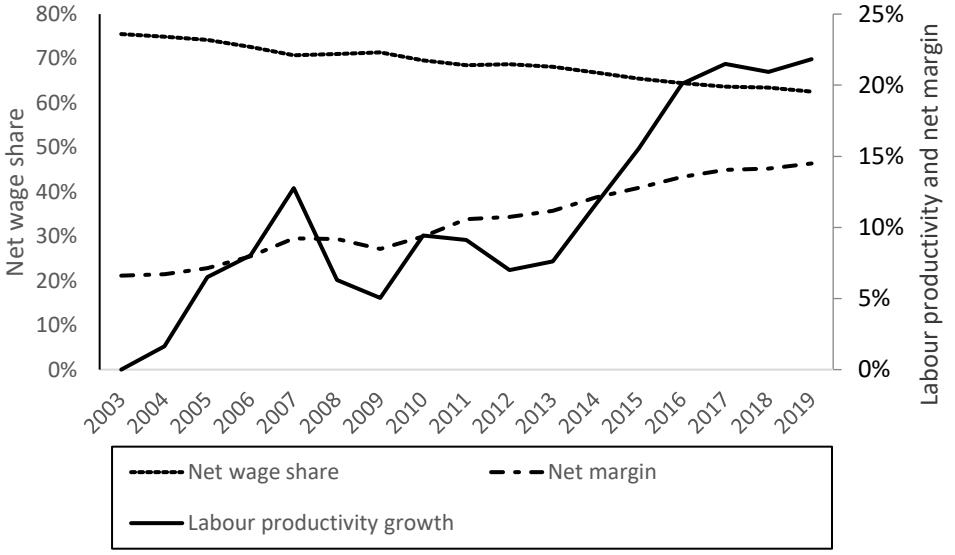

Figure 7. Average labour productivity growth, average net margin and the average net wage share at the national level. 2003-2019.

[11] In contrast to the gross wage share, the net wage share is calculated using depreciation adjusted value added.
[12] A related problem with mapping between the aggregate level and the industry level is raised in Autor and Salmons (2018): labour demand decreases for most industries but at the aggregate labour demand increases.

5.2 The regional level

Thus, these key performance indicators show large changes in the beginning of the century. Therefore, to document regional differences in trends (blurred at the absolute level) we study relative differences to the national mean in Figure 8.

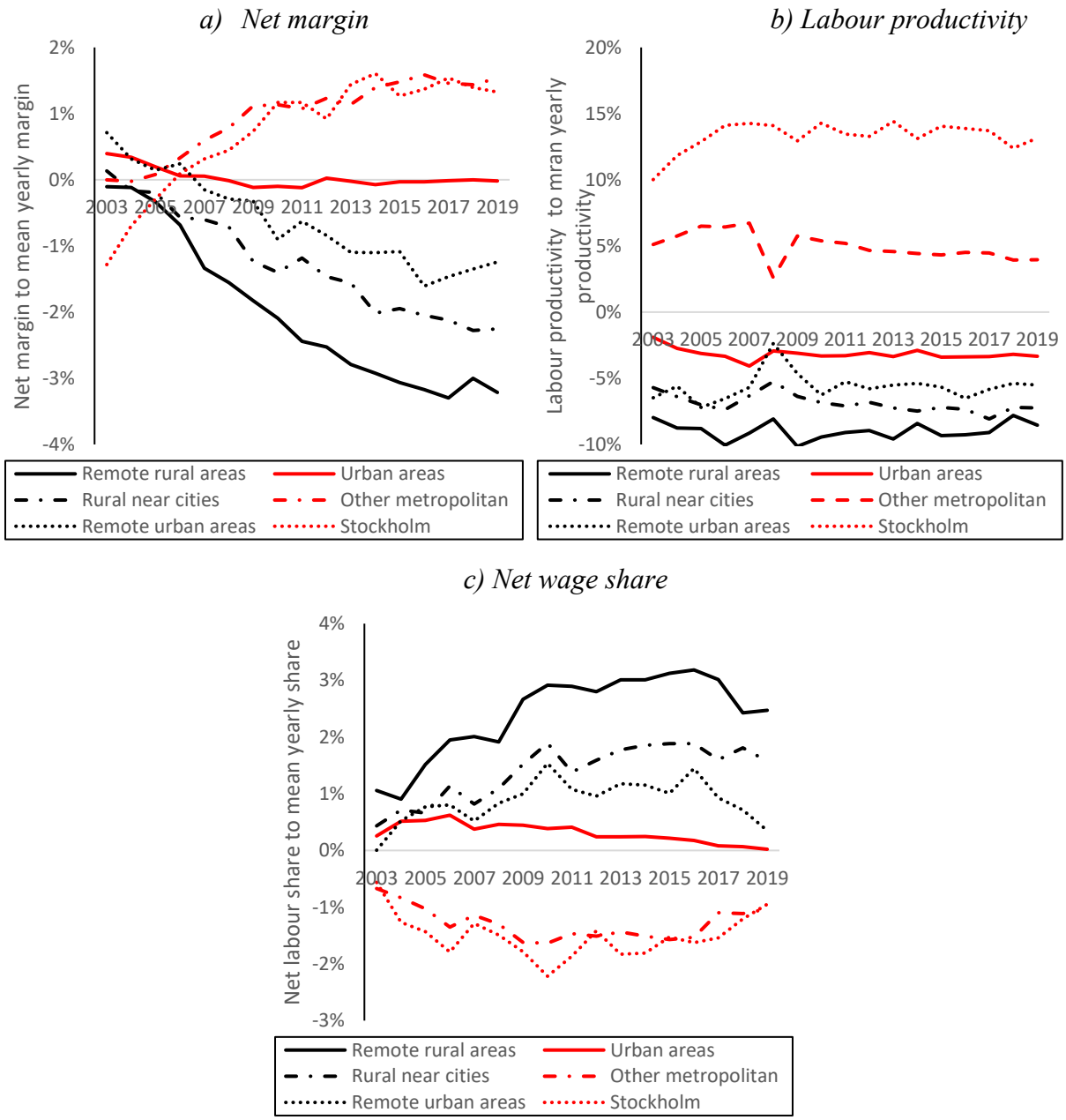

Figure 8a-c. The relative change in the net margin, labour productivity and the net wage share. Average at firm level. 2003-2019.

For changes in average net margin (Figure 8a), a clear urban-rural gradient is found. Between *Stockholm* and *Remote rural areas* a gap of 4.5 percent is evident in the average net margin. In

fact, in 2003 the average net margin was 1 percent higher in *Remote rural areas* than in *Stockholm*. Notable is also that the net margin in *Other metropolitan* areas largely follows the development of the net margin in *Stockholm*.

