The Firms behind the Labor share: Heterogeneity and concentration in market share amongst Danish firms

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Introduction
Historically, most developed economies have shared a common stylized fact: The share of GDP going to labor has been remarkably constant at around 2/3. However, over the past decade the labor share has gradually declined (Karabarbounis and Neiman, 2013). The fundamental reason for this remains unknown, but scholars have presented a number of hypotheses ranging from automation to changes in market power.

To understand the root cause of this shift one needs to look at the labor shares of individual firms. Kehrig and Vincent (2017) use microdata for the US manufacturing industry and show a remarkable shift in the underlying distributions of firms' labor share and size (measured by value added): In the 1970s there was next to no correlation between firm size and labor share and the largest firms mirrored the overall economy with a labor share of around 2/3. In recent years a strong negative correlation between size and labor share has emerged and a substantial part of overall value-added now comes from firms with very low labor shares. It appears that firms in the US manufacturing sector are now better able to scale up in size without a corresponding increase in payments to labor. It remains unknown why.

Using microdata on firms from Statistics Denmark I have demonstrated that the same shift has happened in Denmark and has happened broadly across the whole economy. This shift towards a relatively larger importance of low labor share firms has happened simultaneously with a small increase in median labor share of firms.

The goal of this project is to establish the underlying reason for the substantial shift in heterogeneity of firms' labor shares, in particular the increasing importance of large firms with low labor share.

The State of the Art
Many authors have assessed the decline in the US labor share and explanations include a reduction in the price of capital (Karabarbounis and Neiman, 2013), an increase in market power (Autor et. al., 2017) and an increase in regulatory capture (Gutierrez and Philippon, 2017). These papers, however, have had a US-centric view and have often focused on explanations particular to the US, such as changing in regulation, whereas the fact that Denmark show similar trends suggest a more global explanation. Furthermore, data in the US lacks the richness that allows for a comprehensive

study of firms outside of the manufacturing sector. Finally, these papers do not explore the change in the underlying distribution of firm labor share described above, a fact that has only been recently established by Kehrig and Vincent (2017). The Kehrig and Vincent (2017) paper is purely descriptive and presents no explanation for the shifting trends.

The Danish data is ideal for this purpose. Not only does it contain detailed information on the whole economy which allows for an analysis beyond that of manufacturing. It also contains a wealth of other information on international trade, means of sales and use of capital, that allows us to address the possibly hypotheses directly.

Policy Relevance

Income inequality is a central policy challenge. The share of overall income going to labor is a central element of trends in income inequality. Understanding why the labor share is changing is central for a policy response. In particular, if we conclude that the fact that some firms are able to grow without a corresponding increase in wage payments is due to new automation technology, the policy recommendations would be very different than if conclude that increases in market imperfections are the culprit. Given the similar trends in both the US and Denmark policy insights should be relevant both for Denmark and abroad.

Our Study

This study will be conducted with David Hémous from the University of Zürich with whom I have written several papers. Although, for practical reasons all the data work and estimations will be done by me the analysis will be planned, the theoretical framework will be developed, and the paper written in cooperation with Professor Hémous.

Our study will rely on the micro data from Statistics Denmark on Danish firms covering close to the universe of Danish firms from 1999 onwards and a substantial subset from 1993. We will link the firm data with a unique database which classifies the universe of global patents as automation or not. This dataset has recently been developed by several co-authors and myself using text analysis (Dechezleprêtre, Hémous, Olsen and Zanella, 2017). The present study will consist of two parts. First, a non-structural exploration of possible explanations, followed by a more structural model of innovation where we will attempt to match the underlying shifts in the distributions of firm revenue and value added.

The non-structural part of the analysis is based on a preliminary analysis that I have already conducted. I established the following facts: the shifts in the overall distribution is predominantly a shift *within* industries and not between industries, the shift has happened in a broad set of sectors and not just manufacturing, and the shift predominantly takes place in sectors that have a larger export share. Since a change in the labor share of value added can be met by either a change in the returns to capital or a change of markups, both hypotheses of a changing competitive structure and changing technology are possible. Four hypotheses present themselves:

An *increase in globalization or offshoring*. Though it is not immediately obvious why an increase in globalization would increase market concentration the strong correlation with export exposure justifies an analysis. The data on international trade from Statistics Denmark allows for a direct test of whether firms grow predominantly through growth in exports. Alternatively, the missing growth in labor might be because the workforce has been offshored. The data contains information on imports that would allow us to address this question.

