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Demand Regimes and the Business-Cycle: Feedback Effects between Capacity Utilization and Income Distribution Taking into Account Overhead Labor - SVAR-Estimates for Germany (2007 - 2021)

Author: Mads R. Hansen

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Mads R. Hansen

Technical University Berlin

Abstract: In this paper, Structural Vector Autoregressive (SVAR) models of quarterly data between 2007 and 2021 are estimated to assess short-term regimes of aggregate demand and distribution in Germany. The obtained Impulse Response Functions (IRFs) of the conventional neo-Goodwinian baseline case, with an aggregate wage-share, are compared to an alternative model, disaggregating the wage-share. The robustness of the results is tested by imposing an alternative post-Kaleckian ordering of (contemporaneous) causation. For the neo-Goodwinian baseline model, a profit-led demand schedule and a pro-cyclical wage-share are found. Disaggregation reveals, however, that the pro-cyclical wage-share is mainly driven by supervisory wages, while positive shocks in the direct wage-share had a stronger (negative) impact on aggregate demand, than the supervisory wage share. Imposing post-Kaleckian restrictions of causation yields a consistent (although weaker) estimate of the demand-regime but reversed distributive regimes: The aggregated wage-share behaves counter-cyclical, with the supervisory wage-share reacting stronger (negative) than the direct wage share, when subject to a positive shock in capacity utilization.

Keywords: Demand Regime; Aggregate Demand; Distribution; Capacity Utilization; Business Cycle; SVAR; Functional Income Distribution; Overhead Labor; Germany;

JEL Classification Codes: E12; E25; E6

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Contact: Mads.Hansen@TU-Berlin.de
https://orcid.org/0000-0001-9098-4346

1. Introduction

The model of Amit Bhaduri and Stephen Marglin (1990), a synthesis of Marxian and Keynesian ideas, is the current 'workhorse' of post-Keynesian macroeconomics. It allows for both, profit- and wage-led regimes of aggregate demand in an overall demand-constrained economy. Extending the model with a distributive function, increased economic activity might induce a wage-squeeze (distributing towards capital) or a profit-squeeze (distributing towards labor). The interpretation of this very general model, however, is the subject of vital debate (Hein 2017). Especially two interpretations and applications are relevant for empirical investigation and discussion.

For the classically inspired "neo-Goodwinian" scholars, the Bhaduri-Marglin model allows for a generalization of Marx's ideas of the business-cycle, which were previously formalized by Goodwin (1967). Accordingly, feedback effects between economic activity, distribution, and aggregate demand, would lead to cyclical movement of the economy. A pro-cyclical wage share (profit-squeeze) is expected to decrease profitability to a level that induces adverse effects on investment demand, which cannot be compensated by increased consumption demand of a higher wage-share. Starting with Barbosa-Filho and Taylor (2006) this reasoning spurred several empirical investigations. These use an aggregative empirical approach and estimate demand and distribution schedule simultaneously, usually with Vector Auto Regressive (VAR) estimates of lagged values of capacity utilization and the wage-share.

Those post-Keynesian scholars, however, who are rather inspired by Michał Kalecki's ideas, were, for long, rather concerned with medium or long-term models of the economy and did not focus on the business cycle (Stockhammer 2017). Recently, however, the interest in alternative short-run models has grown (Lavoie 2009, 2017; Stockhammer 2017; Fiebiger and Lavoie 2019; Lavoie and Nah 2020). In terms of distributive dynamics, these post-Kaleckian short-term models dedicate a special role to the distinction between overhead employees (managers), who receive a wage-premium and are employed in proportion to the capital stock, and thus potential output, and direct workers who are employed in proportion to the actual level of output. Different from the above-mentioned (neo-)Goodwinian models, post-Kaleckian models don't solely rely on feedback effects of (domestic) demand components and their distribution but stress the importance of credit and external and autonomous demand components (Fiebiger 2018; Fiebiger and Lavoie 2019) for capacity utilization, as well as cost-productivity effects (Lavoie and Nah 2020) for aggregate demand, due to the existence of overhead employees/managers. The model generates in the short run a positive relationship between capacity utilization and the profit share, driven by aggregate demand dynamics with pro-cyclical effects on labor productivity, which redistributes income in the upswing from the wage- towards the profit-share. This might bias aggregate estimates of short-term demand regimes, like those of neo-Goodwinians, towards finding profit-led results.

In this paper, I investigate whether the aggregative empirical study of demand regimes in Germany is biased towards finding profit-led results when the wage-share is not disaggregated in overhead and direct labor compensations, and whether its results for distributive- and demand-schedule are robust to different theoretical assumptions of contemporaneous causation. Inspired by Michael Cauvel (2023) and especially Lilian Nogueira Rolim (2019), this work provides first evidence for the relationship between possible pro-cyclical productivity-, as well as more nuanced demand feedback-effects, through the existence of overhead labor, for countries other than the USA.

Structural Vector Auto Regressions (SVARs) are estimated, and the obtained impulse response functions of the baseline model (wage-share, capacity utilization) and the alternative model (capacity utilization, supervisory-wage-share, direct-wage-share) are compared. To test the robustness of the findings to theoretical assumptions of causality, the neo-Goodwinian structure is contrasted by an alternative structure of causality, suggested by the post-Kaleckian model (Lavoie and Nah 2020).

The next section will present a brief overview of the empirical literature regarding demand regimes of Germany. In the third section, the notion of overhead labor and the within distribution of wages is introduced. We present the empirical strategy and estimation results in the fourth section. The obtained results are discussed and contrasted with findings from the literature in section five, before concluding.

2. Empirical studies on demand regimes with a focus on Germany

Most empirical studies have used one of two econometrical methodological lines. This section gives a brief overview of the methods and presents the obtained results with a focus on Germany. The categorization is adapted from (Blecker and Setterfield 2019) but alternatives exist (Stockhammer 2017).

The ‘structural’ (or behavioral equations) approach estimates the different components of aggregate demand independently of each other and sums up the partial derivates of aggregate demand concerning the wage share, to obtain the total effect (Blecker and Setterfield 2019, p. 237). Bowles and Boyer (1995) were amongst the first to estimate the model of Bhaduri and Marglin empirically and find Germany to be slightly profit led. Naastepad and Storm (2007) analyzed demand regimes in OECD countries between 1960-2000 and found Germany’s aggregate demand to be wage-led. Hein and Vogel (2008) extended the timeframe by 5 years (1960-2005), applied different versions of the estimated equations and found demand to be wage-led for Germany, too. Stockhammer, Hein and Grafl (2011) investigated the effect of globalization and wage-moderation in Germany by analyzing annual data between 1970 and 2005 and found that the various effects of globalization (like increased international competition, capital mobility and trade) are partially offsetting each other and are not sufficient to change the demand-regime of Germany, as a large open economy, from its wage-led nature. Hartwig (2014) estimated the Bhaduri-Marglin model with OECD panel data and found on average wage-led regimes of aggregate demand. In a global model focusing on G20 countries, Onara and Galanis (2014) found Germany to be wage-led. Even though some countries were identified as profit-led, a simultaneous decline in wage-shares led to decreased growth in all countries. Onara and Obst (2016) found in their estimation of a multi-country demand-led growth model that a lower wage share led to decreased growth in Germany, as well as the EU15 as a whole. Stockhammer, Rabinovitch and Reddy (2021) took a historical perspective and analyzed data from 1870 to 2010 and found the demand regime of Germany overall to be wage-led.

The ‘aggregative’ (or ‘reduced form’) approach estimates the effects of the wage-share, or any control variable, on economic activity (usually proxied by capacity utilization) directly and simultaneously (Blecker and Setterfield 2019, p. 237). This system approach is often utilizing variants of the Vector Autoregressive Model (VAR), which runs regressions of lagged dependent and independent variables on the dependent variable. Impulse response functions (IRFs) analyze the dissemination of shocks in one variable onto the others over discrete time. To the best of my knowledge, there appears to be a notable absence of VAR-based analyses pertaining to the aggregate demand dynamics of Germany. Consequently, the ensuing discussion will provide only a brief overview of publications that pioneered this empirical strategy in the context of (Neo-) Goodwinian theory or applied it in an international context.

Goldstein (1999) is credited with pioneering this methodology in his exploration of traditional Goodwin patterns within the United States economy, wherein he uncovered evidence supporting the existence of a profit-squeeze phenomenon. Building on this foundation, Barbosa-Filho and Taylor (2006) employed a similar approach to empirically validate their neo-Goodwinian theory, utilizing US data spanning the years 1948 to 2002. Their VAR model, which incorporated lagged variables while excluding contemporaneous effects, aligned with their theoretical framework and revealed profit-led demand regimes and a profit-squeeze in the context of the United States.

Subsequently, Kiefer and Rada (2015) extended the application of this methodology by estimating various versions of the (neo-)Goodwinian model using generalized least squares (GLS) with lagged values of the dependent variable onto itself. Their analysis encompassed panel data from 13 OECD countries, including Germany. Notably, their findings echoed those of Barbosa-Filho and Taylor (2006), albeit with larger slopes, indicative of a more pronounced profit squeeze and relatively weaker profit-led demand dynamics.