According to Figure 8b, the relative changes in the net margin do not seem to be caused by regional changes in labour productivity. Even if there is a clear urban-rural gradient also for labour productivity, the large regional differences in labour productivity do not show any substantial changes during the studied time period with the exception of a recent decrease in labour productivity (to trend in *Other metropolitan* areas. Labour productivity is around 15-25 percent higher in *Stockholm* than in the semi-urban and rural regions, and about 10 percent higher than in the *Other metropolitan* areas.

The net wage share evolves in the opposite direction to the net margin: a positive gap evolves between rural and metropolitan areas (although the urban-rural gap has decreased in the end of the period). The conclusion is that the decrease in the wage share is most pronounced in metropolitan areas and less pronounced in rural areas.

5.3 Combining the regional and skill-structure perspective

5.3.1 Net margin

Finally, we combine the regional perspective and the skill perspective. In Figure 9-c we begin by examining the net margin. For each skill industry group, the relative changes in the net margin are similar for all regions: a relative decrease in the net margin for low skilled industries (Figure 9a), a fairly constant net margin for mid-skilled industries (Figure 9b), and an increase in the net margin for high skilled industries (Figure 9c). Thus, the different trends in the net margin found in Figure 8, is not related to location but to the skill level of industries. First, a relative fall in the net margin in rural areas is not caused by rurality but rather to a large over-representation of low skilled industries (see figure A1a) earning low profits in rural areas. Second, an increasing net margin in urban areas is not caused by urbanity but rather to a large over-representation of high skilled industries (see figure A1c) earning high profits in urban areas.

Net margin

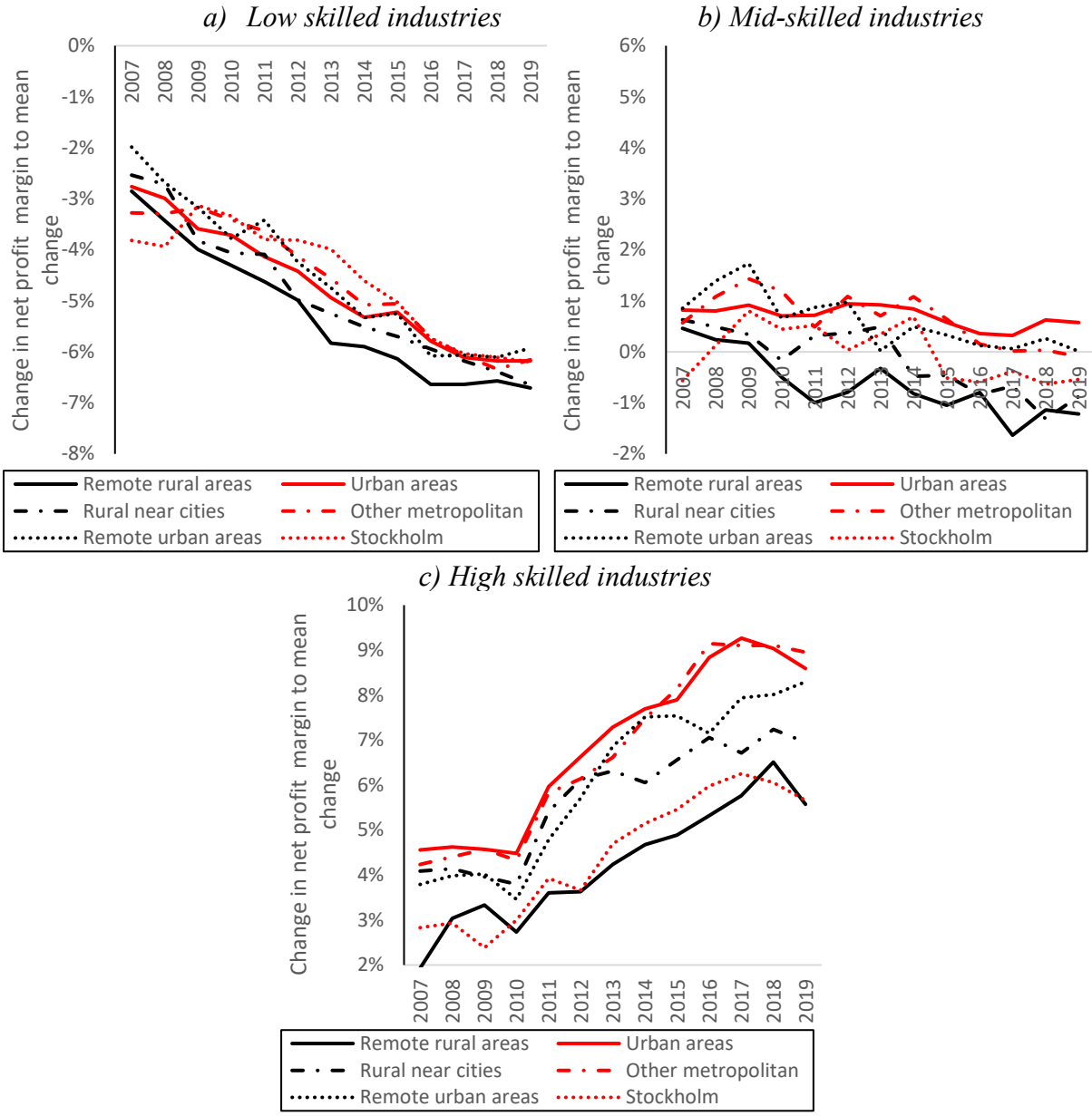

Figure 9a-c. The relative change in the net margin (profit in relation to revenues) for low, mid- and high skilled industries in different regions. Average at firm level. 2007-2019.

In Table 2 we establish this finding econometrically. In column (1) we estimate the yearly percentage point growth rate[13] in the net margin for different regions. By including six interaction variables between a linear time trend variable and six regional dummy variables the yearly growth rate is estimated. In metropolitan areas (*Stockholm* and *Other metropolitan areas*) the growth rate in the net margin is about 11, 19, 24 and 31 percent higher than in *Urban areas*, *Remote urban areas*, *Rural areas near cities* and *Remote rural areas*, respectively. This variation corresponds to the regional change in the net margin documented in Figure 8a.

[13] Note, this is not a standard growth rate since it is *not* calculated as percentage-on-percentage changes.

