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WORKING PAPER SERIES Nº 2026-26

DEPARTMENT OF ECONOMICS, FEA-USP
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**JEL Codes:** C33; D33; F15; O10.

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## 1. Introduction

The relationship between the functional distribution of income, particularly as measured by the wage share, and the level of economic activity has become a central issue in contemporary macroeconomics, including in the context of the European Union (EU). Over the past three decades, most EU member states have experienced a persistent decline in the wage share alongside subdued economic activity, particularly in the aftermath of the global financial crisis of 2008–2009.[1] These developments have renewed interest in the bidirectional relationship between the functional distribution of income and economic activity, as well as in how distributional policies shape long-run economic performance and, conversely, how economic performance influences the functional distribution of income. The EU provides a particularly suitable setting for investigating these issues because its member states are highly integrated through trade, financial markets, and production networks, allowing distributional and aggregate demand shocks to propagate across national borders through cross-country

*This study was funded by CNPq (the National Council of Scientific and Technological Development, Brazil) under Grants 316740/2023-3 (GTL) and 104537/2020-5 (AMM).

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[1] The long-run decline in the wage share has been extensively documented by Karabarbounis and Neiman (2014), ILO (2015), Stockhammer (2017), Guerriero (2019), and Karabarbounis (2023). More recent evidence indicates that, despite the post-pandemic recovery in nominal wages, the wage share in many EU economies remains below its historical average, reflecting persistent structural factors, including technological change, globalization, declining workers' bargaining power, financialization, and evolving labor market institutions (Onaran, 2016; Guschanski and Onaran, 2022; Kohler et al., 2019; Guschanski and Onaran, 2025; European Commission, 2024; International Labour Organization, 2024; Organisation for Economic Co-operation and Development, 2024).

economic spillovers. Indeed, a substantial body of empirical evidence documents significant spatial interdependencies among EU member states, suggesting that cross-country spillovers play an important role in shaping economic performance (Ertur et al., 2006; Battisti and Vaio, 2009; Vega and Elhorst, 2017; Cutrini and Mendez, 2023).

The empirical literature on the effects of the functional distribution of income on aggregate demand—and, by implication, on demand-driven capacity utilization, output, and output growth—has primarily relied on two alternative methodologies: the structural approach and the aggregative approach (Blecker, 2016; Blecker and Setterfield, 2019). The structural approach estimates separate behavioral equations for the individual components of aggregate demand, allowing the overall demand regime to be inferred from the combined effects of changes in the wage share. By contrast, the aggregative approach estimates a reduced-form relationship between output (or capacity utilization) and the wage share directly. Although both methodologies have been widely employed, the structural approach has been particularly influential in studies focusing on European economies. For the studies reviewed below, we adopt a common terminology to ensure comparability across the literature and with our own novel results. Following Blecker and Setterfield (2019), a wage-led (profit-led) demand regime refers to a situation in which changes in the wage share affect output or capacity utilization in the same (opposite) direction, whereas a wage-squeeze (profit-squeeze) distributional regime refers to a situation in which changes in output or capacity utilization affect the wage share (profit share) in the opposite direction.

The existing evidence for Europe generally points to wage-led demand regimes in large and relatively closed economies, while smaller and more open economies are more likely to exhibit profit-led demand. Early contributions by Naastepad and Storm (2006) found wage-led demand regimes in France, Germany, Italy, the Netherlands, Spain, and the United Kingdom using a structural model estimated for the period 1960–2000. Similarly, Stockhammer et al. (2009) reported that aggregate demand in the original twelve-member Euro area responds positively to increases in the wage share. Hein and Vogel (2008), using data from 1960 to 2005, also found positive effects of the wage share on GDP in France, Germany, and the United Kingdom, while identifying the Netherlands as profit-led. Austria constituted an exception in their analysis, exhibiting a profit-led demand regime, a finding consistent with Stockhammer and Ederer (2008). More recently, Bengtsson and Stockhammer (2021), using historical data spanning 1900–2010, reported weakly wage-led growth regimes in both Sweden and Denmark.

Evidence based on broader cross-country analyses reinforces these conclusions. Stockhammer and Ederer (2008), estimating structural models for twelve OECD economies, found robust wage-led domestic private demand regimes in Germany, Finland, France, Luxembourg, the Netherlands, and Sweden, whereas only the United Kingdom consistently displayed a profit-led regime. Onaran and Galanis (2012) likewise concluded that both the Euro area as a whole and the United Kingdom exhibit wage-led demand regimes over the 1969–2007 period. Extending the analysis to the EU15, Onaran and Obst (2016) showed that although individual countries such as Austria, Belgium, Denmark, and Ireland may benefit from lower wage shares, a simultaneous decline in the wage share across member states reduces overall EU output, implying that the European economy as a whole remains wage-led. Consistent with these findings, Stockhammer et al. (2021) reported wage-led domestic private demand regimes for both Germany and the United Kingdom using long historical datasets extending back to the nineteenth century.

Evidence obtained from aggregative approaches is more heterogeneous but broadly consistent with the structural literature. Stockhammer and Onaran (2004), using VAR models, found no significant overall effect of profit-share shocks on capacity utilization in either France or the United Kingdom. Charpe et al. (2020), employing wavelet methods to distinguish short- and long-run dynamics in the United Kingdom and France, showed that higher wage shares reduce output growth at short horizons but increase growth over longer horizons, even after accounting for potential endogeneity. Panel studies also tend to support wage-led outcomes on average. Stockhammer and Wildauer (2016), using annual data for eighteen OECD countries between 1980 and 2013, found that the average demand regime is wage-led, although some small and highly open economies, such as the Netherlands, remain profit-led. Hartwig (2014) similarly reported a mildly wage-led regime for a panel of OECD economies. By contrast, Kiefer and Rada (2015), estimating a system of simultaneous demand and distribution equations for thirteen OECD countries, found weak evidence of a profit-led demand regime in the short run together with a profit-squeeze distributional relationship. Finally, Marques and Lima (2022), using quantile Granger-causality tests for twelve developed economies, find substantial cross-country and quantile heterogeneity in the causal relationship between the wage share and capacity utilization. Their results reveal bidirectional and distribution-dependent causal linkages, with significant causality from capacity utilization to the wage share in Sweden, Italy, the Netherlands, the United Kingdom, Austria, and Ireland, and stronger effects often observed at the tails of the conditional distribution. They also find that capacity utilization positively Granger-causes the wage share across all quantiles in Sweden and Italy, whereas the wage share negatively Granger-causes capacity utilization in Spain and at the upper quantiles in Italy.

Therefore, despite the extensive literature on the relationship between income distribution and aggregate demand, the evidence for European economies remains mixed. While several studies find that European economies are mostly wage-led, other contributions, such as Kiefer and Rada (2015) and Rada and Kiefer (2016), find evidence of profit-led demand regimes, emphasizing the role of lower unit labor costs in enhancing international competitiveness and stimulating net exports. These divergent findings are partly related to differences in empirical methodologies and identification strategies. In particular, while a substantial share of the literature relies on single-equation approaches that may not adequately address simultaneity and cross-country interdependencies, other studies employ simultaneous-equation systems and panel-data methods to account for the endogenous interaction between income distribution and economic activity.

This paper contributes to the literature in four main dimensions. First, unlike many existing studies surveyed by Blecker (2016) and Blecker and Setterfield (2019), which rely on single-equation specifications and typically treat the functional distribution of income as exogenous to aggregate economic activity, we estimate a system of simultaneous equations that explicitly models the joint determination of economic activity and functional distribution of income, following the empirical strategies proposed by Rada and Kiefer (2016) and Blecker et al. (2022). This approach recognizes that changes in the wage share affect aggregate demand through their effects on consumption, investment, and net exports, while economic activity may simultaneously influence the wage share through labor-market conditions, productivity dynamics, and firms' pricing behavior. Ignoring this bidirectional relationship may therefore lead to biased and inconsistent estimates of the underlying demand regime.

Second, unlike several previous empirical studies of European economies that assume the wage share is exogenous, we relax this assumption by employing an instrumental-variable framework that explicitly addresses reverse causality and omitted-variable bias. Our results show that accounting for simultaneity substantially alters the estimated relationship between economic activity and functional income distribution, indicating that the exogeneity assumption may be responsible for conflicting conclusions in the existing literature regarding whether European economies are predominantly wage-led or profit-led.