Summing up, it is interesting to note that post-Kaleckian authors, concerned with medium or long-term aggregate demand regimes, rather use a structural approach and find wage-led demand, while neo-Goodwinians prefer (aggregative) VAR estimates to determine short-term aggregate demand regimes, which seem profit-led. Hence, the findings remain inconclusive, for which a variety of reasons are discussed: Amongst them the potential coexistence of short-term profit-led and medium-term wage-led regimes owing to varying timeframes for cost and demand effects (Blecker 2016), or the omission of considerations related to hoarded overhead labor, resulting in a cyclically evolving composition of the employed labor force. This second dynamic would animate the digression of unit overhead labor cost over the cycle and could consequently influence cyclical income distribution. This argument will be the subject of the forthcoming inquiry.

3. Theory and empirics of the distribution of wages between direct and overhead labor

The distribution of wages has received growing attention from economists in orthodox and heterodox traditions alike, as wage differentials increase (Piketty, 2018; Wang, 2020). While neoclassical economists focus on the increasing returns to skill, for example, due to technical change and increased international competition (Juhn, Pierce, and Murphy 1993), heterodox, especially Marxian and post-Keynesian, authors focus on the increasing proportion of unproductive labor in the wage-share (Mohun 2014), the distribution between managers and workers (Palley 2017; Tavani and Vasudevan 2014), and the role of overhead labor (Lavoie 2009), which is related to both of the previous distinctions.

3.1. Theory of the distribution of wages between direct and overhead labor

Two effects of the within distribution of wages are relevant for the inquiry into demand regimes and distributive dynamics. First, we must consider that the propensities to consume and to save differ not only between capitalists and workers but also between workers with various levels of wage income. These demand effects will likely have an influence on the demand schedule (Tavani and Vasudevan 2014; Carvalho and Rezai 2016; Palley 2017). Secondly, when considering overhead labor, several authors have argued that overhead-wages are experienced by capitalists as fixed costs, and their elasticity of overhead-employment to profits is lower than for direct labor as capitalists 'hoard' supervisors over the cycle, resulting in pro-cyclical labor productivity (Kalecki 1971; Kurz 1991; Lavoie 2009; 2014, pp. 323–325; Lavoie and Nah, 2020). This would influence the distribution schedule as well as the investment decision.

Differences in Propensities to Consume/Save of Workers and Managers

Concerned with within-wage inequality and aggregate demand, Tavani and Vasudevan (2014) follow the Kaleckian tradition. Their three-class model is driven by differences in the saving rates of managers and workers and produces "two distinct regimes with respect to the responsiveness of investment demand to profitability: a low investment–response regime, where effective demand appears to be both wage–led and inequality–led; and a high investment–response regime, where demand looks profit–led" (Tavani and Vasudevan, 2014, p. 1). Both regimes imply a negative response of capacity utilization to a more equal income distribution. This highlights the shared interest of capitalists and managers for a more unequal income distribution and high rates of profit.

Palley (2017) on the other hand uses a rather post-Kaleckian framework for his analytical three-class model of distribution and demand. He finds that changes in the within wage distribution can lead to a misidentification of the demand regime as profit-led when the workers share declines. The propensity to consume is assumed to be higher for non-supervisory workers, than supervisors. Hence, redistribution towards non-supervisory workers could increase capacity utilization through the consumption channel, without diminishing profitability and as such investment demand. In empirical studies, researchers ought to take this into account to avoid inappropriate policy recommendations.

The Special Role of Overhead Employment

Kalecki, defines the 'overhead' as those employees who earn salaries and are concerned with the 'realization' of profits (by organizing and controlling the labor process) and direct laborers as wage-earners. He shows that a wage-share combining wages and salaries is less fluctuant than the gross income of the private sector and stresses the importance of their distinction as of "considerable interest" (Kalecki 1971, p. 75) to understand the business cycle.

Similarly, Kurz (1991, p. 423) notes: "While manual workers are employed in proportion to the level of production, overhead workers are employed in proportion to the capital stock in existence". This notion contrasts with the theoretical assumptions introduced above (Tavani and Vasudevan 2014; Palley 2017), which limited the differentiation of the wage-share to savings and demand effects and assumed a constant proportion of overhead labor to output, not capital stock or potential output. The non-cyclicality of overhead labor has severe consequences for modelling, as this property modulates the cost-structure of firms as well as labor productivity over the cycle. Not only was this feature stressed by Weisskopf (1979) in his refined Marxian theory of the cycle, but especially concerning the relationship of distribution and growth, as well as the impact of technical change, by neo- and post-Kaleckian authors (Rowthorn 1981; Kurz 1991; Lavoie 1992; Lavoie 1995, 2014; Hein 2014).

Lavoie and Nah (2020) combine Sraffian and post-Kaleckian literature and aim at model-consistency between short-run cycle and long-run trend. The long-run trend is determined by super multipliers (Freitas and Serrano, 2015; 2017) of (semi-) autonomous demand components (Fiebiger 2018; Fiebiger and Lavoie 2019). The short-run, however, is strongly driven by cyclical cost-, and labor-productivity-effects due to the existence of overhead labor, and distributive dynamics between the classes, which determine short-run aggregate demand and realized capacity utilization.

In opposition to the neo-Goodwinian models introduced above (Barbosa-Filho and Taylor 2006; Carvalho and Rezai 2016), the share of profits becomes a positive function of capacity utilization (Lavoie and Nah 2020). With increasing economic activity, the relative proportion of supervisory in total labor ought to decrease, as is the respective supervisory-wage-share (assuming a constant mark-up on direct (non-supervisory) unit labor costs). Hence, unit overhead labor costs vary inversely with capacity utilization. With a constant price mark-up at the normal rate of capacity utilization, and hence constant target rate of return, the profit share (and thus the overall wage share) turns endogenous to aggregate demand and capacity utilization. This formulation suggests a contemporaneous effect of capacity utilization on the profit-share, which is captured in the alternative orderings of causation specified in the empirical section below (Section 4, Table 1).

Understanding the demand effects of a permanent increase in the wage-premium of supervisory workers is not trivial, as two conflicting effects occur: On the one hand, a redistribution from retained profits to supervisors increases consumption, as managers consume which firms do not. On the other hand, a redistribution from direct labor to supervisory labor decreases aggregate demand, as worker's propensity to consume is higher than of supervisors. Hence, the overall effect of a larger wage-difference between direct and supervisory labor depends on the retention ratio of the firm, supervisors' propensity to consume and the distance of capacity utilization to its target rate.

Considering, for the short run with a fixed level of autonomous consumption, the effect of a permanent increase in the target rate of return on equilibrium values of profit share and capacity utilization, Lavoie and Nah (2020) postulate three cases which depend on the relative movement of supply-side and demand-side profit curves. While the demand side profit curve shifts up in parallel fashion with an increase in the normal rate of profit, the supply-side profit curve reacts strictly stronger and shifts upwards dependent on the magnitude of response of the equilibrium rate of utilization to the change in the normal rate of return, and therefore on the level of realized capacity utilization. In all cases the model generates wage-led results "in the sense that an autonomous increase in the costing margin of firms calculated at the normal rate of capacity utilization, i.e., an autonomous increase in the mark-up, leads to a fall in the rate of utilization" (Lavoie and Nah 2020, p. 19). However, under certain conditions, an increase in the target rate of profit can generate lower equilibrium values for capacity utilization and profit-share. Empirical investigations of the demand-regime would therefore falsely identify this regime as profit-led (Lavoie and Nah 2020, p. 16).

3.2. Empirics of the distribution of wages between direct and overhead labor

The seminal empirical works on unproductive and, as part of that, overhead labor, are produced by Simon Mohun (2005, 2006, 2014). Mohun and Veneziani (2008) find detrended short-run Goodwin-type patterns for the aggregated wage-share, which remain when excluding the supervisory wage share. This could be interpreted as evidence for the robustness of the Goodwinian narrative, even in the disaggregated case.

Carvalho and Rezai (2016, p. 3) theorize the "saving rate to be an increasing function of wage inequality" and follow the neo-Goodwinian approach (Barbosa-Filho and Taylor, 2006) in their empirical determination of demand regimes. Estimating a two-dimensional threshold VAR (TVAR) for annual US data between 1967 and 2010, they find the neo-Goodwinian profit-led results are largely due to rising wage inequalities after 1988 and obtain weaker profit-led results for periods with lower inequality in the income distribution, supporting their theoretical considerations.

Michael Cauvel (2023) investigates the pro-cyclical productivity hypothesis raised in contrast to the neo-Goodwinian model (Lavoie 2014, 323–325; 2017). Estimating impulse response functions from (structural) vector autoregression (SVAR) models for quarterly US data between 1952 and 2016 he finds the profit-led results to be biased, when not adjusting the wage share for productivity effects and contemporaneous effects of the variables onto each other. Including these effects, he finds a wage-led aggregate demand and wage- as well as profit-squeeze regarding distribution.

Using US data from Mohun (2014), Lilian Nogueira Rolim (2019) investigates another empirical approach by directly disaggregating the wage share into a supervisory wage share and a direct wage share. She conducts Structural VAR-estimates (SVAR) utilizing annual data from 1967 to 2010 and compares the obtained aggregated impulse response functions (AIRFs) of an aggregated baseline model similar to the neo-Goodwinian one (Barbosa-Filho and Taylor, 2006) to an alternative model, which includes two distinct wage-share variables (direct and supervisory). Nogueira Rolim finds an overall profit-led demand regime in the aggregated estimate, but the disaggregated data shows evidence for a positive effect of an increase in the direct wage-share on capacity utilization, indicating a possible bias towards finding profit-led results in the aggregate estimate. Regarding the distributive curve, she presents weak support for the counter-cyclicality of the supervisory-wage-share.