Table 2. Explaining the change in the net margin between 2007-2019.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Skill-gradient in net margin growth rate:								
Low skilled		0.0953***	0.118***	-0.0355***	-0.0387***	0.0312***	0.0403***	0.123***
		(0.00464)	(0.00463)	(0.00366)	(0.00336)	(0.00324)	(0.00349)	(0.00454)
Mid-skilled		0.473***	0.465***	-0.0353***	0.0128***	0.0271***	0.0146***	0.393***
		(0.00463)	(0.00462)	(0.00367)	(0.00337)	(0.00324)	(0.00349)	(0.00454)
High skilled		0.917***	0.864***	0.452***	0.285***	0.175***	0.129***	0.779***
		(0.00446)	(0.00446)	(0.00354)	(0.00325)	(0.00315)	(0.00344)	(0.00439)
Regional gradient in net margin growth rate:								
Remote rural areas	0.349***	-0.00328	-0.0293***	0.0311***	-0.0236***	-0.00446	0.0283***	-0.00406
	(0.00507)	(0.00428)	(0.00427)	(0.00337)	(0.00309)	(0.00298)	(0.00299)	(0.00417)
Rural near cities	0.416***	0.0337***	0.00156	0.0432***	-0.00932***	0.0109***	0.0361***	0.00941**
	(0.00471)	(0.00388)	(0.00387)	(0.00306)	(0.00281)	(0.00270)	(0.00271)	(0.00378)
Remote urban areas	0.465***	0.0704***	0.0494***	0.0678***	0.00546	0.0105***	0.0367***	0.0529***
	(0.00543)	(0.00468)	(0.00466)	(0.00368)	(0.00338)	(0.00325)	(0.00326)	(0.00456)
Urban areas	0.539***	0.0852***	0.0611***	0.0827***	0.0295***	0.0337***	0.0526***	0.0597***
	(0.00403)	(0.00300)	(0.00300)	(0.00237)	(0.00217)	(0.00209)	(0.00209)	(0.00293)
Other metropolitan	0.632***	0.0901***	0.0747***	0.0697***	0.0427***	0.0335***	0.0398***	0.0686***
	(0.00417)	(0.00319)	(0.00318)	(0.00251)	(0.00230)	(0.00222)	(0.00221)	(0.00310)
Stockholm	0.626***							
	(0.00441)							
Company size			yes	yes	yes	yes	yes	yes
Wage share				yes	yes	yes	yes	
Total labour costs					yes	yes	yes	
Input and other costs						yes	yes	
Other revenues							yes	
Stock of commodities							yes	
Depreciation							yes	
Labour productivity								yes
Dividends								yes
Observations	3,372,019	3,372,019	3,372,019	3,372,019	3,372,019	3,372,019	3,372,019	3,372,019
R-squared	0.009	0.041	0.047	0.406	0.500	0.537	0.539	0.091

Notes: The dependent variable is the firm's net margin. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Each growth rate is estimated using a linear time trend interacted with either a dummy variable for a specific region or skill level.

In column (2) we add variables measuring the yearly percentage point growth rate for the skill-industry groups. That is, we add interaction variables between the time trend and three skill industry dummies. It should, however, be noted that due to collinearity with the yearly skill

measures, the regional variation in column (2) is estimated as the *difference* to Stockholm and not as regional *levels* of growth (as in column (1)). Column (2) shows that much of the regional variation in column (1) disappears, i.e. the regional differences in the percentage point growth rates are much smaller.

More interestingly is the result for the skill-gradient. For high skilled industries, the yearly percentage point growth rate in the net margin is almost 1 percent. For mid-skilled and low skilled industries, the growth rate is about 0.45 and 0.06, respectively. Thus, variation in the growth rate of the net margin is related to industry skill structure, and not urbanity-rurality. This is exactly the conclusion we reached by studying Figure 9a-9c. We return to the results in Table 2 when attempting to explain the skill-gradient in the growth rate in section 5.3.4.

5.3.2 Labour productivity

Technical change is assumed to increase labour productivity generally, but more so in high-skilled firms. In figure 10a-c we study the change in labour productivity (relative to the national mean of all industries), regionally and skill-divided. A constant level indicates a mean change in labour productivity. Three general findings are: i) There are no apparent differences in trends for low, mid- and high skilled industries in labour productivity (although there are fluctuations), ii) The high labour productivity in metropolitan areas (found in figure 8b) is caused by a high labour productivity for mid- and high skilled industries, and iii) For low skilled industries, labour productivity is similar for all regions. There is also two specific findings. First, for *Other metropolitan areas* the increase in labour productivity is below trend for mid-skilled industries and for *Stockholm* the increase in labour productivity is below trend for high skilled industries. Second, for low skilled industries in Stockholm labour productivity is particularly low. This may partly be due to the expansion of low skilled jobs in service industries.

