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When it blows, it does not do so at the top: employment and wage inequalities in Norwegian small and large firms

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Abstract

Panel data of Norwegian industries between 2001 and 2014 show that while employment growth occurs equally in small and large firms percentage-wise, employment reduction largely occurs in large firms. The findings imply that large firms are not an engine of employment growth but instead take a lead position in employment reduction. Large firms' employment reduction, in turn, increases wage inequality while median and mean wages are unaltered. The findings imply that large firms' layoffs do not dominate among top-earners but among employees earning median and mean wages.

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1. Introduction

This paper studies if employment growth or reduction in Norwegian industries between 2001 and 2014 has largely occurred in small or large firms. Also, it studies if employment growth or reduction has largely occurred among employees earning high or low wages. We use the Gini-coefficient of firm size inequality in terms of full-time employees to compare small or large firms operating in different industries, and the Gini coefficient of wage inequality among full-time employees to compare employees earning high or low incomes.[1]

Empirically, we carry out panel data analyses taking an industry level of analysis. Hence, we study employment growth or reduction within Norwegian industries between 2001 and 2014. Similarly, we study firm size inequality in terms of full-time employees within industries for the same period. Suppose we theoretically assume that all firms within an industry have exactly the same number of full-time employees a given year. In that case, the Gini coefficient concerning firm size inequality is zero, and if an industry has one large firm and many very small firms, it is close to one. Suppose we theoretically assume that all full-time employees within an industry earn exactly the same a given year. In that case, the Gini coefficient concerning wage inequality is zero. If one employee within an industry earns a high income while the rest earns very little, it is close to one (for a further illustration, please see, e.g., Aarstad and Kvitastein 2021b, p. 3).

Doi and Cowling (1998) have indicated that employment growth largely occurs in small firms. On the contrary, Haltiwanger, Jarmin, and Miranda (2013) did not find that firm size had any systematic effect on growth. Other scholars have also tapped into the topics mentioned (Gorg et al. 2017, Banerjee and Jesenko 2016, Lever 1996, Bianchi and Biffignandi 2018), but ours is the first study to compare if employment growth *and* reduction have largely occurred in small or large firms. If employment growth largely occurs in large (small) firms, it increases (decreases) firm size inequality, and the reason is that large (small) firms at the outset become larger. Conversely, if employment reduction largely occurs in large (small) firms, it decreases (increases) firm size inequality.

Many studies have examined wage inequality (e.g., Deininger and Squire 1996, Hong, Han, and Kim 2020, Bentzen and Tung 2020, Aarstad and Kvitastein 2021a), i.e., the distribution of high vs. low wages in the economy. In particular, there is a literature examining its effect on growth and development at a national level (e.g., Voitchovsky 2005, Berg et al. 2018). However, we have limited knowledge about whether wage inequality is a function of employment growth or reduction in the economy. Increasing wage inequality as a function of employment growth indicates that new employees either earn relatively high or very low incomes, while decreasing wage inequality as a function of employment growth indicates that new employees earn around median incomes. Conversely, increasing wage inequality as a function of employment reduction indicates that layoffs predominate among employees earning around median incomes, while decreasing wage inequality as a function of employment reduction indicates that layoffs predominate among employees earning relatively high or very low incomes.[2]

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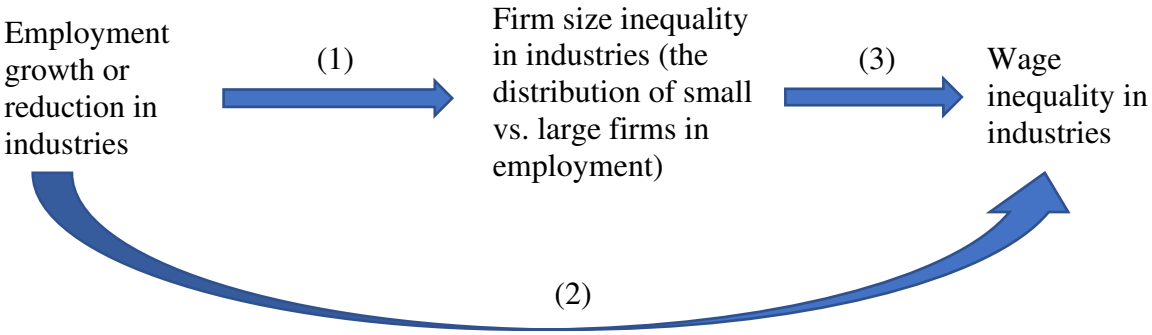
[1] Initially, Gini (1936) developed an index to measure wealth or wage inequality, but it can similarly be used to indicate other types of inequalities, such as firm size inequality within industries, which we further illustrate shortly.