Third, given the strong trade, production, and financial linkages among European economies, we explicitly incorporate spatial dependence into the empirical framework to quantify the magnitude and statistical significance of cross-country spillovers arising from changes in functional income distribution and capacity utilization. This approach recognizes that distributional shocks in one economy may affect aggregate demand in neighboring countries through trade, competitiveness, and production-network linkages, while changes in domestic capacity utilization may likewise influence wage shares in neighboring countries. Ignoring these interdependencies could bias parameter estimates and obscure the underlying national demand regimes. By modeling spatial spillovers explicitly, we distinguish between the direct domestic effects of changes in the wage share on capacity utilization—and vice versa—and the indirect effects transmitted across European economies.[2]

Finally, by combining instrumental-variable panel estimation with local-projection impulse responses, we investigate the hypothesis advanced by Blecker (2016) that demand regimes may exhibit profit-led characteristics in the short run but become wage-led over longer horizons. Unlike conventional dynamic panel specifications, local projections allow the dynamic effects of changes in the wage share to evolve flexibly across forecast horizons without imposing restrictive assumptions on the underlying data-generating process. This approach enables us to examine whether the effects of functional income distribution on aggregate economic activity vary systematically over time, thereby providing a more comprehensive characterization of the temporal dimension of demand regimes.

Our results provide evidence of significant interactions between functional income distribution and economic activity across EU-27 countries. The system estimates indicate that increases in the wage share reduce domestic and neighboring countries' capacity utilization, while higher capacity utilization lowers the domestic wage share but raises the wage shares of neighboring economies. Instrumental-variable local projections confirm these patterns in the short run and reveal a transition from predominantly profit-led demand dynamics in the short run to wage-led dynamics over longer horizons. Regarding the indirect effect, an increase in the wage share of neighboring countries reduces capacity utilization in the country under consideration in the immediate short run, but exerts a positive effect over longer time horizons. Meanwhile, an increase in capacity utilization in neighboring countries reduces the wage share in the country under consideration in the immediate short run. Over longer horizons, however, this effect tends to reverse, as higher capacity utilization in neighboring countries is associated with an increase in the wage share in the country under consideration. Overall, the results support the view that capacity utilization and functional income distribution are jointly determined across the EU-27 economies.

The remainder of the paper is organized as follows. Section 2 presents the econometric models to be estimated, describes the data used in the estimations, and provides an exploratory spatial data analysis. Section 3 reports and discusses the main results. Section 4 presents robustness checks based on instrumental-variable local projections for panel data. Section 5 concludes. Appendix A lists the EU countries included in the sample, defines the variables, and reports diagnostic statistics for the instrumental variables used in the estimations.

## 2. Econometric Methodology

### *2.1. Simultaneous-equations model with spatial spillover effects*

Simultaneous-equations models have long been used in applied economics to account for the joint determination of endogenous variables. For example, they have been employed to examine the impact of distance as a common determinant of exports and foreign direct investment, recognizing that distance affects both trade costs and plant set-up costs (Egger and Pfaffermayr, 2004), and to estimate trade elasticities by modeling the simultaneous determination of imports and exports (Kinal and Lahiri, 1993). The simultaneous-equations model estimated in this paper, fully specified in Equations (1) and (2) below, extends the demand-and-distribution framework developed by Nikiforos and Foley (2012), Kiefer and Rada (2015), and Rada and Kiefer (2016) by incorporating spatial spillover effects. This extension is essential given the close economic and institutional integration of EU member countries, which makes spatial spillover effects an inherent feature of the sample. Accordingly, shocks to aggregate demand and functional income distribution in one EU member country are

[2] Lima and Marques (2024) provide the first application of spatial econometric methods to the analysis of the relationship between functional income distribution and economic activity. Using dynamic spatial panel data for the 48 contiguous US states and the District of Columbia over 1980–2019, they estimate a demand-and-distribution system in which economic activity is measured by capacity utilization and output growth rates, while accounting for endogenous relationships and cross-state spatial spillovers.

likely to propagate to other member countries through trade, investment, labor mobility and other economic linkages. Ignoring these transmission channels would overstate the role of domestic factors while understating the contribution of cross-country interactions in shaping demand and distribution outcomes. For each country in the sample, the functional income distribution is measured by the observed wage share, $\psi$, while economic activity is measured by the rate of capacity utilization, $u$. The demand equation is specified as follows:

$$u_{i,t} = \mu + \rho u_{i,t-1} + \beta \psi_{i,t} + \gamma G_{i,t} + \theta W \psi_{i,t} + \delta W G_{i,t} + \xi_{i,t}, \tag{1}$$

with $i = 1, \ldots, 27$ and $t = 1998, \ldots, 2024$, and where $u_{i,t}$ and $u_{i,t-1}$ denote, respectively, the rate of capacity utilization at time $t$ and its one-lagged value for country $i$ at time $t-1$, and $\rho$ is the autoregressive parameter that measures the degree of persistence in the dependent variable. The variables $\psi_{i,t}$ and $G_{i,t}$ are contemporaneous explanatory variables, representing the actual wage share and the government fiscal balance (deficit/surplus) as a share of GDP, respectively. The corresponding slope coefficients are denoted by $\beta$ and $\gamma$. The government fiscal balance is expected to act countercyclically, thereby affecting aggregate demand through the fiscal stance. In this setup, the coefficients $\beta$ and $\gamma$ represent the own-country partial derivatives (direct effects), while the coefficient $\theta$ captures the cumulative cross-partial derivative (indirect or spillover effect). Following LeSage (2014), the cumulative spillover effect is defined as the sum of the spillover effects transmitted to all neighboring countries, thereby representing the average or typical cross-country spillover generated by a given country. The coefficient $\delta$ has an analogous interpretation as the spillover effect (indirect effect). The disturbance term, $\xi_{i,t}$, is assumed to be independently and identically distributed (i.i.d.) with zero mean and finite variance, $\sigma_{\xi}^2$. The theoretical and empirical literature suggests that the sign of the coefficient $\beta$ is ambiguous.

The distribution equation is specified as follows:

$$\psi_{i,t} = \eta + \alpha \psi_{i,t-1} + \kappa u_{i,t} + \phi x_{i,t} + \pi W u_{i,t} + \omega W x_{i,t} + \nu_{i,t}, \tag{2}$$

with $i = 1, \ldots, 27$ and $t = 1998, \ldots, 2024$, where $\psi_{i,t}$ and $\psi_{i,t-1}$ denote the wage share and its one-period lag for country $i$ at time $t$, respectively, and $\alpha$ is the autoregressive coefficient capturing the persistence of the wage share. The variables $u_{i,t}$ and $x_{i,t}$ are contemporaneous explanatory variables representing capacity utilization and labor productivity growth, respectively, for country $i$ at time $t$. Their corresponding slope coefficients are denoted by $\kappa$ and $\phi$. Similarly to the demand equation, the coefficients $\pi$ and $\omega$ capture the cumulative spillover effects, defined as the sum of the spillover effects transmitted to all neighboring countries and thus representing the average or typical cross-country spillover. The disturbance term, $\nu_{i,t}$, is assumed to be independently and identically distributed (i.i.d.) with zero mean and finite variance, $\sigma_{\nu}^2$. The theoretical and empirical literature suggests that the sign of the coefficient $\kappa$ is ambiguous.

Meanwhile, $W$ is an $n \times n$ non-stochastic, non-negative spatial weight matrix whose elements characterize the neighborhood structure among the sample countries. Specifically, if country $i$ is spatially related to country $j$, then $w_{ij} > 0$; otherwise, $w_{ij} = 0$. The diagonal elements of $W$ are set to zero so that each country is not treated as its own neighbor, and the matrix is row-standardized such that each row sums to one. Consequently, the spatially lagged variable $W\psi_{i,t}$ represents a weighted average of the wage shares of the countries neighboring country $i$. This variable captures the spatial dependence of $\psi_{i,t}$ across countries, and the same interpretation applies to all other spatially lagged explanatory variables included in the model. Because the model incorporates spatial lags of the explanatory variables, a change in a given explanatory variable in country $i$ has both a direct effect, represented by $\beta$ and $\kappa$, on country $i$ itself and an indirect effect, represented by $\theta$ and $\pi$, on other neighboring countries ($j \neq i$).