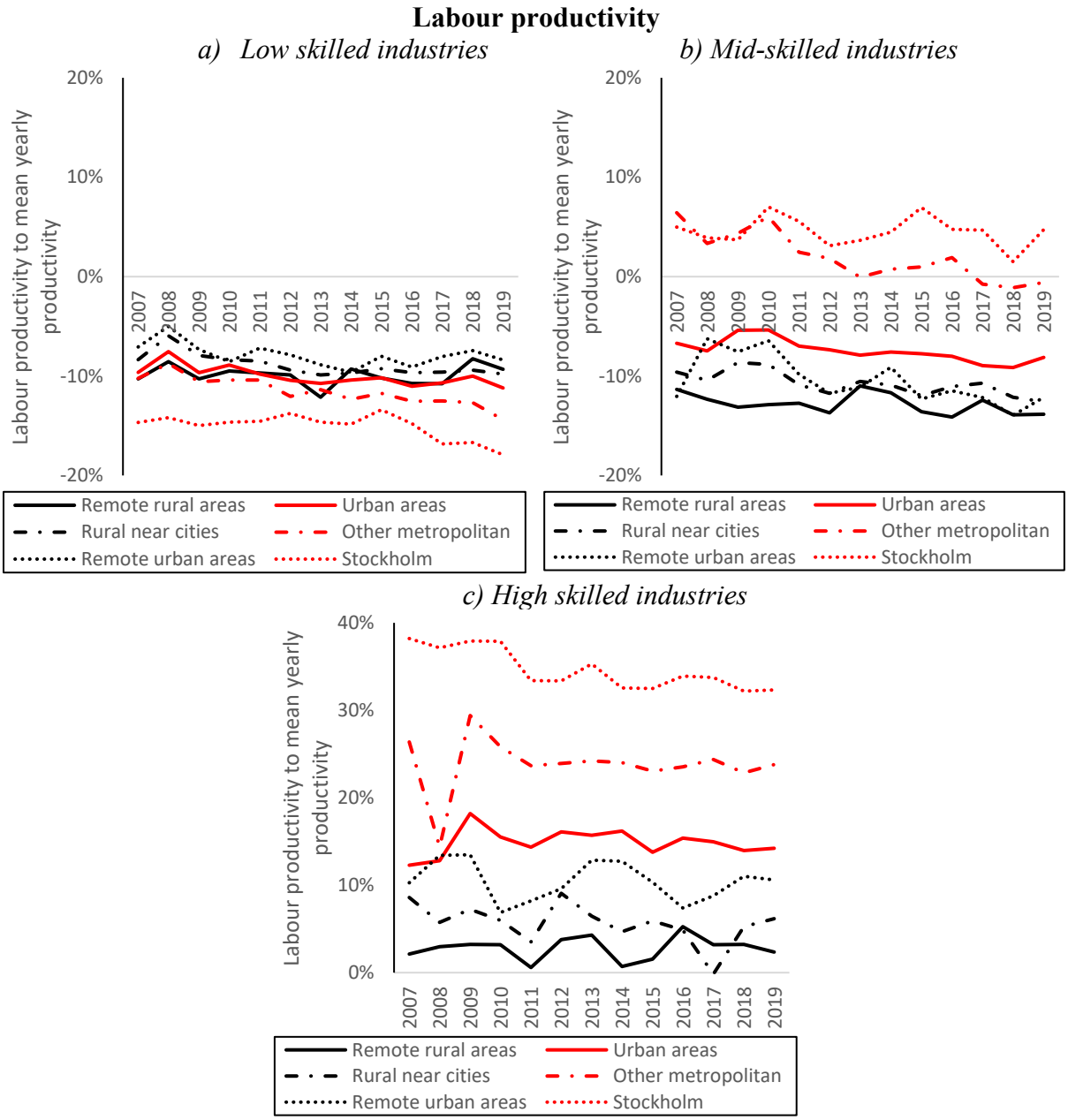

Figure 10 a-c. The relative change in labour productivity (value added per worker) for low, mid- and high skilled industries in different regions. Average at firm level. 2007-2019.

5.3.3 Net wage share

Figure 11 a-c) show that the net wage share is higher for low skilled industries than for high skilled industries and, particularly, mid-skilled industries. Moreover, the skill-related differences are increasing, indicated by different trends for low, mid- and high skilled industries. That is, for low skilled industries the relative net wage share is increasing (remember that the general trend is decreasing (see Figure 7) so this means that the decrease is smaller than the national decrease), and for mid-and high skilled industries the relative net wage is

decreasing (i.e. the decrease is larger than the national decrease). Interestingly, this increase in the skill-related gap between industries is smaller for Stockholm than the other regions (about 25 percent smaller). To sum up, the net wage share is substantially higher for low skilled industries than for mid- and high skilled industries and, importantly, over time the net wage share decreases less for low skilled industries as well.

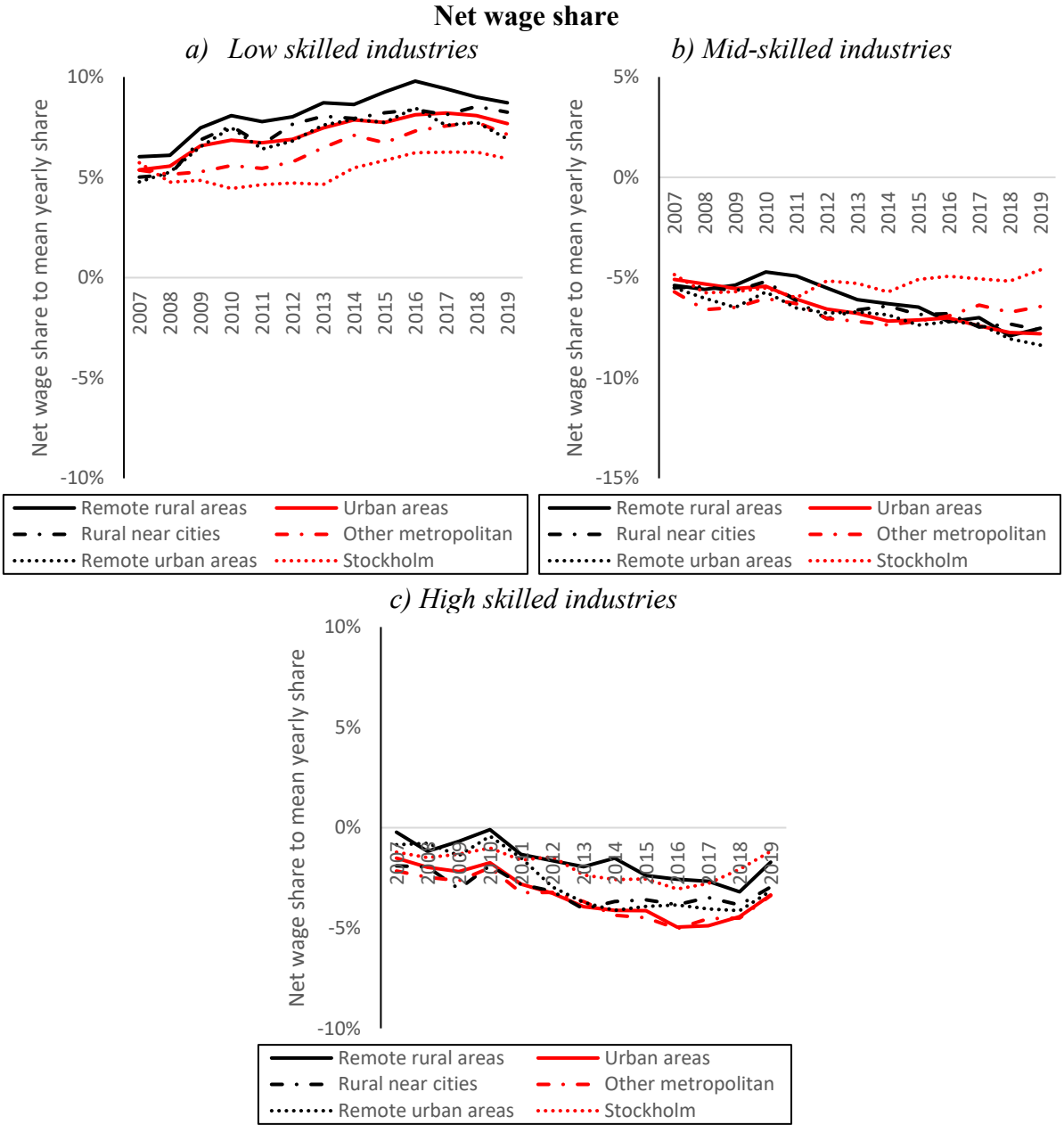

Figure 11 a-c. The relative change in the net wage share (total labour costs as a share of net value added) for low, mid- and high skilled industries in different regions. Average at firm level. 2007-2019.

5.3.4 Explaining the skill gradient in the net margin

But is the increasing skill gradient in the net margin explained by changes in labour productivity, the net wage share and/or other budget items? Table 3, column (3), shows that size-related firm characteristics (number of employees and revenues) have no impact on the skill gradient in the growth rate of the net margin. Much more important is the payment to workers. In column (4) and (5) the wage share and total labour costs are included. Both variables explain a significant share of the skill gradient in the growth rate, but particularly the skill related changes in the net wage share are important for explaining the skill gradient in the net margin.[14] This is illustrated in Figure 12 going from the blue bar to the red bar (comparison of columns (3) and (5)). For mid-skilled firms the growth rate in the net margin is explained by changes in the wage share and total labour costs (as for low skilled firms the growth in the net margin is zero). For high skilled firms the growth rate in the net margin decreases with two-thirds to 0.3. By including the firm costs (input and other costs) in column (6), and external and financial revenues and depreciation in column (7), the growth rate in the net margin is largely explained also for high skilled firms (also shown as green and yellow bars in Figure 12). Finally, in column (8) we show that dividends (included to the model in column (3))[15] have a small impact on the skill-gradient in the growth rate. Labour productivity, also included in column (8), is not affecting the skill-gradient in the growth rate, which is in line with the finding above.