[2] Theoretically, we cannot rule out that employment growth or reduction affects the distribution of income among employees that are neither newly employed or laid off, but as incomes in Norway are relatively sticky and not subject to substantial fluctuation from one year to another, we consider such an impact to be marginal. Therefore, we assume that a change in wage inequality as a function of employment growth or reduction is largely attributed to incomes earned by either those who are recently employed or laid off.

In addition to studying wage inequality as a function of employment growth and reduction in general, we also study if wage inequality is a function of employment growth or reduction in small vs. large firms. As such, we identify whether employment growth or reduction in small vs. large firms predominate among employees earning high or low incomes.

Taken together, we study the conceptual model in Figure 1. First, we study if employment growth or reduction in industries affects firm size inequality (1), measured as the Gini coefficient of firm size distribution in full-time employees in industries. Next, we study if employment growth or reduction affects wage inequality among full-time employees in industries (2) and if firms size inequality also affects wage inequality (3).

Figure 1. A conceptual model.



2. Methods

Using Norwegian employee-level data linked with enterprise-level data, we made a panel dataset where industry *i* (digit-two NACE-code) is the unit of analysis at year *t* (t=2001-2014). (Please see Aarstad and Kvitastein (2021a) for further details.) We used the Gini coefficient of wages earned by full-time employees to measure wage inequality in industry *i* at year *t*. Criteria for being included in the measure were that an employee had positive income in year *t* and was full-time employed in the same enterprise at year *t* and t_{-1}. Also, we measured median and mean incomes in industry *i* at year *t* by the same criteria. Next, we divided each industry's median and mean incomes by the wage index of Statistics Norway (2001 set to 1) for each year.

To measure firm-size inequality in industry *i* at year *t*, we used the Gini coefficient of enterprise size in full-time employees at year *t*. To measure employment in industry *i* at year *t*, we initially calculated the total of full-time employees at year *t*. After that, we divided the number by the mean number of full-time employees for the total of periods the industry was in the panel; our motive for this was to account for large variations in employment in different industries.

To prevent tiny industries in the data (to be reported in Table 1), as they likely cause substantial variations, for instance, because of mergers and acquisitions within and across industries, we sat as criteria that the industry at year *t* at a minimum had 1,000 full-time employees and 100 enterprises. To count an enterprise at year *t*, we sat as criteria that it reported operating revenues and positive or negative operating profits.[3]

[3] Different cut-off levels may alter statistical conclusions. Therefore, as a robustness check, we replicated the analyses by including industries at year *t* with at least 750 full-time employees and 75 enterprises.

3. Results

Econometrically, we analyse the panel data in Stata 14 with industry fixed effects regressions and robust standard errors. All models have year dummies as control variables, and we report the results in Table 1.[4]

Model 1 in Table 1 shows that employment growth (only including observations of employment at t > employment at t_{-1}) has a non-significant effect on industry firm size inequality. Model 2, conversely, shows that employment reduction (only including observations of employment at t < employment at t_{-1}) significantly decreases firm size inequality in industries. The findings imply that while employment growth occurs equally in small and large firms percentage-wise (due to the non-significant effect on firm size inequality in Model 1), employment reduction largely occurs in large firms as the industry becomes more equal in firm size (due to the significant effect on firm size inequality in Model 2). Substantially, the findings inform that large firms are not an engine of employment growth but instead take a lead position in employment reduction.

Table 1. Fixed effects regressions reporting standard errors in parentheses.

Dependent variable	Firm size inequality at t		Wage inequality at t		Median wage at t	Average wage at t
Model	1	2	3	4	5	6
Employment at t	.025	.083***	-.008	.023	16,583	34,869†
	(.028)	(.019)	(.026)	(.017)	(10,405)	(19,733)
Only including observations of employment growth (employment at t > employment at t_{-1})	√		√			
Only including observations of employment reduction (employment at t < employment at t_{-1})		√		√	√	√
Firm size inequality at t			-.013	-.176***	-19,594	-90,783
			(.162)	(.047)	(66,334)	(83,258)
Only including observations of increasing firms size inequality (firm size inequality at t > firm size inequality at t_{-1})			√			
Only including observations of decreasing firms size inequality (firm size inequality at t < firm size inequality at t_{-1})				√	√	√
Year dummies included (but not reported)	√	√	√	√	√	√
N obs./N industries	535/66	316/67	351/62	214/67	214/67	214/67
Min./avg./max. obs. per industry	1/8.1/13	1/4.7/13	1/5.7/11	1/3.2/9	1/3.2/9	1/3.2/9
F-value	3.12**	3.39***	12.0***	18.2***	8.05***	4.53***
R-sq within/between	.304/.123	.276/.006	.253/.124	.527/.078	.277/.057	.229/.147

† p<.10, * p<.05, ** p<.01, *** p<.001. Conservative two-tailed tests for regressors.