In the dynamic panel model specification in Equation (1), the coefficients $\beta$ and $\theta$ capture the immediate effects of a change in the wage share on capacity utilization. However, the long-run effect of a change in the wage share also depends on the persistence of capacity utilization, as captured by the autoregressive parameter

$\rho$. When capacity utilization is stationary ($\rho < 1$), the cumulative effects of the wage share on capacity utilization are given by $\beta/(1-\rho)$ and $\theta/(1-\rho)$, respectively, reflecting the total impact of a change in the wage share after accounting for the dynamic adjustment process. Similarly, the coefficients $\kappa$ and $\pi$ in Equation (2) capture the immediate effects of a change in capacity utilization on the wage share. However, the long-run effect of a change in capacity utilization also depends on the persistence of the wage share, as captured by the autoregressive parameter $\alpha$. When the wage share is stationary ($\alpha < 1$), the cumulative effects of capacity utilization on the wage share are given by $\kappa/(1-\alpha)$ and $\pi/(1-\alpha)$, respectively, reflecting the total impact of a change in capacity utilization after accounting for the dynamic adjustment process.

Given the objective of this paper, we employ a spatial regression framework that allows for local spatial spillovers, namely the Spatial Lag of X (SLX) model (Vega and Elhorst, 2015; LeSage, 2014). If no spatial interactions exist among the sample countries, such that $\theta = \delta = 0$, the dynamic panel specification in Equation (1) collapses to the demand equation proposed by Kiefer and Rada (2015) and Rada and Kiefer (2016). Similarly, if $\pi = \omega = 0$, the dynamic panel specification in Equation (2) reduces to the distribution equation specified by Kiefer and Rada (2015) and Rada and Kiefer (2016). The SLX specification has also been employed in empirical analyses of European integration, such as the ordered probit models estimated by Cutrini and Mendez (2023) for EU regions, which provide evidence of the pro-growth effects of EU enlargement for Central and Eastern European countries that joined the EU from 2004 onward.

### 2.2. *Data description*

We construct an annual panel dataset covering 27 European Union (EU-27) member countries over the period 1998–2024, as listed in Appendix A. Our sample includes substantially more countries than those considered by Kiefer and Rada (2015) and Rada and Kiefer (2016), who analyzed a panel of 13 OECD countries over the period 1971–2012. The list of countries included in our sample follows Eurostat (2025) and is reported in Table 5 of Appendix A. The sample selection is based on two criteria: first, the countries must be EU member states included in the classification provided by Eurostat (2025); second, the relevant variables must be available from a reliable, complete, and homogeneous data source. Table 6 in Appendix A reports the definitions of all variables used in the study. We employ the adjusted wage share, measured as a percentage of GDP at current factor cost (Stockhammer and Ederer, 2008; ILO, 2015; Guerriero, 2019). We also use actual capacity utilization, denoted by $u_{i,t}$, which is calculated as the ratio of real output to trend output, with the latter estimated using the filter proposed by Hamilton (2018). The dataset used in this study is compiled from two sources. First, all quantitative information for the sample countries is obtained from the AMECO database, available at `https://ec.europa.eu/economy_finance/ameco/user/serie/SelectSerie.cfm`. All remaining macroeconomic variables are extracted from this database. Lastly, to construct the spatial weight matrices ($W$) used in the estimations, we obtain the corresponding geographical information shapefiles from GISCO (Geographic Information System of the European Commission), available at `https://ec.europa.eu/eurostat/web/gisco`.

As stated previously, we employ a distance-based spatial weight matrix following the approach adopted by Baltagi and Rokicki (2014) and Ertur et al. (2006). Specifically, the inverse-distance matrix uses the inverse of the geographical distance between the centroids of countries $i$ and $j$ to define each off-diagonal element of the spatial weight matrix, $w_{ij}$. Since no country is considered its own neighbor, the diagonal elements are set to zero, such that $w_{ii} = 0$. The distance threshold is determined using the max-min criterion, which ensures that no isolates exist in the sample by guaranteeing that each country has at least one neighbor. Because geographic distance is a symmetric relationship, the resulting distance-based $W$ matrix is symmetric. Summing up, the spatial weight between two countries $i$ and $j$ is defined as $w_{ij} = 1/d_{ij}$, where $d_{ij}$ denotes the geographical distance between their centroids. We row-standardize the $W$ matrix by dividing each element by the sum of the corresponding row. As an alternative to the inverse-distance specification, we also estimate models using a six-nearest-neighbor $W$ matrix, following Cutrini and Mendez (2023). As in Ertur et al. (2006), LeSage and Pace (2009), and LeSage et al. (2011), we select the preferred spatial weight matrix based on a goodness-of-fit criterion.

## 3. Results and Discussion

The first step in our empirical strategy is to assess whether there is evidence of spatial dependence among the countries in the sample (Le Gallo and Kamarianakis, 2011; Anselin et al., 2008), while accounting for the simultaneous determination of demand and distribution. In the second stage, we identify the most appropriate panel regression specification using the econometric procedures proposed by LeSage (2014). Specifically, we compare the SUR-SIM specification, which excludes spatial dependence, with the SUR-SLX specification, which incorporates spatial lags of the explanatory variables. We employ the inverse-distance matrix as the baseline spatial weight matrix, following Tobler's first law of geography (Baltagi and Rokicki, 2014), according to which the influence between spatial units decreases with distance (Ertur et al., 2006; LeSage and Pace, 2009). Moreover, as Battisti and Vaio (2009) explains, although contiguity-based $W$ matrices are widely used, they may leave island countries disconnected from the rest of the sample. Therefore, distance-based matrices are more appropriate for analyses involving EU countries.

Table 1: Results of spatial dependence tests for the system of simultaneous equations (1)–(2).

| ***Spatial autocorrelation tests*** | $W_1$ | $W_2$ |
|---|---|---|
| $LM^* - SUR - SLM$ | $133.85^{***}$ | $131.26^{***}$ |
| | [0.0000] | [0.0000] |
| $LM^* - SUR - SEM$ | $64.907^{***}$ | $56.602^{***}$ |
| | [0.0000] | [0.0000] |

Notes: (***), (**), and (*) denote statistical significance at the 1%, 5%, and 10% levels, respectively. Following Anselin et al. (2008) and Baltagi and Rokicki (2014), we employ geographic distance criteria to define the spatial weight matrices $W$. The matrix $W_1$ is the (Euclidean) inverse-distance matrix (Baltagi and Rokicki, 2014), while $W_2$ is a six-nearest-neighbor matrix (LeSage and Pace, 2009; Anselin et al., 2008; Cutrini and Mendez, 2023). Under the inverse-distance specification, the average number of links across countries is 6, with a minimum of 1 and a maximum of 12 links. The $p$-values are reported in square brackets. The null hypothesis of the robust $LM^*$-SUR-SLM test is that there is no spatial autocorrelation in the dependent variable, allowing for hidden spatial dependence in the disturbances. The null hypothesis of the $LM^*$-SUR-SEM test is that there is no spatial dependence in the disturbances, allowing hidden spatial dependence in the dependent variable. Both test statistics account for the joint determination between demand and distribution because they are applied to the system of simultaneous equations one at a time.

We implement two tests for the absence of spatial spillover effects and, based on their results, assess whether the SUR-SLX specification provides a better representation of the data than the non-spatial SUR-SIM model. Following Elhorst (2010), we test the restriction that the coefficients of the spatially lagged explanatory variables in Equations (1) and (2) are jointly equal to zero. Under this restriction, the system reduces to the SUR-SIM specification, whereas the unrestricted alternative is the SUR-SLX model, in which spatial spillover effects are allowed to influence the endogenous variables. After estimating the restricted system (Table 2) and the unrestricted specification (Table 3), we find that the data reject the restrictions underlying the SUR-SIM model, as the additional spatially lagged explanatory variables are statistically significant.

As expected, Tobler's first law of geography holds in this panel dataset: as distance increases, the mutual influence between countries decreases. Among the two spatial weight matrices considered, the inverse-distance matrix ($W_1$) yields the largest computed $LM$ statistics in the tests for spatial dependence. Following Ertur et al. (2006) and LeSage et al. (2011), we therefore select $W_1$ as the spatial weight matrix used in all estimations in this paper. The results reported in Table 1 indicate significant spatial dependence in the panel data. Specifically, both $LM$-SUR statistics reject the null hypothesis of no spatial dependence at the 5% significance level. The first and second rows of Table 1 show that, under both the inverse-distance and nearest-neighbor specifications, the robust *LM* statistics have *p*-values below 0.05 (reported in brackets), providing evidence against the absence of spatial effects.