An increase in competition. Under certain specifications – in particular a classical Salop model – an increase in competition is consistent with a more productive firm being able to scale up while less productive firms are squeezed on the profit margin and consequently have higher labor share. This could either be because of a technological change, such as the internet, which allows firms to expand their market share faster, or from a reduction in trading costs. Statistics Denmark has data on the extent to which firms sell online and the importance of international trade for firms.

A slow-down in catch-up / a lower rate of creative destruction. A decrease in the rate of creative destruction – the ability of laggard firms to catch up or take over leading firms – would give the leading firm longer time to establish a dominant market share, increase overall profits and thereby reduce own labor share, while increasing the labor share of other firms through squeezed profit margins. Such a theory would have strong predictions about a slowdown in the churn over of firms that can be examined using the panel data structure of the data. Furthermore, in a structural model of innovation such changes would have implications for a number of distributions of firm characteristics such as firm entry rate, firm growth, spread of productivity distribution etc.

Automation. A natural candidate for a decline in the labor share is automation. Though it is not immediately obvious how to reconcile that with a small upward shift in the median labor share it is worth trying to quantify the importance. Three measures present themselves i) the reported purchases of production equipment, ii) the use of very detailed import data on robots, which is presently being used by Anders Nielsen of Princeton to show the impact of robots on firms' labor composition, iii) data we have used in a different dataset which link individual industries and firms with their patenting of new automation technology.

The structural model naturally builds on the results established through the regression analysis and will be dependent on the analysis just described. Since preliminary results suggest a story that is most consistent with a changing environment of innovation, I will sketch how we intend to build a structural model of endogenous innovation to capture these changes. The starting point would be the Klette & Kortum (2004) model, which has already proved highly useful in other quantitative setting, notably including Denmark in Lentz and Mortensen (2008). Naturally, if we were to find that robot and automation technology is a substantial part of the explanation we would need to incorporate such elements as well. In such a case we would incorporate theoretical elements from a joint paper with David Hémous which incorporates automation technology into an endogenous growth model (Hémous and Olsen, 2018).

Expected Output and Publication Potential

The output of the project is expected to be 1-2 academic papers. The relevant existing papers on these issues have been published in top-5 journals or top field journals. Given that other countries are seeing analogous trends in the distribution of labor shares, a strongly supported conclusion on Danish data will be of interest to the international research community. Since the analysis will be conducted on Danish data there should be a natural Danish interest and we expect to present the results for Danish policy makers in a variety of ways. We plan to have results on the first part by early 2019 and the first draft of a paper by the end of 2019. After receiving feedback at the appropriate conferences and seminars we would then submit a paper by the end of 2020.

Budget

The firm data from Statistics Denmark is relatively standard and will cost around 15-25.000 to procure. Based on previous experiences of my colleagues matching the data with our patent data should be an additional 15.000 implying a total of around 35.000. In addition, I am applying for a teaching buy-out for three months for 133.569 since most of the analysis will be conducted by me. For some simpler analyses and data preparation I would need a research assistant for half a year for 35.473. After UCPH overhead this comes to a total of 244.851 kr. (see attached budget).

References

Karabarbounis, L and Neiman, B. "The global decline of the labor share", Quarterly Journal of Economics, 2013.

Kehrig, M and Vincent, N. "Growing productivity without growing wages: The micro-level anatomy of the aggregate labor share decline", Working Paper, 2017.

Autor, D., Dorn, D., Katz, L., Patterson, C. and Van Reenen, J. "The Fall of the Labor Share and the Rise of Superstar Firms", Working Paper, 2017.

Gutierrez, G., and Philippon, T. "Declining Competition and Investment in the U.S.", Working Paper, 2017.

Dechezleprêtre, A., Hémous, D., Olsen, M. and Zanella, C. "Automating Labor: Evidence from Firm-level Patent Data", Working Paper, 2017.

Klette, T. and Kortum, S. "Innovating firms and aggregate innovation", Journal of Political Economy, 2004.

Lentz, R. and Mortensen, D. "An empirical model of growth through product innovation", Econometrica.

Hémous, D. and Olsen, M. "The Rise of Machines: Automation, Horizontal Innovation and Income Inequality", Working Paper, 2018.