Model 3 shows that increasing firm size inequality (only including observations of firm size inequality at t > firm size inequality at t_{-1}) has a non-significant effect on wage inequality when there is also employment growth (only including observations of employment at t > employment at t_{-1}). Model 4, on the other hand, shows that decreasing firm size

As a further robustness check, we finally replicated the analyses by including industries at year t with at least 1,250 full-time employees and 125 enterprises. The replicated analyses did not alter any statistical conclusion compared to those to be reported in Table 1.

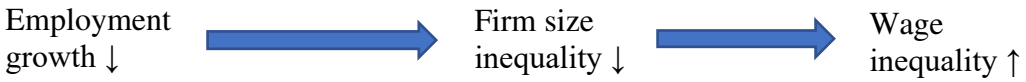
[4] In addition to the robustness checks we report on in Footnote 3, we also replicated the models in Table 1, but each excluded industries with less than three observations. However, no statistical conclusion was altered.

inequality (only including observations of firm size inequality at t < firm size inequality at t_{-1}) has a significant negative effect on wage inequality when there is also employment reduction (employment at t < employment at t_{-1}). The findings imply that employment reduction in large firms increases wage inequality (Model 4),[5] while employment growth in large firms has no significant effect (Model 3). Moreover, unreported analyses show that the effect of Model 4 is significant ($p < .05$) when replicating it with a time lag of one and two years between the independent and dependent variables, and borderline significant with a time lag of three years ($p < .10$).

It is worth noting that employment reduction per se does not directly affect wage inequality (cf. the non-significant effect in Model 4), but indirectly by decreasing firm size inequality (cf. the significant effect in Model 2). In turn, decreasing firm size inequality, as an indicator of employment reduction in large firms, increases wage inequality (cf. the significant effect in Model 4).

We conclude the findings reported so far in the empirical model in Figure 2. It has some similarities with the conceptual model in Figure 1. However, our empirical data pinpoints that negative employment growth, i.e., employment reduction, decreases firm size inequality (while positive employment growth has no significant effect), and decreasing firm size inequality, in turn, increases wage inequality (while increasing firm size inequality has no significant effect). In line with what we have noted above, employment reduction per se does not directly affect wage inequality (but indirectly by decreasing firm size inequality, as an indicator of employment reduction in large firms, which in turn increases wage inequality).

Figure 2. An empirical model.



Although large firms' employment reduction increases wage inequality (Model 4), the effects on median and mean wages are non-significant (Model 5 and 6, respectively). The non-significant effects imply that increasing wage inequality is due to employment reduction among employees earning median and mean wages.[6] In other words, the findings imply that large firms' layoffs do not dominate among top-earners but instead among those earning around the mean and median.

4. Conclusion

Our findings imply that large firms are not an engine of employment growth but instead take a lead position in employment reduction. Also, our findings imply that large firms' layoffs do not dominate among top-earners but instead among employees earning median and mean wages. We reached these conclusions by distinguishing between employment growth and reduction and between increasing and decreasing firm size

[5] Only including observations of decreasing firm size inequality *and* employment reduction in Model 4 implies that the employment reduction largely occurs in large firms.

[6] Assuming that median and mean wages were to increase (decrease) would imply that employment reduction largely occurs among employees earning below (above) these wage levels.

inequalities, which to our knowledge, is a novel way to study the concepts in a panel data research design.

Elaborating on our study, future research should investigate potential performance effects when firms or industries increase or decrease employment among employees earning low vs. high wages. We did not find that employment growth or reduction directly affected wage inequality at an industry level, and future research should aim to replicate and study the same concepts at a firm level.

One may argue that the study's econometric analyses should have included time-lagged independent variables. However, the major variables – employment growth, firm size inequality, and wage inequality – largely change coincidingly and, therefore, do not require the mentioned econometric approach, we argue. Also, we have noted before that in unreported analyses replicating Model 4, decreasing firm size inequality significantly increased wage inequality with a time lag of one to three years. In our opinion, these are the only concepts for which there may exist some time lag between the effect of the independent variable on the dependent variable, but future research may nonetheless further scrutinize these issues.

One may similarly argue that the study should also have included dynamic models with time-lagged dependent variables. However, at face value, we cannot see a logical rationale for potential reverse causation between the independent and dependent variables for this study's major variables showing significant associations. I.e., it is likely to assume that firm size inequality is a function of negative employment growth, but not vice versa, at least not in a short-term perspective. Similarly, it is likely to assume that wage inequality is a function of firm size inequality, but not vice versa, at least not in a short-term perspective. Nonetheless, future studies may find it appropriate to investigate the potential reverse causal effect of this study's major variables in a long-term perspective.

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