4. Empirical Strategy and Methodology

Following the arguments developed above, this section investigates whether (stronger) profit-led results arise if the wage-share is not disaggregated, indicating a bias toward finding profit-led results when disregarding the distribution of wages between supervisors and workers. To do so, the baseline model, following broadly neo-Goodwinian lines (Barbosa-Filho and Taylor 2006), is compared to an alternative model which decomposes the wage-share in a supervisory-wage-share (overhead labor) and a direct-wage-share (direct labor) following Nogueira Rolim's (2019) strategy.
Both models are estimated by Structural Vector Autoregression Models (SVAR). The obtained Aggregated Impulse Response Functions (AIRFs) are analyzed to understand how the dependent variable react over time to unit-shocks in one of the independent variables.

$$y_t = \mu + \sum_{j=1}^{L} F_j y_{t-j} + e_t \tag{1}$$

Where yt is a vector of dependent variables which will be specified below, t is the time period, μ is the constant, Fj represents the coefficient matrices to be estimated, et the error term, L is the number of lags, which are indexed as discrete time by j = 1, …, L.

The vector of dependent variables is specified as the first differences of the natural-log values of capacity utilization (CU) and the wage-share (WS) for the bivariate baseline model: yt = [Δ ln(CUt), Δ ln(WSt)]. For the alternative model, the wage share is disaggregated such that we arrive at a multivariate VAR-model with the first differences in the natural log values of capacity utilization (CU), the direct-wage-share (DWS) and the supervisory-wage-share (SWS) as endogenous variables:
yt = [Δ ln(CUt), Δ ln(DWSt), Δ ln(SWSt)]. The first differences of the log values are taken to avoid unit-root-processes and achieve stationarity of all variables, which is a precondition for VAR estimations. The respective tests can be found in the Appendix, Table 1.

As we are interested in not only correlations but investigating the causal relationship of the endogenous variables in the system, we must impose restrictions on the contemporaneous effects of variables onto each other. These 'structural restrictions' are an option to resolve the identification problem of macroeconomic systems in which ‘everything influences everything’. It is a precondition to obtain uncorrelated errors of the endogenous variables and be able to conduct meaningful AIRFs. This paper utilizes Cholesky decompositions (Sims 1980). Following this method, variables have only contemporaneous effects on variables that come after them (further to the right) in the ordering. The Cholesky ordering follows economic theory, although we will see statistical tests for their plausibility. According to the previous literature review, we can contrast the neo-Goodwinian causal reasoning with the post-Kaleckian.

Whereas the original model of Barbosa-Filho and Taylor (2006) excluded any contemporaneous effects, successors have improved on this. I will follow their specification (Carvalho and Rezai 2016; Cauvel 2023; Nogueira Rolim 2019) and define the Goodwinian baseline causation as: The wage-share contemporaneously affects capacity utilization. Conversely, the post-Kaleckian reasoning: Capacity utilization contemporaneously affects the wage share. Extensions for the disaggregated alternative model can be found in Table 1. In this paper, the baseline Goodwinian ordering is thus tested for its sensitivity to theoretical assumptions by an alternative ordering of the post-Kaleckian form (Lavoie and Nah 2020).

Table 1: Cholesky Orderings (contemporaneous effects on all variables to the right)

	Baseline:	**Alternative:**
Neo-Goodwinian (G)	Δ ln(WS) → Δ ln(CU)	Δ ln(DWS) → Δ ln(CU) → Δ ln(SWS)
Post-Kaleckian (K)	Δ ln(CU) → Δ ln(WS)	Δ ln(CU) → Δln(SWS) → Δln(DWS)

Note: WS := wage-share; CU := capacity utilization; DWS := direct-wage-share; SWS := supervisory-wage-share

In VAR estimates, the dependent variable is contemporaneously, or via lags, related to all other variables and itself. Our aggregate approach estimates therefore the demand schedule simultaneously with the distribution schedule.

Based on the post-Kaleckian model of Bhaduri and Marglin (1990), aggregate demand depends (in the closed economy case) on the reactions of the two demand components to changes in the share of profits (π) and capacity utilization (U). I_{π} and I_U represent the partial derivatives of the Investment function to the share of profits and capacity utilization, respectively. S_{π} and S_U likewise the partial derivatives of the savings function.

$$\frac{dU}{d\pi} = \frac{I_{\pi} - S_{\pi}}{S_U - I_U} \tag{2}$$

Aggregate demand will be categorized as ‘wage-led’ when an increase in the wage share (decrease of the profit share) overcompensates the negative impact of falling profitability on investment by consumption such that: $dU/d\pi < 0$. Conversely, we will characterize aggregate demand as 'profit-led' and expect investment demand to react stronger to a decrease in profitability than consumption demand, when: $d\text{U}/d\pi > 0$.

Regarding the distributive relationship, a profit squeeze is theorized, and was empirically suggested, by Barbosa-Filho and Taylor (2006) as well as Carvalho and Rezai (2016). Increasing economic activity (proxied by U) could have positive effects on wage-bargaining power of workers, as the relative demand for labor rises, reducing the share of profits. Lavoie and Nah (2020) have provided another explanation for this observation. Under certain conditions a negative response of the profit-share to an increase in capacity utilization might occur due to an increased target rate of profits, changes in the propensity to save supervisors or the wage-premium of overhead labor. In any case, a profit-squeeze is characterized by: $d\pi/d\text{U} < 0$. The alternative distributive schedule found in the literature is the wage-squeeze which is characterized by a falling wage-share when capacity utilization increases. This can not only be explained by structural effects of wage-bargaining (wages grow less than productivity over the cycle) but also through the existence of an overhead labor wage premium as a fixed cost for capitalists (Lavoie 2017; Lavoie and Nah 2020), hence the profit-share can be understood as pro-cyclical. In terms of derivatives: $d\pi/d\text{U} > 0$.

4.1. Data

Data on four variables are needed: First, the aggregated wage-share, second the supervisory-wage-share, third the direct-wage-share and fourth, capacity utilization.

First, to obtain the wage-share, the national accounts of Germany ('Volkswirtschaftliche Gesamtrechnung des Bundes') is used, which is available online in quarterly and annual periodicity after 1991 through the "Genesis" database of the German Federal Statistical Office (in the following referred to as 'Destatis'). To measure the wage-share, total employee compensation is divided by gross value added. Seasonally adjusted values are taken. Hence,

$$WS := Employee\ Compensation/Gross\ Value\ Added. \qquad (3)$$

As Mohun and Veneziani (2008) discuss, this approach is likely overstating the profit-share as the compensation of self-employed as well as income from rents are included in the share of profits. Additional bias is added, as employee compensations also include wages paid to state-employees, who should not be subject to cyclical movements, and employees in the farming-sector, which will likely be exposed to different dynamics not included in the theoretical considerations of the models under investigation.

Differentiated data is only available since 2007 when previous surveys were extended to employees outside of industry and mining and classified all wage-earners in 5(/6) performance groups, as well as by gender, thereby allowing a much better understanding of the wage-structure. The survey builds the bases for the computation of employee compensation in national accounting and should therefore be highly consistent with our measure of the wage-share. It surveys 40.500 firms with more than 10 employees (for some sectors more than 5) quarterly and the response is mandatory by law (Destatis 2021). Figure 1 presents an overview over the sum of real wages in billions of € in 2015 values.

'Performance-groups' (Leistungsgruppen - LG) group together employees with similar tasks, qualifications, and position in the production process. 'Marginally employed' are those who work without social insurance, a form of work introduced during the liberalization of the labor market ('Agenda 2010'). LG5 groups unskilled workers, LG4 semi-skilled workers and LG3 skilled workers who received vocational training or a university degree. LG2 gathers experienced workers with vocational training or a university degree, some of which have small-scale supervisory authority, like foreman or 'Meister'.

LG1 gathers all those who have 'supervisory and dispositional authority' and will therefore be our proxy for supervisory labor. LG2 was not included in this proxy as those low-rank supervisors are rather sensitive to changes in economic activity and often not 'hoarded'. Future studies could however expand on this notion and derive a less conservative measure of overhead labor. Figure 2 gives an overview of the number of employees over time. The count of direct laborers increases over the sampled period but exhibits declines in times of crises, as observed in 2009 and 2020. The number of supervisors however is relatively constant, as the theory of overhead-labor suggests.

The supervisory-wage-share is hence calculated from the quarterly sum of wages of LG1 added to the average sum of annual special payments, to avoid seasonal effects (e.g., Christmas and holiday bonuses), divided by the sum of all wages and annualized bonuses, to obtain the fraction of supervisory wages, which is then scaled up to the wage share by multiplication of the factor with the wage-share:

$$SWS := \frac{\sum Wages\ of\ LG1 + \frac{Annual\ Special\ Payments\ of\ LG1}{4}}{\sum All\ Wages\ and\ Special\ Payments} * WS \tag{4}$$

The bias introduced in the aggregated measure of the wage-share is slightly mitigated in the disaggregated wage-shares, as the wages from the quarterly earnings survey exclude those paid to public employees, such that the dynamic is governed by industry-wages, although the level still includes wages from public employment.