To properly estimate the system of simultaneous equations represented by Equations (1) and (2), we employ two estimation methods. These methods account for the cross-equation error structure, spatial spillovers, and the simultaneous determination of demand and distribution, while differing in their treatment of potential endogeneity of the explanatory variables. The first method is Seemingly Unrelated Regression Estimation (SURE), which assumes that all explanatory variables are exogenous, that is, that the right-hand-side variables are uncorrelated with the disturbances. The second method allows the wage share and capacity utilization to be potentially correlated with the error terms and therefore requires a set of instrumental variables. This approach addresses the possible endogeneity arising from the simultaneous determination of these variables and is implemented through Three-Stage Least Squares (3SLS) estimation (Zellner and Theil, 1962; Greene, 2018).[3]

A caveat regarding interpretation is warranted when comparing our findings with those from studies based on single-equation estimates. As argued by Kiefer and Rada (2015), single-equation estimates of the relationship between the functional distribution of income and economic activity based on a demand equation may reflect the joint effects of shocks to the wage share and capacity utilization, as well as the dynamic adjustment processes governing these variables. Consequently, such estimates may be incorrectly interpreted as identifying a demand equation, despite potentially capturing the simultaneous determination of distribution and economic activity. Therefore, comparisons with single-equation estimates should be interpreted with caution, since those estimates do not account for the joint determination of functional distribution and economic activity. To the best of our knowledge, the studies most closely related to our simultaneous-equation approach are Kiefer and Rada (2015), Rada and Kiefer (2016), and Blecker et al. (2022). However, no previous empirical study has estimated a dynamic panel system of simultaneous equations examining the joint determination of functional income distribution and capacity utilization across European countries while explicitly accounting for spatial spillover effects.

Our first set of estimation results, reported in Table 2, is only partially comparable with those presented in Rada and Kiefer (2016) and Kiefer and Rada (2015). This is because we use the observed wage share and actual capacity utilization, whereas Rada and Kiefer (2016) and Kiefer and Rada (2015) employ a wage share index (2005=100) and the GDP gap (the percentage difference between actual and potential GDP) as a measure of capacity utilization. Furthermore, our model specification, represented by Equations (1) and (2), includes control variables following Nikiforos and Foley (2012), whereas the specifications estimated by Rada and Kiefer (2016) and Kiefer and Rada (2015) do not include additional control variables. Finally, Kiefer and Rada (2015) and Rada and Kiefer (2016) report empirical results based exclusively on SURE estimation, which relies on the assumption that the wage share and capacity utilization are exogenous, that is, uncorrelated with the disturbances. This assumption has been widely criticized in the literature because of the potential simultaneity between functional distribution and economic activity (see Blecker (2016)).

[3] We employ spatially lagged exogenous variables as instruments to identify the effects of the endogenous regressors, following the theoretical rationale proposed by Kelejian and Prucha (1998) and subsequent empirical applications such as Baltagi and Rokicki (2014). In addition, the standard 3SLS estimator accounts for heteroskedasticity by estimating the variance-covariance matrix of the disturbances through generalized least squares (GLS) procedures (Koutsoyiannis, 2013).

Table 2: Estimates of the restricted specification of the demand-and-distribution system of simultaneous equations (1)–(2). The restrictions impose $\theta = \delta = 0$ in Equation (1) and $\pi = \omega = 0$ in Equation (2). Endogenous variables instrumented: $u_{i,t}$, $u_{i,t-1}$, $\psi_{i,t}$, and $\psi_{i,t-1}$.

| | ***SURE-SIM*** | | | ***3SLS-SIM*** | | | |
|---|---|---|---|---|---|---|---|
| demand | | distribution | | demand | | distribution | |
| $\mu$ | **0.5782**** | $\eta$ | **-0.0228** | $\mu$ | **0.7523**** | $\eta$ | **0.0613**** |
| | (0.0347) | | (0.0162) | | (0.0486) | | (0.0199) |
| $u_{t-1}$ | **0.4645**** | $\psi_{t-1}$ | **0.9599**** | $u_{t-1}$ | **0.3384**** | $\psi_{t-1}$ | **0.9477**** |
| | (0.0307) | | (0.0105) | | (0.0435) | | (0.0116) |
| $\psi$ | **-0.049***** | $u$ | **0.049**** | $\psi$ | **-0.1244**** | $u$ | **-0.0279** |
| | (0.0226) | | (0.0149) | | (0.0265) | | (0.0186) |
| $G$ | **-0.004**** | $x$ | **-0.088**** | $G$ | **-0.0044**** | $x$ | **-0.0750**** |
| | (0.0004) | | (0.0188) | | (0.0004) | | (0.0204) |
| $\chi^2$ | 438.33 | $\chi^2$ | 8890.31 | $\chi^2$ | 275.75 | $\chi^2$ | 7442.98 |
| $p$-value | [0.0000] | — | [0.0000] | — | [0.0000] | — | [0.0000] |
| Effective sample size | 702 | | 702 | | 648 | | 648 |

Notes: (*) and (**) denote statistical significance at the 1% and 5% levels, respectively. Standard errors (SE) are reported in parentheses. We employ the standard SURE and 3SLS estimation methods. For the 3SLS estimation, the instrumental variables include $\psi_{i,t-3}$, $u_{i,t-3}$, $G_{i,t-1}$, $G_{i,t-2}$, $G_{i,t-3}$, $x_{i,t-1}$, $x_{i,t-2}$, $x_{i,t-3}$, $g_{i,t}$, $Wg$, $WW\psi$, $WWg$, $WWu$, $WWx$, $WWG$, $T$, and $T^2$. Here, $T$ denotes the time trend, $T^2$ denotes the quadratic time trend, $g$ denotes the growth rate of real output, and $WW\psi$, $WWg$, $WWu$, $WWx$, and $WWG$ denote the second-order spatially lagged variables defined in Table 6.

The estimation results reported in boldface in the first two columns of Table 2 indicate that a higher wage share reduces capacity utilization, consistent with a profit-led demand regime. Conversely, higher capacity utilization increases the wage share, suggesting that the sample countries exhibit a profit-squeeze effect in the distribution equation. However, when the wage share and capacity utilization are treated as endogenous and instrumental variables are employed, the 3SLS estimates reported in the last column of Table 2 indicate that capacity utilization has no statistically significant effect on the wage share in the distribution equation. Moreover, we observe a reversal in the sign of the $\kappa$ estimate, which changes from positive to negative. These initial findings should be interpreted with caution, as this restricted and simplified specification does not account for the potential influence of spatial spillovers, the global financial crisis (Great Recession, 2008–2009), or the COVID-19 pandemic (2020–2021).

It is worth noting that the estimation results reported in boldface in the third row of Table 2 are similar in terms of statistical significance, sign, and magnitude regardless of whether the wage share is treated as exogenous (SURE estimation) or endogenous (3SLS estimation). In the latter case, the endogenous variables in the system are allowed to be correlated with the disturbances, and instrumental variables are employed to address this potential source of endogeneity. Therefore, this first set of estimation results suggests that the sample countries exhibit a profit-led demand regime.

It is important to note that the diagnostic statistics for the instrumental variables indicate no evidence of weak-instrument problems in these panel data. As shown in Table 5 (Appendix A), the Kleibergen–Paap *rk* statistics for the demand and distribution equations exceed the Stock–Yogo critical value of 10.47 associated with a maximum relative IV bias of 10%. Moreover, the corresponding first-stage $F$-statistics are above the conventional threshold of 20. Since the Kleibergen–Paap *rk* statistic is robust to heteroskedasticity, these results provide evidence against weak identification of the endogenous regressors in both the demand and distribution equations.