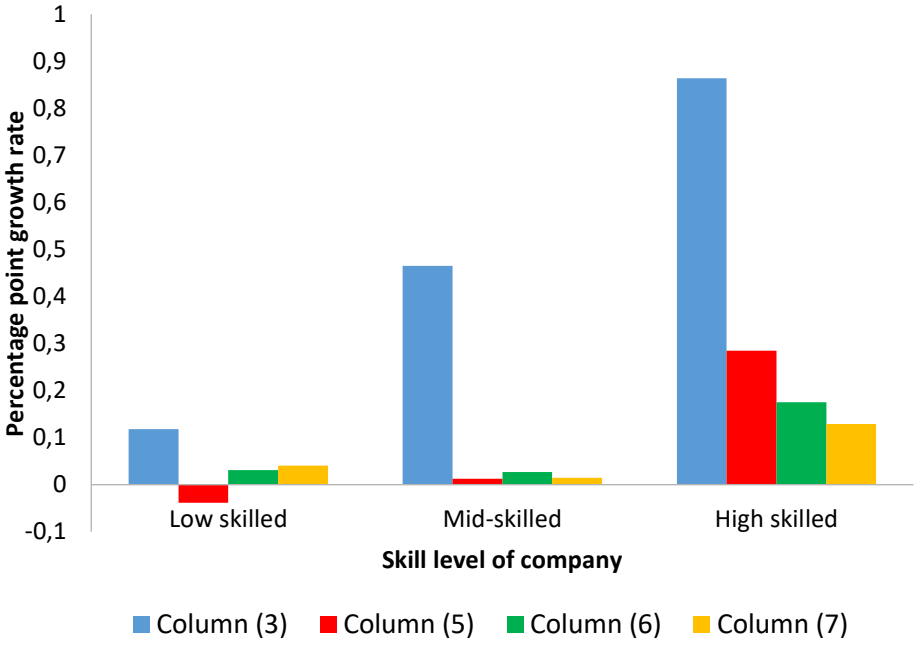

Figure 12. Growth rate for the net margin for low, mid- and high skilled industries. With and without control variables.

[14] The wage share is also a much more significant determinant of the skill-gradient in the net margin if we add the variables in the opposite order.
[15] To show the specific impacts of dividends and labour productivity we only control for firm size.

6 THE IMPORTANCE OF FIRM STARTUPS

In this section we show that an increase in firm start-ups is important for understanding the increase in the net margin. Before adding this perspective to the econometric modelling, we study the urban-rural gradient in business density. In Figure 14, business density is measured as the number of limited firms per capita in the six regions. This measure shows, in Figure 13, a large increase in business density for all regions. At the national level, the number of limited firms has increased from 2.1 to 3.2 firms per 100 inhabitants. The overall increase in business density is probably related to the more favourable rules for running limited firms. Even if business density is higher in the densest areas, business density is the lowest in *Urban areas* and *Remote urban areas* whereas rural areas have somewhat more firms per inhabitant. For *Stockholm* the number of firms increases with almost 2 firms per 100 inhabitants in 2003-2019, and for the other regions the increase is around 1 firm per 100 inhabitants.

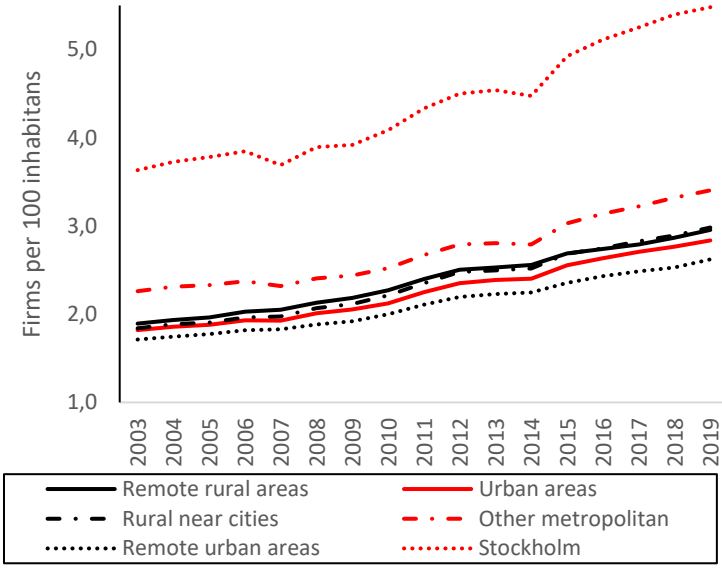

Figure 13. Business density (firms per 100 inhabitants) for different regions.

But why is the change in business density important? In Table 2 (column 1) we estimate the same model as in Table 1 (column 2) but now with firm fixed effects added. This exercise reveals our point, with fixed effects the skill gradient in the growth rate is removed. Thus, the increased profits are not related to changes within firms but to new, and highly profitable, firms included in the sample. Another strategy for revealing the same conclusion is to include a set of variables measuring the skill-related variation in the net margin for firms started in different years. In column (2) we find for high skilled firms that the net margin is 1.9 percentage points higher for firms starting one year later. For mid-and low skilled firms, the net margin is 0.5 and 0.2 percentage points higher for firms starting one year later, respectively. But more

importantly, our skill-gradient in the net margin growth rate disappears (and turns, even, negative for the high skilled firms).

Table 2. Explaining the skill gradient in the net margin growth with fixed effects or with starting year.

	(1)	(2)
	FE	OLS
Skill gradient in growth rate:		
Low skilled	-0.0866***	0.0955***
	(0.00705)	(0.00625)
Mid-skilled	0.00269	0.282***
	(0.00709)	(0.00697)
High skilled	0.104***	-0.0567***
	(0.00718)	(0.00714)
Regional gradient in growth rate:	yes	yes
Skill related difference in impact of starting year:		
Low skilled		0.192***
		(0.00739)
Mid-skilled		0.480***
		(0.00871)
High skilled		1.561***
		(0.00846)
Observations	3,372,019	3,372,019
R-squared	0.000	0.052
Number of companies	547,864	

Notes: The dependent variable is the firm net margin. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

6.1 Entrepreneurial activity and changes in the splitting rules

A majority, almost 70 percent, of our firms are limited firms where up to four shareholders own shares corresponding to at least half of the votes in the firm (fåmansaktiebolag in Swedish). The regulatory framework for operating these smaller limited firms (SLF) have over time been more favourable. The splitting rules (3:12 rules) regulating the distribution of incomes between labour incomes and capital returns has resulted in extensive income shifting from labour incomes to capital incomes (Alstadsæter and Jacob, 2016; Jacob, 2020). In 2006 a tax reform was intended to increase risk compensation to promote entrepreneurship and employment, but it mainly implied that a larger share of firm income was paid out as dividends at a lower tax rate than before. Primarily, the introduction of a simplification rule increased dividends for SLF (see Selin (2021) or Alstadsæter and Jacob (2012) for a comprehensive overview of the reform).