Third, the direct wage-share is computed in the same fashion, which corresponds to one minus the supervisory wage-share:

$$DWS := (1 - SWS) * WS =$$

$$\frac{\sum Wages\ of\ LG2{-}5\ and\ marginal\ empl. + \frac{Annual\ Special\ Payments\ LG2{-}5}{4}}{\sum All\ Wages\ and\ Special\ Payments} * WS \tag{5}$$

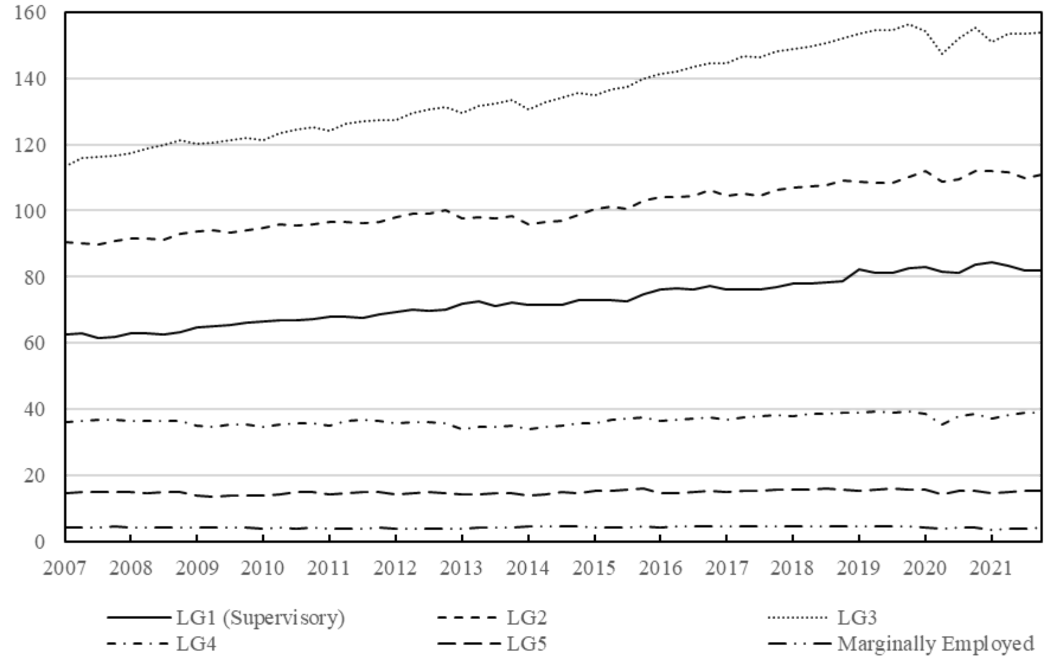
The obtained measures of the wage-share and the disaggregated shares is presented in Figure 3. In the years following 2009, there was a notable shift in wage dynamics compared to the preceding decade, characterized by relatively positive trends in wages. This led to an increase in the wage share, primarily driven by direct wages. During times of crises, such as in 2009 and 2020, the wage share exhibits spikes. This phenomenon occurs because employee compensation remains relatively stable, thanks to the restrictive labor laws for direct workers and the hoarding of overhead labor, even as capacity utilization declines sharply.

Fourth, a measure for capacity utilization is needed. Capacity utilization is defined as:

$$CU := \frac{Realized\ Output}{Potential\ Output} \tag{6}$$

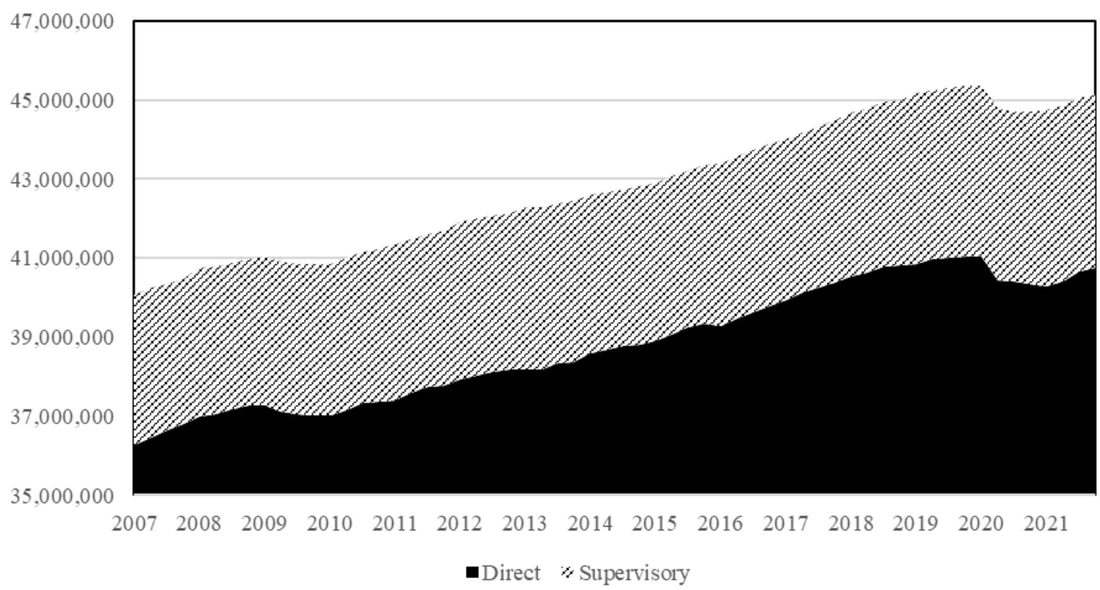
At least four approaches exist to estimate potential output and accordingly capacity utilization: Purely statistical, using a production function, estimating the average workweek of capital, or by conducting surveys. For the forthcoming estimation, quarterly survey data of the IFO-institute (IFO 2022) is used, which effectively measures the difference between actual capacity utilization and its target, or the short-term rate of capacity utilization (Nikiforos 2016).

Figure 1: Sum of Real Wages in Billions of 2015 € in Germany, differentiated in Performance Groups (2007–2021 quarterly)



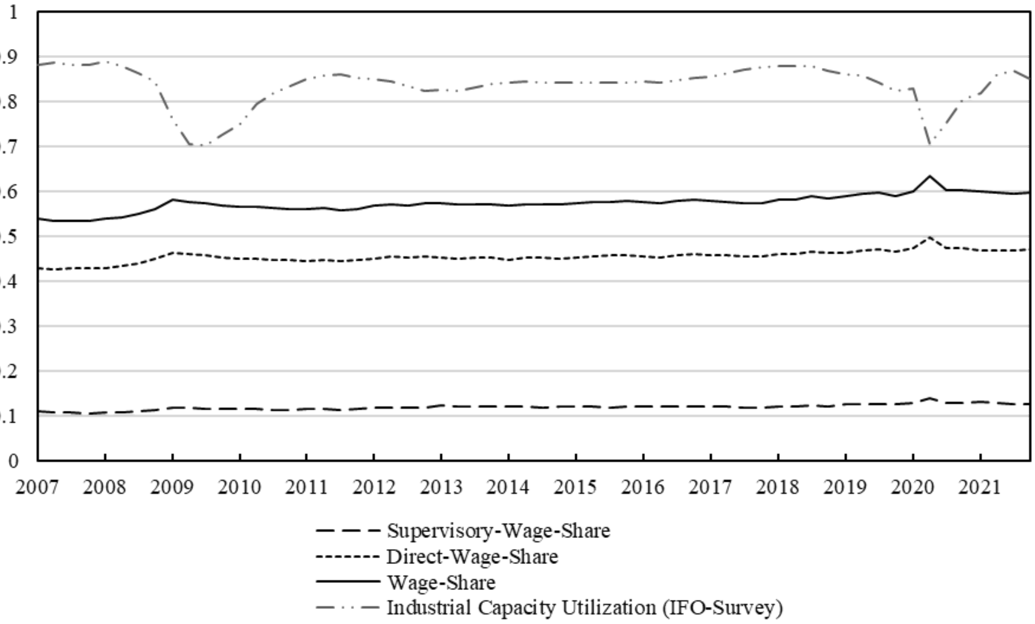
Data: Destatis 2022a, authors elaboration.
Details: LG1-5 are performance groups, description in text.