Table 3 reports our main and more robust empirical findings, which incorporate spatial spillover effects and dummy variables capturing the impacts of the global financial crisis (2008–2009) and the COVID-19 pandemic (2020–2021). These estimates represent our preferred specification for two reasons. First, they are obtained from the unrestricted version of the system of simultaneous demand-and-distribution equations (1)–(2), which accounts for spatial spillovers and major common shocks affecting EU countries. Second, they are based on the inverse-distance spatial weight matrix, which follows Tobler's first law of geography that the influence between spatial units decreases with distance (Ertur et al., 2006; LeSage and Pace, 2009; Baltagi and Rokicki, 2014). Following Nikiforos and Foley (2012), we define dummy variables to capture major disruptions in the macroeconomic environment that may affect functional income distribution and capacity utilization. *GFC* is a dummy variable capturing the global financial crisis, which takes the value of 1 in 2008 and 2009 and 0 otherwise. *COV* is a dummy variable capturing the COVID-19 pandemic, which takes the value of 1 in 2020, 2021, and 2022 and 0 in all other years.[4]

Because the sign reversal of the $\kappa$ estimate observed in the last columns of Table 2 raises concerns about potential endogeneity bias, obtaining consistent estimates requires addressing the possible correlation between the endogenous variables and the disturbances through instrumental variables and the 3SLS method. Our preferred estimation results, reported in boldface in the last two columns of Table 3, particularly those obtained from the *3SLS-SLX* estimator, confirm the main findings previously obtained without spatially lagged variables and reported in Table 2. However, unlike the restricted specification in Table 2, these estimates account for spatial spillover effects as well as the global financial crisis and the COVID-19 pandemic. In particular, the 3SLS estimates reported in the last two columns of Table 3 confirm that a higher wage share statistically significantly reduces capacity utilization in the own country, indicating a profit-led demand regime at the country level ($\hat{\beta} = -0.133$, $SE = 0.0242$). Conversely, higher capacity utilization statistically significantly reduces the wage share in the own country, suggesting that the sample countries exhibit a profit-squeeze effect in the distribution equation ($\hat{\kappa} = -0.132$, $SE = 0.0339$). In addition, the preferred estimates reported in the last two columns of Table 3 reveal that both capacity utilization and the wage share exhibit substantial persistence, with the former displaying a considerably higher degree of persistence than the latter.

These empirical findings reported in the last two columns of Table 3 only partially corroborate the previous results of Kiefer and Rada (2015) and Rada and Kiefer (2016) for European countries. Unlike these previous studies, our approach does not impose the assumption that the wage share or capacity utilization is exogenous, that is, uncorrelated with the error terms. Instead, we allow for the possibility that these variables are jointly determined within the system of demand and distribution equations. When we relax the assumption of an exogenous wage share and exogenous capacity utilization by employing instrumental variables, we obtain a different conclusion regarding the distribution equation. While the response of capacity utilization to changes in the wage share ($\hat{\beta} = -0.133$, $SE = 0.0242$) confirms a strong profit-led demand regime, statistically significant at the 1% level, the response of the wage share to changes in capacity utilization ($\hat{\kappa} = -0.132$, $SE = 0.0339$) indicates a strong profit-squeeze effect in the distribution equation, also statistically significant at the 1% level. Furthermore, those previous studies do not account for the role of spatial spillovers in their estimations. Given the very nature of our sample, which comprises economically and geographically interconnected EU countries, such spillover effects are likely to be present. Incorporating these effects improves the empirical specification by capturing cross-country interdependencies and can provide more precise estimates of the demand-and-distribution relationships.

[4] Although the most acute phase of the COVID-19 pandemic occurred in 2020 and 2021, we extend the dummy variable to 2022 to capture the persistence of its broader macroeconomic effects, including disruptions to global supply chains, inflationary pressures, and the gradual normalization of economic activity across EU countries.

Table 3: Estimation of the unrestricted specification of the demand-and-distribution system of simultaneous equations (1)-(2) (Equation (1) with $\theta \neq \delta \neq 0$ and Equation (2) with $\pi \neq \omega \neq 0$). Instrumented variables: $u_{i,t}$, $u_{i,t-1}$, $Wu$, $\psi_{i,t}$, $\psi_{i,t-1}$, $W\psi$.

| ***SUR-SLX*** | | | | ***3SLS-SLX*** | | | |
|---|---|---|---|---|---|---|---|
| demand | | distribution | | demand | | distribution | |
| $\mu$ | **0.643*** | $\eta$ | **-0.013** | $\mu$ | **0.951*** | $\eta$ | **0.045**** |
| | (0.0446) | | (0.0207) | | (0.0643) | | (0.0229) |
| $u_{t-1}$ | **0.488*** | $\psi_{t-1}$ | **0.959*** | $u_{t-1}$ | **0.3600*** | $\psi_{t-1}$ | **0.944*** |
| | (0.0294) | | (0.0104) | | (0.0422) | | (0.0118) |
| $\psi$ | **-0.055*** | $u$ | **0.049**** | $\psi$ | **-0.133*** | $u$ | **-0.132*** |
| | (0.0208) | | (0.0199) | | (0.0242) | | (0.0339) |
| $G$ | **-0.002*** | $x$ | **-0.092*** | $G$ | **-0.002*** | $x$ | **-0.052**** |
| | (0.0004) | | (0.0206) | | (0.0005) | | (0.0248) |
| *GFC* | **-0.036*** | *GFC* | **0.011*** | *GFC* | **-0.030*** | *GFC* | **0.010*** |
| | (0.0054) | | (0.0027) | | (0.0057) | | (0.0027) |
| *COV* | **0.022*** | *COV* | **-0.005*** | *COV* | **0.022*** | *COV* | **-0.004**** |
| | (0.0045) | | (0.0021) | | (0.0046) | | (0.0021) |
| $W\psi$ | **-0.120*** | $Wu$ | **-0.0123** | $W\psi$ | **-0.334*** | $Wu$ | **0.121*** |
| | (0.0489) | | (0.0263) | | (0.0759) | | (0.0385) |
| $WG$ | **-0.005*** | $Wx$ | **0.082*** | $WG$ | **-0.006*** | $Wx$ | **0.059** |
| | (0.0007) | | (0.0347) | | (0.0008) | | (0.0381) |
| $\chi^2$ | 652.07 | $\chi^2$ | 9250.04 | $\chi^2$ | 462.42 | $\chi^2$ | 7428.47 |
| $p$-value | [0.0000] | — | [0.0000] | — | [0.0000] | — | [0.0000] |
| Effective sample size | 702 | | 702 | | 648 | | 648 |
| $LR_\beta$ | **-0.107** | $LR_\kappa$ | **1.195** | $LR_\beta$ | **-0.208** | $LR_\kappa$ | **-2.357** |
| $LR_\theta$ | **-0.234** | $LR_\pi$ | **-0.300** | $LR_\theta$ | **-0.522** | $LR_\pi$ | **2.161** |

Notes: (*) and (**) denote statistical significance at the 1% and 5% levels, respectively. Standard errors (SE) are reported in parentheses. We employ the standard SURE and 3SLS estimation methods. For the 3SLS estimation, the instrumental variables include $\psi_{i,t-3}$, $u_{i,t-3}$, $G_{i,t-1}$, $G_{i,t-2}$, $G_{i,t-3}$, $x_{i,t-1}$, $x_{i,t-2}$, $x_{i,t-3}$, $g_{i,t}$, $Wg$, $WW\psi$, $WWg$, $WWu$, $WWx$, $WWG$, $T$, and $T^2$. Here, $T$ denotes the time trend, $T^2$ denotes the quadratic time trend, $g$ denotes the growth rate of real output, and $WW\psi$, $WWg$, $WWu$, $WWx$, and $WWG$ denote the second-order spatially lagged variables defined in Table 6. $LR_\beta$ and $LR_\theta$ measure the long-run cumulative direct effect and long-run cumulative spillover effect, respectively, of the wage share on own-country capacity utilization and on capacity utilization averaged across neighboring countries. $LR_\kappa$ and $LR_\pi$ measure the long-run cumulative direct effect and long-run cumulative spillover effect, respectively, of own-country capacity utilization on the own-country wage share and on the wage share averaged across neighboring countries.

As regards the spatial spillover effects in the demand specification in Equation (1), the estimated spatial spillover coefficient, $\theta = -0.334$ ($SE = 0.0759$), is statistically significant at the 1% level. This estimate indicates that a lower wage share in immediately neighboring countries is associated with a statistically significant increase in capacity utilization in a given country. Taken together with the direct effect of changes in the wage share ($\beta$), this finding provides further evidence of a profit-led demand regime, indicating that both domestic and cross-country changes in income distribution exert expansionary effects through a redistribution toward profits. Regarding the spatial spillover effects in the distribution specification in Equation (2), the estimated spatial spillover coefficient, $\pi = 0.121$ ($SE = 0.0385$), is also statistically significant at the 1% level. This result implies that higher capacity utilization in immediately neighboring countries is associated with a statistically significant increase in the wage share of a given country, suggesting positive cross-country transmission of distributive outcomes through regional demand conditions. To the best of our knowledge, this empirical result has not been documented in the existing literature. Whereas the direct effect ($\kappa < 0$) corroborates the presence of a wage-squeeze regime, the indirect spatial spillover effect ($\pi > 0$) points to a profit-squeeze regime in the distribution equation.