Initially the reform had no effects on employment (Alstadsæter et al., 2014), but with data up until 2017 a small impact is found for cash-constrained firms (compared to cash-rich firms) with fixed assets of SEK 100 000 or more (Jacob, 2020). More relevant for this study is the impact on start-ups. The reform increased active ownership, consulting corporations and holding corporations, and implied that self-employed firms were transformed into SLF (Alstadsæter and Jacob, 2012). In fact, many of the start-ups have zero revenues (i.e. probably different types of holding corporation with the purpose of owning assets) and are excluded from our study sample, although much of the dividends are collected by these firms.

Figure 14a shows that the inflation-adjusted dividends from SLF have increased with about 700 percent in 2003-2019. However, in 2019 only 50 percent of the dividends are collected by firms in our study sample (see Figure 14b). In 2007, this share was almost 70 percent. Also, for high skilled firms the average dividend to its owners is SEK 200,000 in the end of the period which is almost 49 percent higher than for mid-and low skilled firms (see Figure 15a). For firms with zero revenues the average dividend is around SEK 300,000-450,000 for high skilled firms in the end of the study period: more than 50 percent higher than for mid-and low skilled firms with zero revenues (see Figure 15b). Hence, remarkably high dividends is mainly a feature of high skilled firms with zero revenues.

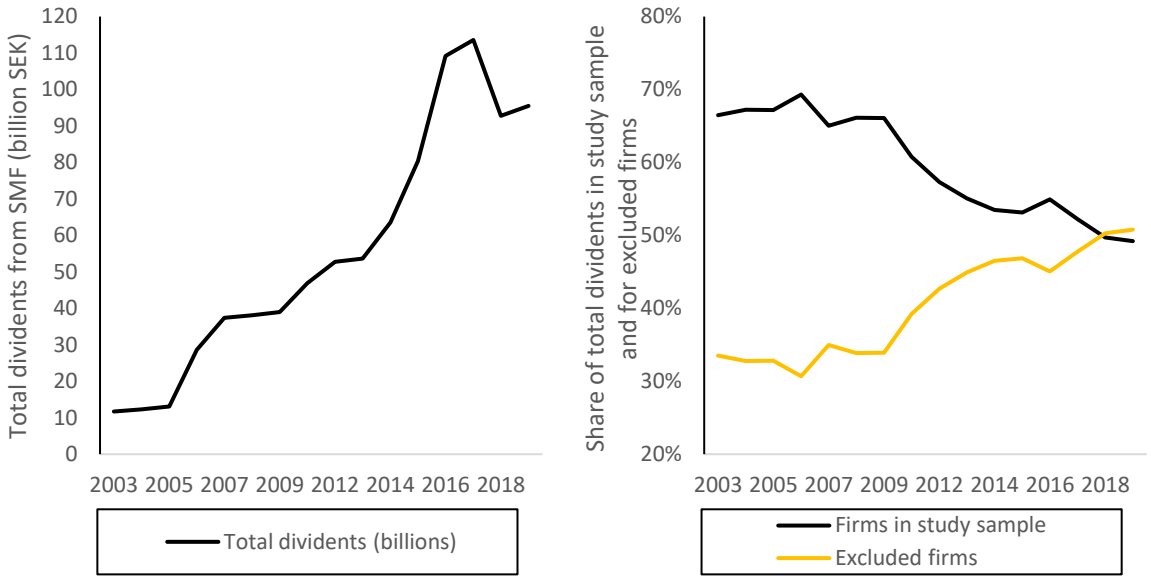

Figure 14a and 14b. Total dividends (billions SEK) and the share of dividends collected by firms in the study sample and excluded firms. 2003-2019.
Note: The year 2010 is excluded because of data problems. This has also been acknowledged by Selin (2021).

Study sample *Firms with zero revenues*

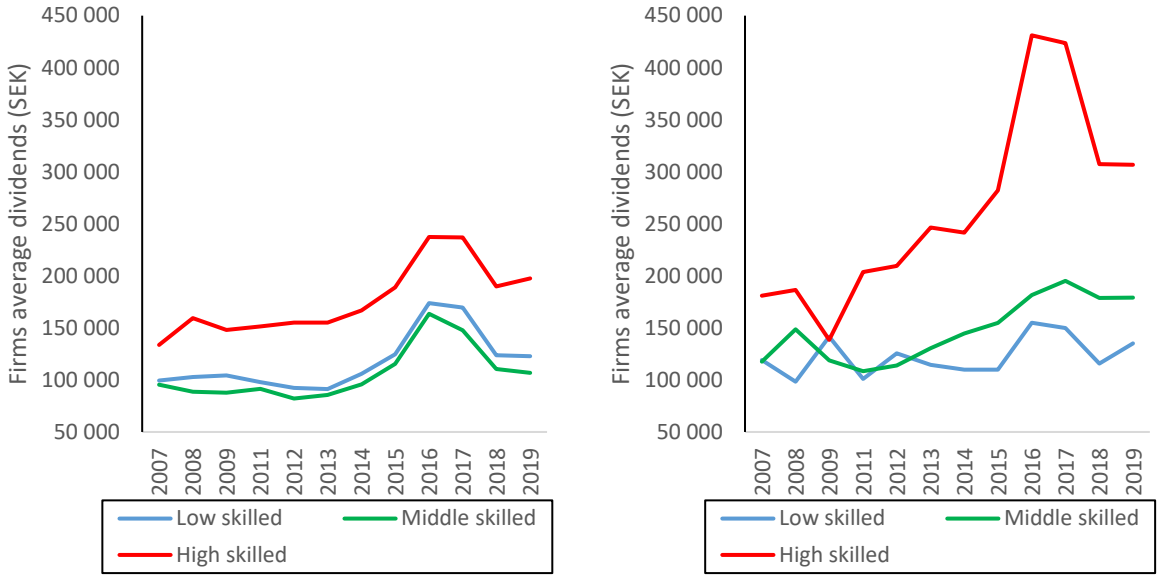

Figure 15a and 15b. Average dividends for low, mid-and high skilled firms. For study sample (figure 15a) and for firms with zero revenues (15b). 2003-2019.
Note: The year 2010 is excluded because of data problems. This has also been acknowledged by Selin (2021).