Figure 2: Number of Employed Individuals in Germany Disaggregated in Supervisory- and Direct-Labor (2007–2021 quarterly)



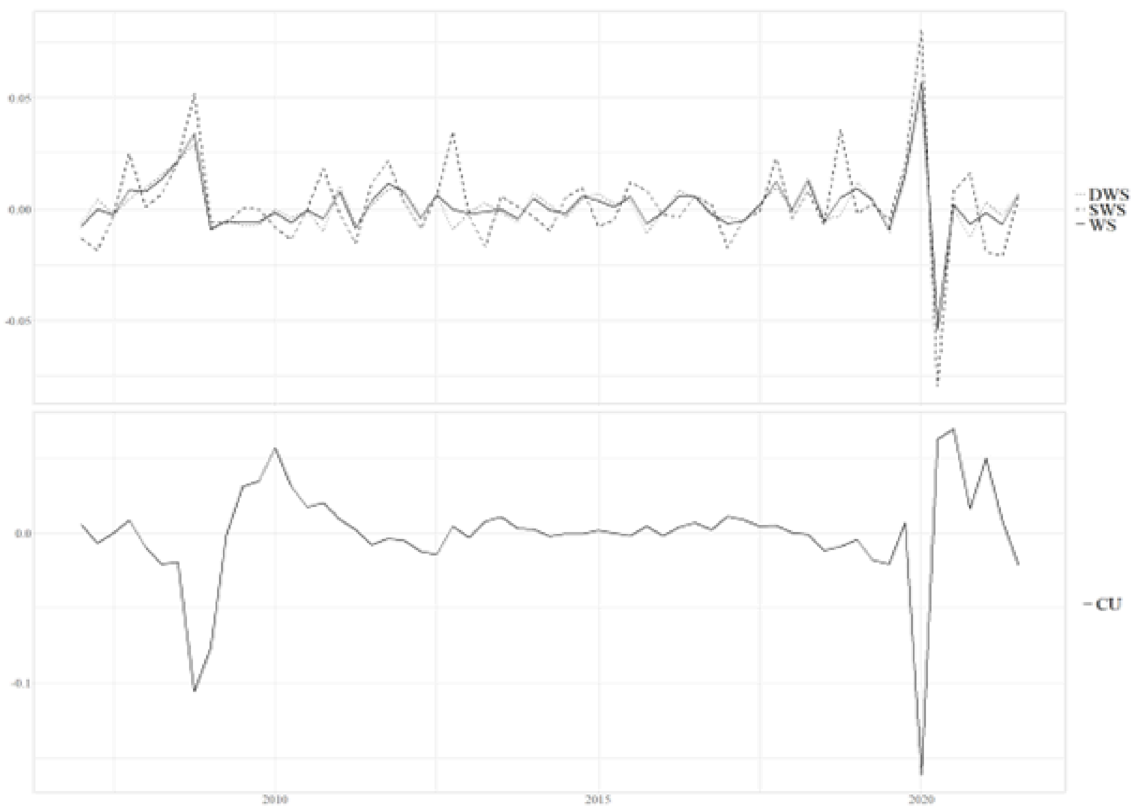
Data: Destatis 2022a, authors elaboration.
Details: Overhead: LG1, Direct: LG2-5 and marginally employed

Figure 3: Evolution of the Wage-Share in Germany, disaggregated in Direct- and Supervisory-Wage-Share, along with Capacity Utilization (2007-2021 quarterly)



Data: Destatis (2022a; 2022b; 2022c), authors elaboration.

Figure 4: Overview over Transformed Data: Direct- (DWS), Supervisory- (SWS), Wage-Share (WS) and Capacity Utilization (CU)



Data: Destatis (Destatis 2022a; 2022b; 2022c), IFO (2022), author's elaboration.
Details: All data log-transformed and first order differenced.

4.2. Estimation and Results assuming neo-Goodwinian Causation

All data is log-transformed and taken as their first difference to obtain stationarity and results not in levels but percentages of change. This is unproblematic, as we do not decompose our results for different demand components later (Barbosa-Filho and Taylor 2006; Cauvel 2023). Differencing the already stationary variable of capacity utilization is not biasing our estimate but increases the internal consistency and simplifies interpretation. After the transformation (Figure 4) all conducted tests indicate stationarity (see Appendix, Table 1 for test-results). All tests, as well as the following estimations are conducted using 'R' as the statistical software.

For our baseline model, the optimal length of lags is decided by comparing several tests. The Akaike information criterion (AIC) and Final Prediction Error (FPE) suggest a lag of four, Hannan Quinn (HQ) and Schwartz (SC) criterion a lag of one. A lag of four is chosen to obtain white-noise residuals. The model output can be seen in Table 2.

Tests for Granger-causality (Table 3) do not find much evidence against (contemporaneous) causation in either direction. The conducted tests do not object to the preceding introduction of structural restrictions. Introducing the structural restrictions in the form of a lower-triangle Cholesky-ordering of the Neo-Goodwinian form (G) yields the A-matrix in Table 4.

The obtained AIRFs are presented in Figure 5. The results indicate a profit-led demand regime (Figure 5 b), as the response of capacity utilization to a positive one-unit shock in the wage-share is negative (~-3%). The distribution schedule (Figure 5 c) is characterized as profit-squeeze, as with a unit shock of capacity utilization, the wage-share reacts positively (~0.3%). This corresponds to the theoretical expectations of the Goodwinian narrative and will be discussed below.

The alternative model differentiates the wage-share in direct-wage-share and supervisory-wage-share. The AIC criterion advises a lag of ten, HQ a lag of three, SC a lag of one and FPE a lag of five. To obtain white-noise residuals, a lag of five is chosen. The result of the estimation can be found in Table 3. Tests for Granger-causalities (Table 5) provide less evidence for the disaggregated cases, than the baseline estimate. Nonetheless, we can reject nearly all hypotheses that variables could not (instantaneously) cause each other on the 10% level. However, the hypothesis that capacity utilization might not cause the wage-shares, cannot be easily rejected. Again, an A-Matrix is estimated to implement the structural restrictions to the VAR (Table 6). The obtained AIRFs are presented in Figure 5.

Table 2: Output of the VAR estimate of Baseline (reduced) and Alternative model

	Baseline		Alternative		
	D(ln(ws))	D(ln(cu))	D(ln(cu))	D(ln(dws))	D(ln(sws))
d_ln_ws_ts.l1	0.48 *	-1.90 **			
	(0.23)	(0.56)			
d_ln_cu_ts.l1	0.28 **	-0.42 .			
	(0.09)	(0.23)			
d_ln_ws_ts.l2	-0.09	-0.14			
	(0.25)	(0.63)			
d_ln_cu_ts.l2	-0.19 .	0.32			
	(0.10)	(0.24)			
d_ln_ws_ts.l3	0.23	-0.44			
	(0.26)	(0.63)			
d_ln_cu_ts.l3	0.21 .	-0.27			
	(0.10)	(0.26)			
d_ln_ws_ts.l4	0.53 **	-1.11 *			
	(0.19)	(0.48)			
d_ln_cu_ts.l4	0.10	-0.43 *			
	(0.08)	(0.19)			
d_ln_dws_ts.l1			-2.09 **	0.39	1.11 **
			(0.66)	(0.27)	(0.36)
d_ln_cu_ts.l1			-0.26	0.25 *	0.34 *
			(0.27)	(0.11)	(0.15)
d_ln_sws_ts.l1			0.42	0.09	-0.43
			(0.49)	(0.20)	(0.27)
d_ln_dws_ts.l2			-0.81	-0.16	0.45
			(0.76)	(0.31)	(0.41)
d_ln_cu_ts.l2			0.21	-0.18	-0.25
			(0.27)	(0.11)	(0.15)
d_ln_sws_ts.l2			0.45	0.04	-0.45 .
			(0.44)	(0.18)	(0.24)
d_ln_dws_ts.l3			-0.51	0.23	0.67
			(0.76)	(0.31)	(0.41)
d_ln_cu_ts.l3			-0.14	0.18	0.19
			(0.28)	(0.11)	(0.15)
d_ln_sws_ts.l3			0.14	-0.05	-0.17
			(0.48)	(0.19)	(0.26)
d_ln_dws_ts.l4			-1.08	0.11	0.50
			(0.76)	(0.31)	(0.41)
d_ln_cu_ts.l4			-0.31	-0.02	0.20
			(0.29)	(0.12)	(0.15)
d_ln_sws_ts.l4			0.09	0.07	0.43 .
			(0.43)	(0.18)	(0.23)
d_ln_dws_ts.l5			0.69	-0.25	-0.18
			(0.67)	(0.27)	(0.36)
d_ln_cu_ts.l5			-0.21	0.03	0.09
			(0.24)	(0.10)	(0.13)
d_ln_sws_ts.l5			-0.82	0.03	0.39
			(0.47)	(0.19)	(0.25)
Number of Observations	55	55	54	54	54
R^2	0.29	0.34	0.44	0.29	0.54
Adjusted R^2	0.17	0.22	0.22	0.02	0.37

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Table 3: Tests for Granger Causality: Baseline Model

Null hypothesis	*F-Test*	*df*	*p-value*
D(ln(ws)) does not granger-cause D(ln(cu))	3.6434	4	0.008352
D(ln(cu)) does not granger-cause D(ln(ws))	4.3105	4	0.003024
	Chi-squared	***df***	***p-value***
D(ln(ws)) does not instantaneously granger-cause D(ln(cu))	21.323	1	0.00
D(ln(cu)) does not instantaneously granger-cause D(ln(ws))	21.323	1	0.00