Regarding the demand specification, the statistically significant estimated coefficient $\beta$ associated with $\psi$

suggests that a 10-percentage-point increase in the wage share would correspond to a 1.33-percentage-point reduction in country-level capacity utilization. In addition to such a direct effect, the indirect (spatial spillover) effect measured by the estimated value of the coefficient $\theta$ associated with the variable $W\psi$ suggests that a 10-percentage-point increase in the wage share in a given sample country would correspond to a 3.34-percentage-point decrease in the rate of capacity utilization in the immediate neighboring countries.

From the distribution equation, we may conclude that the statistically significant estimated value of the coefficient $\kappa$ associated with the variable $u$ indicates that a 10 percentage-point increase in capacity utilization would correspond to a 1.32 percentage-point reduction in the country-level wage share. In addition to such a direct effect, the indirect (spatial spillover) effect measured by the estimated value of the parameter $\pi$ associated with the variable $Wu$ suggests that a 10 percentage-point increase in the capacity utilization in a given country would correspond to a 1.21 percentage-point increase in the wage share in the neighboring countries.

Meanwhile, note from the last columns of Table 3 that the long-run effects in the demand specification, given by $LR_\beta = \beta/(1-\rho)$ and $LR_\theta = \theta/(1-\rho)$, are larger in magnitude than their contemporaneous counterparts because both capacity utilization and the wage share exhibit significant persistence (both parameters $\rho$ and $\alpha$ are statistically significant at the 1% level). It follows that a 10-percentage-point increase in the wage share in a given sample country, in addition to corresponding to a cumulative 2.1-percentage-point decline in its own capacity utilization, would correspond to a cumulative 5.2-percentage-point decrease in capacity utilization in the neighboring countries over the long run.

Along the same lines, the last columns of Table 3 show that the long-run effects in the distribution specification, given by $LR_\kappa = \kappa/(1-\alpha)$ and $LR_\pi = \pi/(1-\alpha)$, are larger in magnitude than the corresponding contemporaneous effects of capacity utilization on the wage share. It follows that a 10-percentage-point increase in capacity utilization in a given sample country, in addition to corresponding to a cumulative 23.6-percentage-point decline in the wage share of that country, would correspond to a cumulative 21.6-percentage-point increase in the wage share of the neighboring countries. These comparatively large long-run effects in absolute value reflect the substantial persistence of the wage share, as captured by the parameter $\alpha$, relative to the lower persistence of capacity utilization, as captured by the parameter $\rho$.

After establishing empirical evidence of a profit-led demand regime and a wage-squeeze distribution regime in the EU countries, we assess the hypothesis advanced by Blecker (2016), according to which an economy may exhibit a profit-led demand regime in the short run while becoming increasingly wage-led over longer time horizons. This temporal dependence of the demand regime may arise because the positive effects of lower labor costs on investment and net exports are primarily short-run phenomena, whereas the positive response of workers' consumption to higher wage income is likely to strengthen over time. To allow the sign, magnitude, and statistical significance of these effects to vary across horizons, we employ the panel instrumental variables local projection approach proposed by Jordà et al. (2015).

## 4. Robustness check: short- and long-run effects on demand and distribution

In this section, we employ the Local Projection with instrumental variables (LP-IV) approach to estimate the dynamic responses of economic activity and the wage share to identified shocks in the explanatory variables. Specifically, we implement the panel LP-IV methodology proposed by Jordà et al. (2015), which extends the impulse response framework originally developed by Jordà (2005) to instrumental-variables panel models. To enhance estimation efficiency and robustness, we depart from the two-stage least squares (2SLS) estimator employed by Jordà et al. (2015) and instead follow Blecker et al. (2022) by estimating the local projection equations using the Generalized Method of Moments (GMM). Relative to standard 2SLS, GMM is more efficient in the presence of arbitrary heteroskedasticity, thereby yielding more precise estimates of the impulse response functions.

More specifically, we examine how a shock to the wage share (capacity utilization) at time $t$ affects capacity utilization (the wage share) over a given future horizon, relative to a counterfactual scenario in which no shock occurs. In this framework, the estimated coefficients capture the response of the dependent variable $h$ periods after a unit shock occurring at time $t$. Using the variable definitions introduced in Section 3, for each horizon $h = 0, 1, 2, \dots, H$, we estimate the following local projection specification for the demand equation by GMM:

$$u_{it+h} = \mu_i^h + \beta^h S_{it}^{\psi} + X_{it}\Gamma^h + X_{it-1}\Phi^h + \varepsilon_{it+h}^u, \tag{3}$$

where $\mu_i^h$ denotes country fixed effects that account for unobserved cross-country heterogeneity, and $S_{it}^{\psi}$ represents a unit shock to the wage share in the typical country ($\psi_{it}$) and a unit shock to the wage share in a neighboring country ($W\psi$) in each experiment. For the distribution equation, we employ:

$$\psi_{it+h} = \eta_i^h + \kappa^h S_{it}^u + X_{it}\Upsilon^h + X_{it-1}\Omega^h + \varepsilon_{it+h}^{\psi}, \tag{4}$$

where $\eta_i^h$ denotes country fixed effects that account for unobserved cross-country heterogeneity, and $S_{it}^u$ represents a unit shock to capacity utilization in the typical country ($u_{it}$) and a unit shock to capacity utilization in a neighboring country ($Wu$) in each experiment. The vector $X_{it}$ includes all control variables associated with Equations (1) and (2). The observed control variables and the set of instrumental variables $z_{it}$ provide identification of the effects of the endogenous explanatory variables $\psi_{it}$ and $u_{it}$, as well as their spatially lagged counterparts ($W\psi$ and $Wu$), which constitute the four shocks considered separately in each experiment. As in Jordà et al. (2015), we include two lags of both the response variable and the shock variable in each specification, along with cluster-robust standard errors to account for serial correlation and unobserved group-level shocks. The dynamic multipliers of interest are the GMM estimates of $\beta^h$ (direct effect) and $\theta^h$ (indirect effect) in the demand equation, and $\kappa^h$ (direct effect) and $\pi^h$ (indirect effect) in the distribution equation.

As noted above, the diagnostic statistics for the instrumental variables indicate no evidence of weak-instrument problems in the panel data. Table 5 in Appendix A reports that, for a 10% maximal IV relative bias, the critical value for the computed $rk$ statistic is 10.47 in each experiment. For example, when considering the effect of a wage share shock on capacity utilization, the computed $rk$ statistic is 129.613, which is substantially above the critical value of 10.47. Similar results are obtained for all four types of shocks considered across the four experiments. Moreover, the corresponding $F$-statistics are also above the conventional threshold of 20. The Kleibergen–Paap $rk$ statistic is robust to heteroskedasticity. Therefore, the data reject the null hypothesis that the instruments are only weakly correlated with the four endogenous shock variables considered in the demand and distribution equations.

After analyzing the results, we derive four main conclusions from Table 4 and the associated impulse response functions. First, regarding the direct effect of a unit shock to the wage share on capacity utilization in the demand equation (Figure 1), we find that the demand regime is predominantly profit-led in the immediate short run ($h = 0, 1$). A rise in the wage share significantly reduces capacity utilization at short horizons, whereas it increases capacity utilization significantly over longer horizons ($h = 3, 4$). Therefore, EU countries may be characterized as profit-led in the immediate short run and wage-led over longer horizons. The impulse responses indicate that the nature of the demand regime depends on the time horizon considered, as suggested by Blecker (2016). Although this pattern is present for the direct effect of the wage share, it becomes substantially more pronounced when considering a unit shock to the wage share in the immediate neighboring countries of a given country, as shown in Figure 1.