A conclusion is that the net wage share is decreasing because of income shifting from labour incomes to capital incomes. By assuming that the main part of the dividends are incomes that without the tax system changes would have been defined as labour incomes, we adjust the firm labour incomes by adding dividends before calculating the net wage share. Figure 16 shows that this removes much of the fall in net wage share. If we could have added the dividends collected by holding and partner firms, the *adjusted* net wage share would probably increase over time.

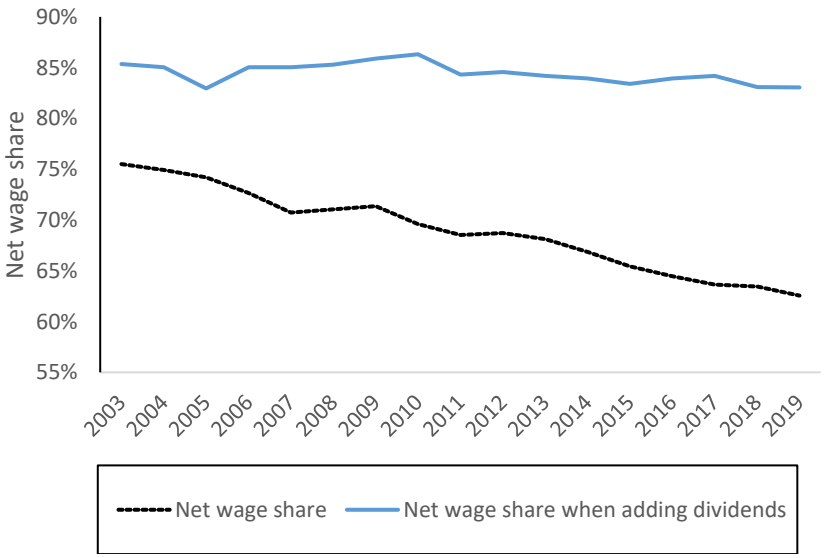

Figure 16. The net wage share with and without adding dividends to labour incomes.

Discussion

This study finds evidence of job polarization among limited firms in Sweden. Limited firms employ about 80 percent of private sector workers and is thus an important part of the Swedish economy. In terms of number of employees, it is evident that fewer workers are found in mid-skill industries and more workers are found in high skill industries by the end of the studied period, a finding that is in line with the job polarization hypothesis. As regards the share of low-skill workers the trend is slightly decreasing, which does not support the hypothesis. In terms of revenues, polarization is less evident. The revenue share of high skill industries is not increasing as expected. However, after the financial crisis in 2008 revenues of low skilled industries have grown at the expense of mid-skilled industries, somewhat supporting the job polarization hypothesis.

It has been argued that job polarization is mainly an urban phenomenon. This study supports the finding. First, the decrease in employment for mid-skilled sectors is larger for denser areas, and the decrease in revenue-market share for mid-skilled industries is much larger in Stockholm than nationally. Second, an increase in low skilled employment is only observed in the densest region: Stockholm. Finally, even if high skilled employment is increasing everywhere, the increase is most significant in urban areas. But surprisingly − whereas the revenue-market size for high skilled firms increases the most in Stockholm − high skilled employment increases less in Stockholm than in other urban areas.

Profits have increased substantially for the limited firms and regional polarization in profits is observed. The net margin has increased much more in denser areas than in rural areas. Before the financial crisis the net margin was somewhat higher in rural areas, but in the end of the period it is around 4-4.5 percentage points (or around 35 percent) higher in metropolitan areas than in rural areas. However, the urban-rural profit gap is not caused by density. Instead, industry structure is causing the profit gap. For high skilled industries − much more common in urban areas − the net margin is increasing significantly more than for low skilled industries − much more common in rural areas. In fact, the net margin develops in a similar way in urban and rural areas for high and low skilled industries.

This raises a new question: Why does profits evolve differently depending on the skill level of the firm? An evident explanation is related to skill biased technological change, which is assumed to increase labour productivity in high skilled firms. However, our findings do not support this explanation. Even if labour productivity does increase in high skilled industries,

the increase in labour productivity is not larger for high skilled firms than for other firms. The finding may be caused by mismeasure of labour productivity – without data on working time, decreasing working time might mask an increased labour productivity. But it is difficult to explain that high skill industries should differ from other industries in this aspect. In fact, changes in working time due to part time or temporary work is more common in less skilled industries. The main explanation is instead related to wages. A large increase in wages has been documented since the economic crisis in Sweden in the early 1990s, although a weaker income growth is documented after the recent financial crisis in 2008 (Jonsson and Theobald, 2019). For our firms, real per-worker wage costs increased by 15 percent in 2007-2019. Even if the Swedish collective agreements predict a similar wage increase for all industries and all regions, there are two main exceptions to this. For low skilled industries in metropolitan areas outside of Stockholm, the increase in real wage costs is particularly high (22 percent), and for high skilled industries the increase is low and even negative in urban areas outside of Stockholm. Importantly, this has impacted the net wage share. Overall, the net wage share has fallen with 13 percentage points in 2007-2019. However, for high skilled firms (mainly located in urban areas) the decrease is larger, around 3-4 percentage points than for low skilled industries. Thus, the net wage share and the total labour costs of firms explain two-thirds of the increase in profits for high skilled industries. For mid-skilled firms the net wage share and total labour costs explain the entire increase in profits in 2007-2019.

So why is a decreasing net wage share – associated with increased profits – not accompanied with increased (labour) productivity for limited firms in Sweden? To answer this question, start-ups must be considered. Notably, the variation in profits is entirely caused by newly started firms; for existing firms the increase in profits is not related to the skill levels of the firm. The number of firms per 100 inhabitants has increased with 52 percent during the studied period and this development is largely caused by changes in taxation splitting rules. It has been documented that a reform in 2006 increased active ownership, consulting corporations and holding corporations, and implied that self-employed firms transformed into limited firms. This was beneficial as dividends were taxed at a lower tax rate.

The reform implied income shifting from labour income to capital income which increased dividends with 700 percent. However, in 2015-2019 only 50 percent of dividends are collected by the firms in our study sample, the rest is collected by firms with low or zero revenues, i.e. different types of partner or holding firms. The highest dividends are collected by high skilled

firms with zero revenues, on average 170 percent more than for low and mid-skilled firms in our sample.

Hence, a decreasing wage share, causing higher profits among mainly high skilled firms, is most probably related to income shifting. This is strongly supported by the findings when recalculating the net wage share. By adding the dividends to wage costs, i.e. to assume that dividends were collected as wages instead, the entire fall in the net wage share is removed. If we could have included dividends collected by the partner or holding firms, the net wage share is likely to have increased over time.