Table 4: Estimated A-Matrix of Baseline SVAR in G-Ordering

	d_ln_ws_ts	*d_ln_cu_ts*
d_ln_ws_ts	1	0
d_ln_cu_ts	1.97	1

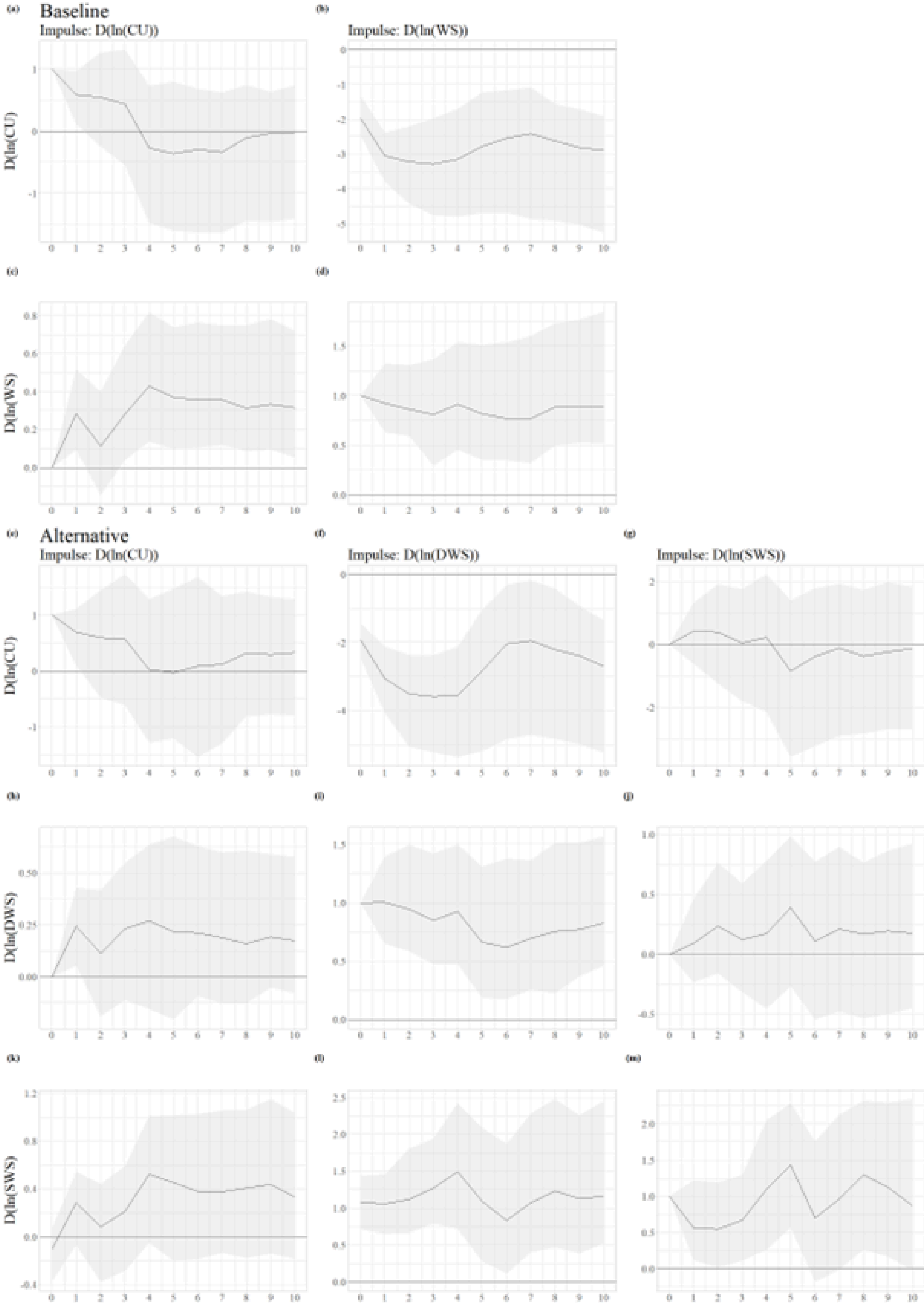
Table 5: Tests for Granger Causalities: Alternative Model

Null hypothesis	*F-Test*	*Df*	*p-value*
D(ln(dws)) does not granger-cause D(ln(cu)), D(ln(sws))	1.8195	10	0.06444
D(ln(sws)) does not granger-cause D(ln(sws)), D(ln(cu))	1.8733	10	0.05567
D(ln(cu)) does not granger-cause D(ln(dws)), D(ln(sws))	1.464	10	0.1616
	Chi-squared	***Df***	***p-value***
D(ln(dws)) does not instantaneously granger-cause D(ln(cu)), D(ln(sws))	22.671	2	0.0
D(ln(sws)) does not instantaneously granger-cause D(ln(dws)), D(ln(cu))	21.872	2	0.0
D(ln(cu)) does not instantaneously granger-cause D(ln(dws)), D(ln(sws))	21.872	2	0.0

Table 6: Estimated A-Matrix of Alternative SVAR in 'G'-Ordering

	d_ln_dws_ts	*d_ln_cu_ts*	*d_ln_sws_ts*
d_ln_dws_ts	1	0	0
d_ln_cu_ts	1.9266	1	0
d_ln_sws_ts	-0.8756	0.1054	1

Figure 5: Plots of Aggregated Responses to Various Impulses from SVAR-Estimates with neo-Goodwinian-Ordered Structural Restrictions, Baseline and Alternative Model



The AIRFs show a negative (~-2.75%) response of capacity utilization to a unit-increase in the direct-wage-share (Figure 5 f). The response is slightly weaker than in the baseline case (~-3%) (Figure 5 b). In terms of demand-regimes we interpret these results as profit-led demand. The response of capacity utilization to a shock in the supervisory-wage-share (Figure 5 g) is undetermined and fluctuates around zero with confidence interval stretching from +2% to roughly -3%. Comparing baseline and alternative model we find a (small) bias towards finding (stronger) profit-led results when not disaggregating the wage-share.

Looking at the distributive consequences of increased capacity utilization, our AIRFs suggest a positive (~0.3%) response of the wage-share to a unit-increase in capacity utilization, indicating a profit-squeeze for the baseline case (Figure 5 c). Interestingly, the response of the supervisory-wage-share (~0.3%) (Figure 5 k) is stronger, than that of the direct-wage-share (~0.2%) (Figure 5 h), when disaggregated. However, the 95% confidence intervals of the disaggregated estimates (Figures 5 k and h) stretch into the negative realms and leave some (>5%) probability for misidentified distributive regimes.

4.3. Estimation and Results assuming post-Kaleckian Causation

In the following, the sensitivity of the AIRFs is checked by an alternative Cholesky-ordering suggested by the post-Kaleckian literature on the business cycle (Fiebiger and Lavoie 2019; Lavoie and Nah 2020). It is argued that not the direct-wage-share contemporaneously affects the rate of capacity utilization, which both have effects on the supervisory-wage-share, but the other way around: Capacity utilization causes the supervisory-wage-share contemporaneously, and capacity utilization together with the supervisory-wage-share (with its effect as a fixed cost) influence the direct-wage-share (see Table 1).

The baseline-model is again estimated with four lags, following the FPE criterion (see Appendix Table 2 for estimation results). Imposing the structural restrictions introduced above, we obtain an A-matrix (Table 7) and derive AIRFs (Figure 6). While the response of capacity utilization to a unit-increase of the wage-share is negative (Figure 6 b), indicating a profit-led regime, and is as such consistent with our findings from the previous section, the distributive schedule displays a negative cumulated response of the wage-share to a positive shock in capacity utilization (Figure 6 c). Different from our findings above, this could be understood as a wage-squeeze distributive schedule, or a pro-cyclical profit-share, in the post-Kaleckian baseline model.

Estimating our alternative model with a lag of five (Appendix Table 2) and imposing structural restrictions (Table 8), we obtain AIRFs presented in Figure 6.

In the post-Kaleckian baseline model, a unit shock in the wage-share leads to a cumulated response of capacity utilization of negative ~3% after 10 quarters (Figure 6 b). This profit-led aggregated demand schedule is in line with that of G-ordering. The response of capacity utilization to a simulated shock of the direct-wage-share (Figure 6 f) is weaker (~-2%), but stronger than to a shock of the supervisory-wage-share (~-0.75%) (Figure 6 g). However, confidence intervals indicate that these results should be treated with caution. Especially the estimate for the demand response to a shock in supervisory-wage-share is ambiguous, as 95% confidence intervals stretch from ~+1.5% to ~-3.5%. As such there is a considerable probability (>5%) that our estimate of disaggregated demand response is mistakenly identified as profit led. The same is true, although to a lesser extent, for the response of capacity utilization to a shock in the direct wage-share.

In terms of distribution, a positive unit shock of capacity utilization results in a negative response of the wage-share (~-0.175%) (Figure 6 c). Considering the disaggregated model, after 10 quarters, the decrease in the supervisory wage-share is slightly stronger (~-0.25%) (Figure 6 k) than in the direct wage-share (~-0.2%) (Figure 6 h). The found wage-squeeze is a fundamentally different distribution schedule than in the Goodwinian-ordered specification of contemporaneous causation (profit-squeeze).