Table 4: LP-GMM: Estimates with the full set of controls — full sample, EU-27, 1998–2024.

| **Responses** | Year $h=0$ | Year $h=1$ | Year $h=2$ | Year $h=3$ | Year $h=4$ |
|---|---|---|---|---|---|
| $\beta^h$ | -2.9050* | -3.7310* | -0.2139* | 0.7381* | 0.4097* |
| | (0.1996) | (0.2954) | (0.0756) | (0.2140) | (0.1358) |
| $\theta^h$ | -1.2261* | -1.8528* | 1.6040* | 3.0965* | 3.2862* |
| | (0.0795) | (0.1843) | (0.2851) | (0.2003) | (0.2495) |
| $\kappa^h$ | -0.2341* | -0.1465* | -0.0954* | -0.0062 | -0.0340 |
| | (0.0177) | (0.0138) | (0.0240) | (0.0232) | (0.0206) |
| $\pi^h$ | -0.0712* | -0.0276 | 0.1117* | 0.0560 | 0.0544** |
| | (0.0155) | (0.0235) | (0.0343) | (0.0381) | (0.0268) |

Notes: (**) and (*) denote statistical significance at the 5% and 1% levels, respectively. Country-based cluster-robust standard errors (SE) are reported in parentheses. Coefficient estimates for fixed effects and control variables are not reported. In the demand equation, the set of controls includes: (i) government deficit/surplus-to-GDP ratio; (ii) lagged capacity utilization; (iii) spatially lagged wage share; (iv) spatially lagged government deficit/surplus-to-GDP ratio; (v) a dummy variable for the global financial crisis; and (vi) a dummy variable for the COVID-19 pandemic. In the distribution equation, the set of controls includes: (i) labor productivity growth; (ii) lagged wage share; (iii) spatially lagged capacity utilization; (iv) spatially lagged labor productivity growth; (v) a dummy variable for the global financial crisis; and (vi) a dummy variable for the COVID-19 pandemic. As in Jordà et al. (2015), we include contemporaneous terms and two lags of the relevant variables. The full sample covers the period from 1998 to 2024. All shock variables are treated as endogenous in each experiment, and the corresponding instruments employed are: $\psi_{i,t-3}$, $u_{i,t-3}$, $G_{i,t-1}$, $G_{i,t-2}$, $G_{i,t-3}$, $x_{i,t-1}$, $x_{i,t-2}$, $x_{i,t-3}$, $g_{i,t}$, $Wg$, $WW\psi$, $WWg$, $WWu$, $WWx$, $WWG$, $T$, and $T^2$, where $T$ denotes the time trend and $T^2$ the quadratic time trend. The variable $g$ denotes the rate of real output growth, while $WW\psi$, $WWg$, $WWu$, $WWx$, and $WWG$ denote the second-order spatially lagged variables defined in Table 6

Second, regarding the indirect effect in the demand equation of a unit shock to the wage share in neighboring countries (Figure 1), we find that the demand regime is predominantly wage-led in the longer term and profit-led in the short run. An increase in the wage share in neighboring countries reduces capacity utilization over the immediate short-run horizons considered (i.e., $h=0,1$), whereas it has a positive effect on capacity utilization over longer horizons ($h=2,3,4$).

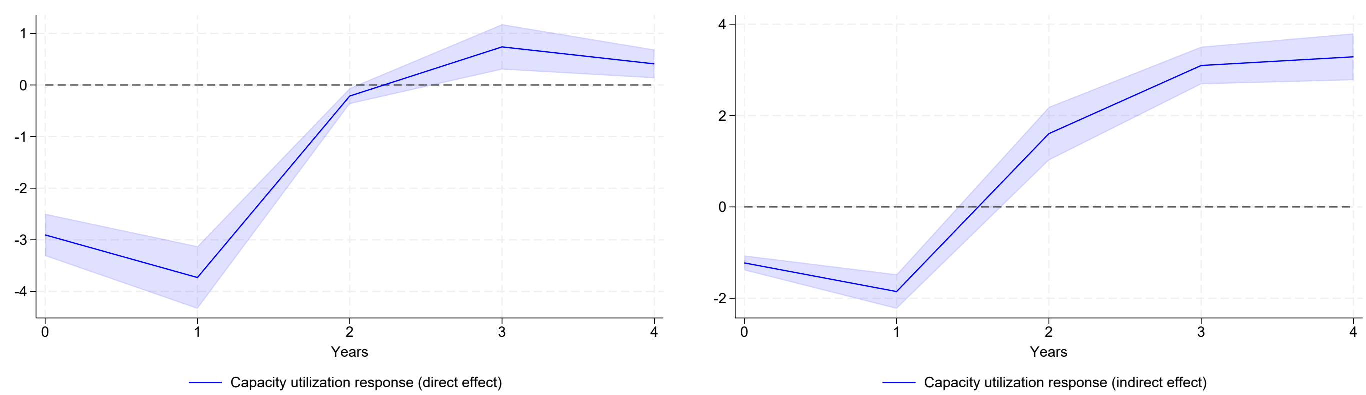


Figure 1: This figure reports the estimated impulse response of capacity utilization to a unit shock to the wage share in a typical EU country (left panel) and the estimated impulse response of capacity utilization to a unit shock to the wage share in the immediate neighboring countries of a typical EU country (right panel), along with the associated 95% confidence interval computed using country-clustered robust standard errors (SE).

Summing up, an increase in the wage share, which is equivalent to an increase in unit labor costs, significantly reduces capacity utilization in the first few periods following a unit shock, likely through its adverse effects on net exports, but increases capacity utilization over subsequent periods, likely through stronger consumption dynamics. The empirical findings reported in Figure 1 are consistent with the simulations presented by Horn and Watt (2017), which are based on an error-correction model estimated using quarterly time-series data for Germany over the 2001–2015 period. They find a substantial negative effect of a 1% increase in wages on German net exports, alongside a sizeable positive effect on consumption over time.

Third, regarding the direct effect of a unit shock to capacity utilization on the wage share response in the distribution equation (Figure 2), we find that the distribution regime is predominantly characterized by a wage-squeeze pattern, in which an increase in capacity utilization reduces the wage share over most horizons, from the immediate short run to the longer term.

Lastly, regarding the indirect effect of a unit shock to capacity utilization in neighboring countries on the wage share in a typical country (Figure 2), we find that an increase in capacity utilization in neighboring countries reduces the wage share in the typical country in the immediate short run ($h = 0$). However, this effect tends to reverse over longer horizons, with capacity utilization in neighboring countries significantly increasing the wage share in the typical country at $h = 3$.

Based on these four conclusions derived from the empirical evidence for a panel of 27 EU member countries, we highlight the observations of Blecker (2016) regarding the broader pattern, which suggest that caution is warranted when attempting to classify a particular country unequivocally as either wage-led or profit-led. The nature of the demand regime may change across space and time depending on the prevailing economic circumstances. In particular, the hypothesis that lower unit labor costs generate positive short-run effects on net exports, while the effects of lower unit labor costs on consumption emerge over longer horizons, appears to be broadly consistent with the evidence from the EU-27 spatial panel data.

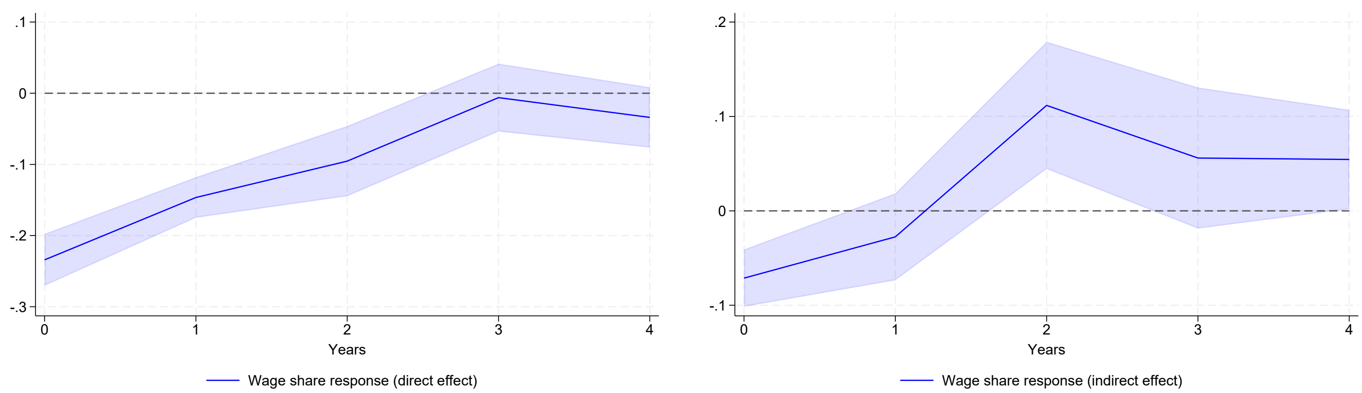


Figure 2: This figure displays the estimated impulse response of the wage share to a unit shock to capacity utilization in a typical EU country (left panel) and the the estimated impulse response of the wage share to a unit shock to capacity utilization in the immediate neighboring countries of a typical EU country (right panel), along with the associated 95% confidence interval computed using country-clustered robust standard errors (SE).