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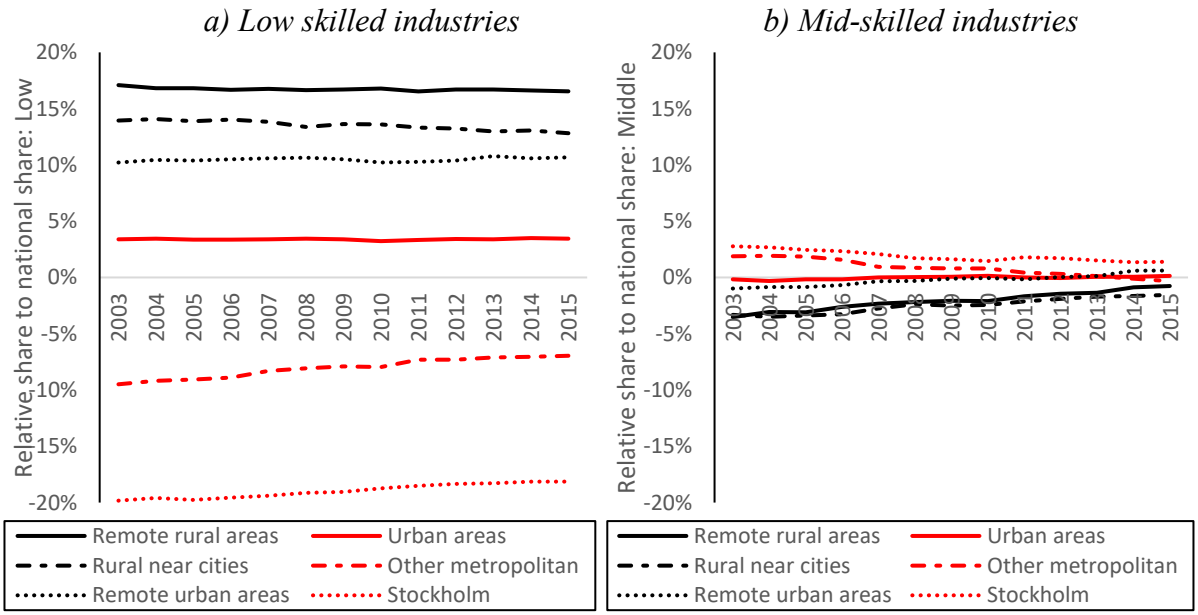
Appendix

The regional share of firms in low, mid-and high skilled industries

In this appendix we analyse the skill-shares of firms, regionally. The statistics is shown in relation to the skill-shares of firms in the nation. For example, in figure A1a for low skilled firms, the solid black line in the top shows that in *Remote rural areas* the share of low skill firms is around 16.5 percent higher than the share of low skilled firms in the nation. Moreover, figure A1a shows a clear urban-rural gradient in the share of low skilled firms and particularly in the densest area, *Stockholm*, the share of low skilled firms is low. However, the share of low skilled firms is increasing in *Stockholm* and the *Other metropolitan areas* with around 2 percent, whereas the share decreases somewhat in the most rural areas, implying a decreasing urban-rural gradient. For mid-skilled firms (figure A1b), the urban-rural gradient (in level) is less pronounced even if there is a small over-representation of mid-skilled firms in urban areas, and a small under-representation of mid-skilled firms in rural areas. There are clear changes, however: the relative share of mid-skilled firms decreases in urban areas and the relative share of mid-skilled firms increases in rural areas.

Finally, the urban-rural distribution of high skilled firms (figure A1c) mirrors the urban-rural distribution of low skilled firms, i.e., high skilled industries are much more common in *Stockholm* and the *Other metropolitan areas* and much less common in rural areas. On the other hand, for high skilled firms the urban-rural gradient is increasing and not decreasing as for the distribution of low skilled firms.



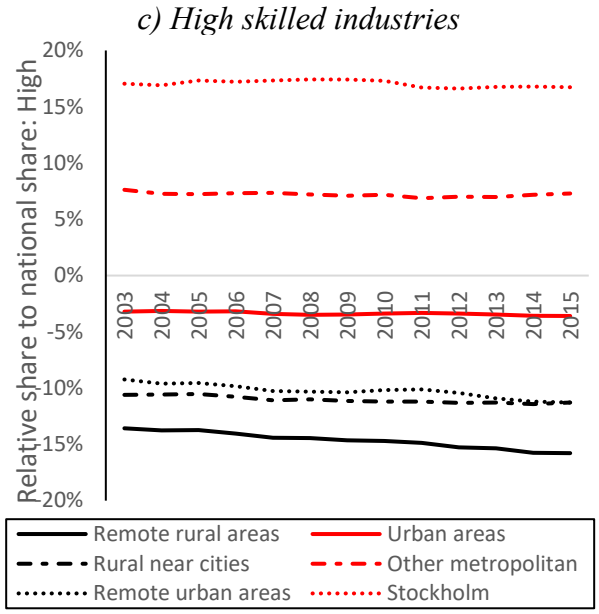


Figure A1a-c. Relative share of firms to the national share. 2007-2019.

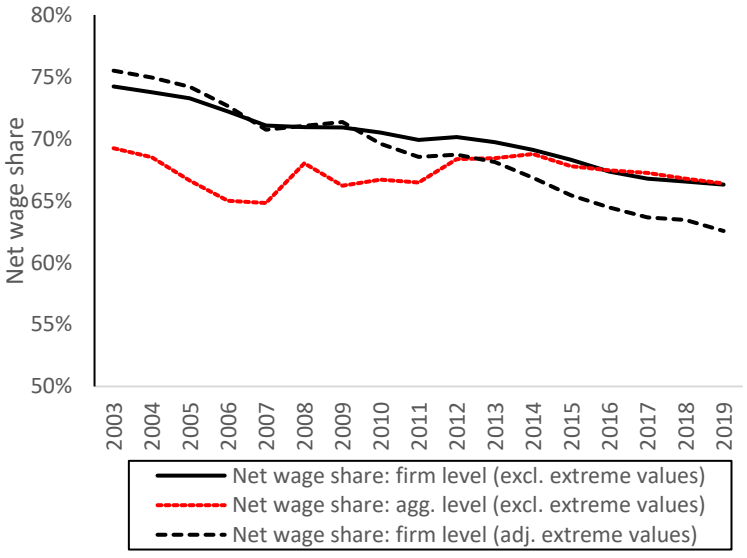


Table A2. The labour net wage share at firm level and at aggregate level. When removing extreme values (Net wage share>1 or Net wage share<0 at firm level) and adjusting extreme values (to zero or one).

Note: Largely negative and largely positive values (much higher than one) are either removed or adjusted to either zero or one (keeping them have a major biasing impact). In both cases the net wage share at firm level, decreases. Removing the extreme values before calculating the aggregate net wage share decreases the aggregate net wage share in general, but it has no impact on the trend.

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AgriFood Economics Centre provides economic expertise in the fields of food, agriculture, fishing and rural development. The Centre is a cooperation for applied research between the Swedish University of Agricultural Sciences (SLU) and Lund University. The aim is to supply government bodies with a solid scientific foundation supporting strategic and long-term policy choices.

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