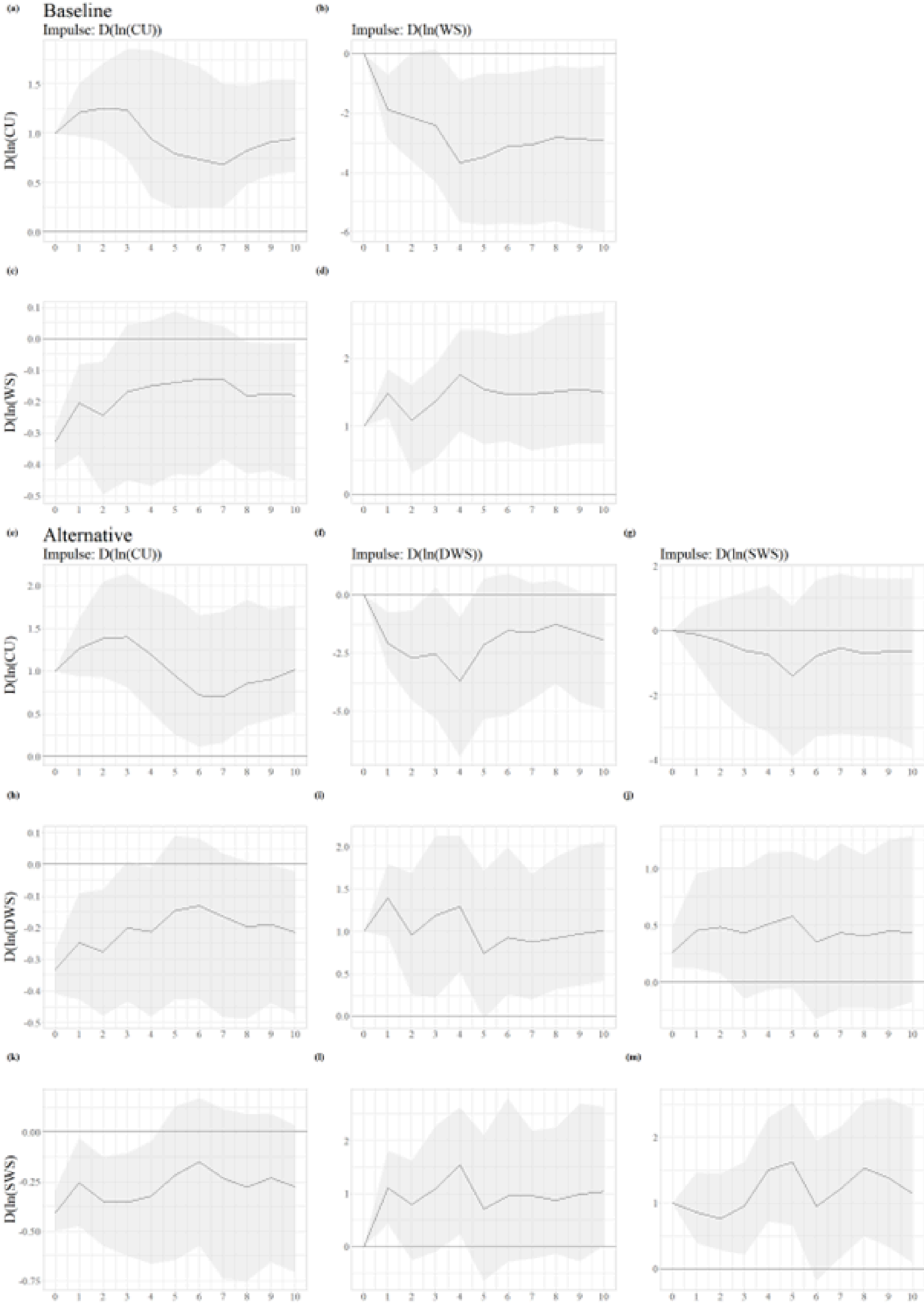
Table 7: Estimated A-Matrix of Baseline SVAR in ‘K’-Ordering

	d_ln_cu_ts	*d_ln_ws_ts*
d_ln_cu_ts	1	0
d_ln_ws_ts	0.33	1

Table 8: Estimated A-Matrix of Alternative SVAR in 'K'-Ordering

	d_ln_cu_ts	*d_ln_sws_ts*	*d_ln_dws_ts*
d_ln_cu_ts	1	0	0
d_ln_sws_ts	0.4075	1	0
d_ln_dws_ts	0.2271	-0.2612	1

Figure 6: Plots of Aggregated Responses to Various Impulses from SVAR-Estimates with post-Kaleckian-Ordered Structural Restrictions, Baseline and Alternative Model



5. Discussion

Comparing the results of the models in both orderings, several differences become apparent. In the following, first the demand schedule will be discussed before distributive dynamics are put into perspective of the conflicting theories.

At first glance, profit-led demand regimes are found for quarterly data in all models, baseline, and alternative, as well as specifications of causal ordering. Thus, the short-term demand schedule appears relatively insensitive to the structure of the model.

Nonetheless, disaggregating the wage-share yields weaker profit-led results in both specifications. This shows a possible bias towards finding (stronger) profit-led results in aggregated estimates and is in line with the findings of Nogueira Rolim (2019) for US-Data. Different from Nogueira Rolim, however, the demand-regime does not switch from profit-led to (direct-)wage-led when disaggregating the wage share.

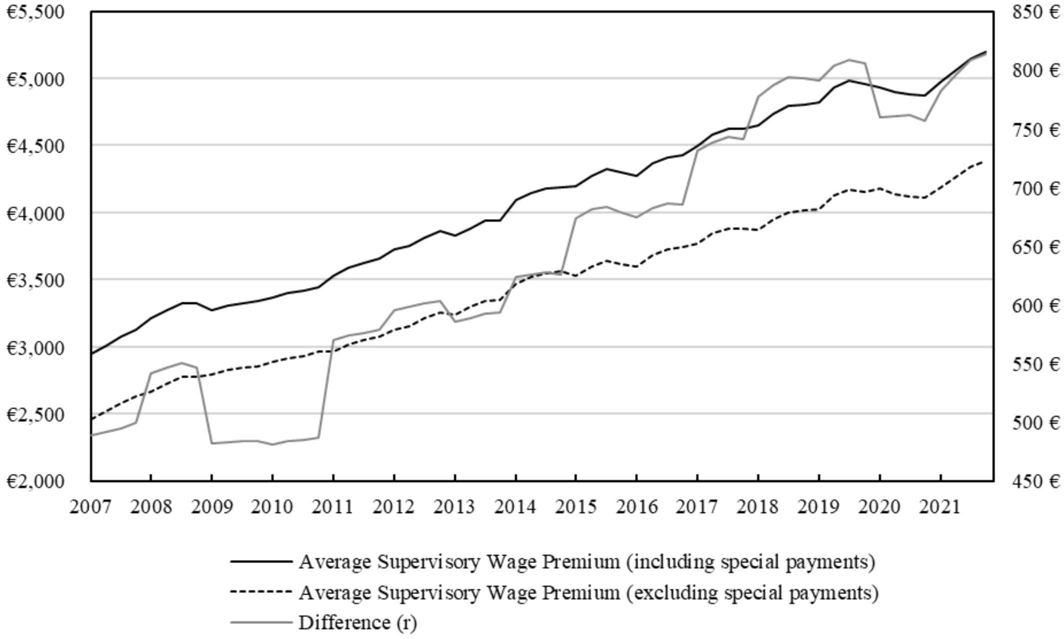
This bias becomes more pronounced when applying post-Kaleckian ordered structural restrictions. In instances of Goodwinian-ordered restrictions, the adjustment of capacity utilization to a one-unit shock in the (direct) wage-share decreases only marginally by approximately 0.25 percentage points, shifting from around 3% to about 2.75%, considering the impact of the direct wage-share alone. However, under post-Kaleckian ordered structural restrictions, the disparity between the effects of the aggregated wage-share (approximately -3%) and the direct wage-share (approximately -2%) is substantially larger, reaching around 1 percentage point.

When confidence intervals are considered, estimates of demand schedules in the disaggregated post-Kaleckian model lack statistical significance at the 5% level. This outcome challenges the credibility of the predicted negative effect of a shock in the direct wage-share on capacity utilization.

Noteworthy are the different responses of capacity utilization to a positive shock in the supervisory-wage-share. Both are, on average and aggregated after 10 quarters, negative. The estimate of the Goodwinian model, however, presents a period of 3 quarters in which a shock positively influences capacity utilization (Figure 5 g), and might indicate brief inequality-led demand (Tavani and Vasudevan 2014) -maybe as a consumption demand stabilizing effect after a crisis.

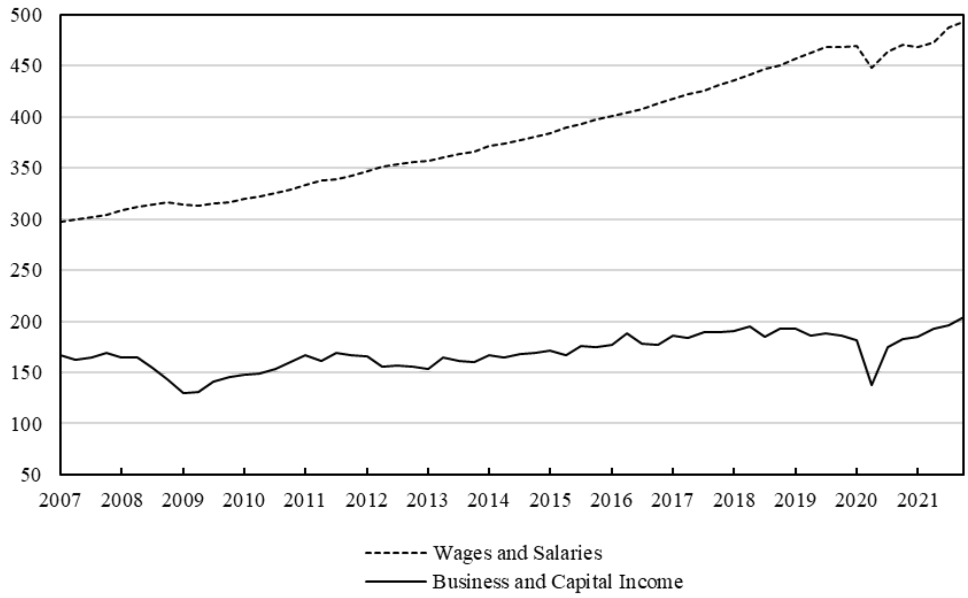
Lavoie and Nah (2020) argue, that under certain conditions profit-led results might arise due to an increase in the target rate of profits or the wage-premium of supervisory labor, and are more likely when the propensity of managers to save is close to zero. A look at the quarterly earnings survey (Figure 7) reveals that indeed the differences between average monthly real wages (in 2015 prices) of supervisors (LG1) and the average wage of direct workers (LG2-5 and marginally employed) is increasing. While measuring the target rate of profit is empirically challenging, the observed increase in the wage-premium substantiates the claim of post-Kaleckian authors that the existence of overhead labor plays a more important role than previously accepted.