## 5. Conclusions

This study contributes to the literature on the relationship between functional income distribution and economic activity by estimating a system of simultaneous equations that addresses both endogeneity and spatial dependence. Using a dynamic spatial panel for the 27 European Union (EU) countries over the 1998–2024 period, we explicitly incorporate cross-country spillover effects into the empirical analysis of aggregate demand regimes. Given the strong trade, production, and financial linkages among EU economies, explicitly accounting for these interdependencies provides a more comprehensive assessment of the relationship between functional income distribution and aggregate demand.

The main findings are as follows. First, a higher wage share significantly reduces both domestic capacity utilization and capacity utilization in neighboring countries. These cross-border effects amplify the contractionary impact of higher wage shares, highlighting the importance of accounting for spatial interdependence when evaluating national demand regimes. Second, higher domestic capacity utilization significantly lowers the country's own wage share while increasing the wage shares of neighboring economies. These findings indicate that the interaction between aggregate demand and functional income distribution extends beyond national borders, reinforcing the importance of modelling endogeneity and cross-country interdependencies simultaneously. Third, instrumental-variable local projections and impulse response functions corroborate these short-run relationships. Fourth, aggregate demand is predominantly profit-led in the short run but becomes wage-led over longer horizons, particularly through the spillover effects of wage shares on capacity utilization. Finally, higher wage shares in neighboring countries reduce domestic capacity utilization in the short run but increase it over longer horizons. Conversely, higher capacity utilization in neighboring countries initially lowers the domestic wage share, although this effect tends to reverse in the longer run. Overall, the findings indicate that capacity utilization and functional income distribution are jointly determined across the EU-27 economies.

Although some member states—particularly smaller and more open economies—may display profit-led characteristics because of the importance of net exports, these external competitiveness effects largely offset one another when the EU-27 is considered as an integrated system. Consequently, coordinated wage restraint across the EU weakens domestic and regional aggregate demand while generating only limited gains in external competitiveness. Over longer horizons, the resulting demand dynamics are therefore wage-led.

These findings have important implications for wage policy, economic activity, and European integration. EU member states cannot be treated as isolated economies when designing wage policies, since changes in the wage share affect both domestic capacity utilization and the wage shares and economic activity of neighboring countries through spatial spillovers. Effective wage policies should therefore be formulated within a coordinated European framework that accounts for these regional interdependencies and their implications for national and regional aggregate demand.

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## Appendix A: EU country sample and diagnostic statistics for instrumental variables

Table 5: First-stage regressions of endogenous variables on instruments and control variables: EU-27, 1998–2024.

| Instrumented | $\psi_{i,t}$ | $W\psi$ | $u_{i,t}$ | $Wu$ | $\psi_{i,t}$; $\psi_{i,t-1}$; $W\psi$; $u_{i,t}$; $u_{i,t-1}$; $Wu$ |
|---|---|---|---|---|---|
| $F$-statistic | 45.14 | 68.16 | 524.78 | 147.59 | demand: 60.75; distribution: 759.13 |
| Kleibergen-Paap $rk$ | 129.613 | 294.430 | 198.588 | 3022.602 | demand: 82.73; distribution: 214.42 |
| $R^2$ | 0.5319 | 0.5116 | 0.7769 | 0.7878 | demand: 0.5203; distribution: 0.7766 |
| Observations | 648 | 648 | 648 | 648 | 648 |

Notes: Country-based cluster-robust standard errors (SE) are employed in all estimations. In the demand equation, the set of control variables includes: (i) government deficit/surplus-to-GDP ratio; (ii) lagged capacity utilization; (iii) spatially lagged wage share; (iv) spatially lagged government deficit/surplus-to-GDP ratio; (v) a dummy variable for the global financial crisis; and (vi) a dummy variable for the COVID-19 pandemic. In the distribution equation, the set of control variables includes: (i) labor productivity growth; (ii) lagged wage share; (iii) spatially lagged capacity utilization; (iv) spatially lagged labor productivity growth; (v) a dummy variable for the global financial crisis; and (vi) a dummy variable for the COVID-19 pandemic. The full sample covers the period from 1998 to 2024. All shock variables are treated as endogenous, and the corresponding instruments employed are: $\psi_{i,t-3}$, $u_{i,t-3}$, $G_{i,t-1}$, $G_{i,t-2}$, $G_{i,t-3}$, $x_{i,t-1}$, $x_{i,t-2}$, $x_{i,t-3}$, $g_{i,t}$, $Wg$, $WW\psi$, $WWg$, $WWu$, $WWx$, $WWG$, $T$, and $T^2$. Here, $T$ denotes the time trend and $T^2$ the quadratic time trend, $g$ denotes the rate of real output growth, and $WW\psi$, $WWg$, $WWu$, $WWx$, and $WWG$ denote the second-order spatially lagged variables defined in Table 6. The Kleibergen–Paap $rk$ statistic is employed to assess the strength of the excluded instruments and the potential presence of weak identification. For a 10% maximal IV relative bias, the corresponding critical value is 10.47. The Kleibergen–Paap $rk$ statistic is robust to heteroskedasticity. The null hypothesis is that the excluded instruments are only weakly correlated with the endogenous regressors.

Table 6: **Variables description and definitions**.

***Variables description***

1. $u_{i,t}$: capacity utilization, calculated as the ratio of real output to trend output, with the latter estimated using the Hamilton (2018) filter.
2. $\psi_{i,t}$: adjusted wage share, defined as compensation of employees adjusted for self-employed labor income and expressed as a percentage of GDP at current factor cost (ALCD2), based on the income approach (Stockhammer and Ederer, 2008; Guerriero, 2019; ILO, 2015).
3. $G_{i,t}$: government surplus/deficit, defined as the difference between total government expenditure and total current government revenue, with both variables expressed as percentages of GDP at market prices.
4. $x_{i,t}$: Labor productivity growth is measured as the growth rate of labor productivity per hour worked.
Labor productivity is defined as real GDP divided by total hours worked, where total hours worked are given by the product of average annual employment, $E$, and average annual hours worked per person employed, $H$.
Thus, $x_{i,t} = \frac{A_{i,t}-A_{i,t-1}}{A_{i,t-1}}$, where $A_{i,t} = \frac{GDP_{i,t}}{E_{i,t} \cdot H_{i,t}}$ denotes labor productivity per hour worked in levels.
5. $Wu$: spatially lagged capacity utilization.
6. $W\psi$: spatially lagged wage share.
7. $WG$: spatially lagged government surplus/deficit as percentage of GDP at market prices.
8. $Wx$: spatially lagged labor productivity growth.
9. *GFC* denotes a dummy variable for the global financial crisis, equal to 1 in 2008 and 2009 and 0 in all other years.
10. *COV* denotes a dummy variable for the COVID-19 pandemic, equal to 1 in 2020–2022 and 0 in all other years.

Table 7. List of European Union member countries

| *Country* | *Country* |
|---|---|
| 1. BEL (Belgium) | 15. LTU (Lithuania) |
| 2. BGB (Bulgaria) | 16. LUX (Luxembourg) |
| 3. CZE (Czech Republic) | 17. HUN (Hungary) |
| 4. DNK (Denmark) | 18. MLT (Malta) |
| 5. DEU (Germany) | 19. NLD (Netherlands) |
| 6. EST (Estonia) | 20. AUT (Austria) |
| 7. IRL (Ireland) | 21. POL (Poland) |
| 8. GRC (Greece) | 22. PRT (Portugal) |
| 9. ESP (Spain) | 23. ROU (Romania) |
| 10. FRA (France) | 24. SVN (Slovenia) |
| 11. HRV (Croatia) | 25. SVK (Slovakia) |
| 12. ITA (Italy) | 26. FIN (Finland) |
| 13. CYP (Cyprus) | 27. SWE (Sweden) |
| 14. LVA (Latvia) | — |

Source: Author's elaboration from data.