Figure 7: Evolution of Average Monthly Supervisory Wage Premiums in Germany between 2007 and 2021 (in 2015 Prices)



Data: Destatis (2022a), author's elaboration.

Figure 8: Evolution of Wages and Salaries along with Business and Capital income, in Germany between 2007 and 2021 (in Billion €)



Data: Destatis (2022f), author's elaboration.

Another explanation of persistent profit-led results might be of rather statistical nature in combination with German labor market regulations. Looking at the reason for the increase of the (direct-) wage-share in times of low capacity utilization (spikes in Figure 3), national accounting suggests that this is due to plummeting profits and (relatively) stable employee compensations (see Figure 8), as firms cannot instantaneously fire employees or decrease real-wages for direct labor, due to labor law and collective wage-agreements. From this angle, it appears implausible that higher direct wage claims would have triggered the decrease in capacity utilization, but the other way around: a shock in capacity utilization causes an instantaneously higher wage-share, not because wages rise (and make investment less profitable), but profits fall when capacity utilization plummets.

The results of the distribution schedule are highly sensitive to the structure of the model. Here, the cumulated effects after 10 periods switch sign when the structure of the model is changed. The distribution schedule switches from profit-squeeze (Figure 5 c, h, k) to wage-squeeze (Figure 6 c, h, k) for the same data and supports both theories dependent on the specification of contemporaneous effects. The Neo-Goodwinian narrative could attempt to explain the stronger increase of supervisory wages by a higher bargaining power of supervisors (compared to the power of direct workers and capital) over the cycle. However, it appears unlikely that a reserve army of managers and the scarcity of supervisors would govern this dynamic, as, per definition, the employment of overhead labor remains relatively stable over the cycle. The wage-dynamic of supervisors is, as already discussed by Mohun and Veneziani (2008), beyond the Goodwinian model and demands additional theoretical consideration in future research.

Altering the order of contemporaneous causation to the post-Kaleckian narrative, the profit-share is found to be pro-cyclical with a changing composition of the wage-share by an, on average, slightly stronger decrease in the wage-share of supervisors compared to that of direct workers. This result is in line with the theoretical expectations of post-Kaleckian authors and stresses the importance of more empirical studies disaggregating the wage-share.

Considering confidence intervals of estimated distributive effects, it can be observed that estimates of both specification of (contemporaneous) causation are statistically significant on the 5%-level. However, in the disaggregated model, the reaction of the direct wage share to a shock in capacity utilization is only statistically significant in the case of post-Kaleckian ordered restrictions (wage-squeeze). All other disaggregated estimates of the distributive regime are not statistically significant at the 5%-level after 10 timesteps.

The test for granger-causality does not let us reject the null hypothesis of capacity utilization not causing the differentiated wage-shares, while for aggregated data, we could easily reject it. This questions a simple wage-bargaining mechanism based on the pro-cyclical scarcity of labor determining the profit share. The profit share may thus be endogenous to the trade cycle via countercyclical unit overhead costs, i.e. unit supervisory wage costs in our approach.

6. Conclusion

Summing up, we can state that the conducted econometric exercise of disaggregating the wage-share of Germany between 2007 and 2021 into a supervisory-wage-share (as a proxy of overhead labor) and a direct-wage-share was a fruitful exercise to gain a better understanding for the intricacies of feedback effects between income distribution and economic activity. Structural Vector Autoregressive (SVAR-)models were estimated, and the obtained impulse response functions used to compare the aggregated baseline model with the disaggregated alternative in two specifications of contemporaneous causation, suggested by economic theory, the neo-Goodwinian and the post-Kaleckian.

All specifications showed a profit-led regime of aggregate demand in the short run, whose severity was reduced in the models which disaggregated the wage share into the shares of direct and supervisory labor. Found demand responses are undetermined when shocked by the supervisory wage-share and negative when shocked by an increase in the direct wage share. This latter effect is only statistically significant with neo-Goodwinian ordered structural restrictions. As such, our findings support the growing numbers of authors who stress the importance of the distribution of wages for aggregate demand. We have discussed possible shortcomings of our model in determining the demand-regime, which range from purely statistical effects to theoretical shortcomings in understanding the dynamics of supervisory-wage-premium or target rate of profit.

The found distributive dynamics differs between the two specifications of structural restrictions and match the respective theoretical expectations, a profit-squeeze in the neo-Goodwinian approach and a wage-squeeze in the post-Kaleckian theory. Aggregated distributive regimes are statistically significant. However, in the disaggregated model, the reaction of the direct wage share to a shock in capacity utilization is only statistically significant in the case of post-Kaleckian ordered restrictions. All other disaggregated estimates of the distributive regime are not statistically significant at the 5%-level after 10 timesteps.

In an additional analysis of the quarterly earnings survey, evidence for a changing composition of the labor force over the cycle, as well as increasing wage-premium of supervisors (beyond cycles) were found. Which effect appears to dominate depended on the specification of the econometric model.

Causality tests indicate that, in post-Kaleckian specification, a simple wage-bargaining automatism, based on the pro-cyclical scarcity of labor, might not be warranted and that pro-cyclical profit shares can be viewed to be endogenous to the trade cycle.

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Appendix

Table 1: Tests for Stationarity of the variables

H0:	***ADF-Test*** At least 1 Unit-Root		***P-P-Test*** At least 1 U-R		***KPSS-Trend-Test*** 0 U-R	
	t-statistic	p-value	t-stat.	p-value	LM-stat.	p-value
D(ln(cu))	-5.6132	0.00	-6.096	0.01	0.097949	0.1
D(ln(ws))	-7.1371	0.00	-9.066	0.01	0.63843	0.01914
D(ln(dws))	-6.8739	0.00	-8.774	0.01	0.62672	0.02021
D(ln(sws))	-3.9838	0.00	-9.775	0.01	0.6385	0.01914

Table 2: Output of the VAR estimate of Baseline (reduced) and Alternative model. Kaleckian ordering of contemporaneous causation.

	Baseline				Alternative					
	D(ln(ws))		D(ln(cu))		D(ln(cu))		D(ln(dws))		D(ln(sws))	
d_ln_cu_ts.l1	0.28	**	-0.42	.						
	(0.09)		(0.23)							
d_ln_ws_ts.l1	0.48	*	-1.90	**						
	(0.23)		(0.56)							
d_ln_cu_ts.l2	-0.19	.	0.32							
	(0.10)		(0.24)							
d_ln_ws_ts.l2	-0.09		-0.14							
	(0.25)		(0.63)							
d_ln_cu_ts.l3	0.21	.	-0.27							
	(0.10)		(0.26)							
d_ln_ws_ts.l3	0.23		-0.44							
	(0.26)		(0.63)							
d_ln_cu_ts.l4	0.10		-0.43	*						
	(0.08)		(0.19)							
d_ln_ws_ts.l4	0.53	**	-1.11	*						
	(0.19)		(0.48)							
d_ln_cu_ts.l1					-0.26		0.25	*	0.34	*
					(0.27)		(0.11)		(0.15)	
d_ln_sws_ts.l1					0.42		0.09		-0.43	
					(0.49)		(0.20)		(0.27)	
d_ln_dws_ts.l1					-2.09	**	0.39		1.11	**
					(0.66)		(0.27)		(0.36)	
d_ln_cu_ts.l2					0.21		-0.18		-0.25	
					(0.27)		(0.11)		(0.15)	
d_ln_sws_ts.l2					0.45		0.04		-0.45	.
					(0.44)		(0.18)		(0.24)	
d_ln_dws_ts.l2					-0.81		-0.16		0.45	
					(0.76)		(0.31)		(0.41)	
d_ln_cu_ts.l3					-0.14		0.18		0.19	
					(0.28)		(0.11)		(0.15)	
d_ln_sws_ts.l3					0.14		-0.05		-0.17	
					(0.48)		(0.19)		(0.26)	
d_ln_dws_ts.l3					-0.51		0.23		0.67	
					(0.76)		(0.31)		(0.41)	
d_ln_cu_ts.l4					-0.31		-0.02		0.20	
					(0.29)		(0.12)		(0.15)	
d_ln_sws_ts.l4					0.09		0.07		0.43	.
					(0.43)		(0.18)		(0.23)	
d_ln_dws_ts.l4					-1.08		0.11		0.50	
					(0.76)		(0.31)		(0.41)	
d_ln_cu_ts.l5					-0.21		0.03		0.09	
					(0.24)		(0.10)		(0.13)	
d_ln_sws_ts.l5					-0.82	.	0.03		0.39	
					(0.47)		(0.19)		(0.25)	
d_ln_dws_ts.l5					0.69		-0.25		-0.18	
					(0.67)		(0.27)		(0.36)	
Number of Observations	55		55		54		54		54	
R^2	0.29		0.34		0.44		0.29		0.54	
Adjusted R^2	0.17		0.22		0.22		0.02		0.37	

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