MASTER'S THESIS

Gendering the Socio-Ecological Transition: A Feminist Macroeconomic Perspective

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Abstract

This paper examines the gendered employment effects of government spending and investment within a Feminist Post-Kaleckian macroeconomic framework. By supplying a Structural Vector Autoregressive (SVAR) model for six EU countries including Austria, Germany, Spain, Italy, France, and Finland, the analysis identifies heterogeneous employment effects on Women and Men to fiscal shocks. Public investment proves the most consistent employment driver, particularly in contexts of very low (Italy) or high (Finland, Germany) female labor force participation, underscoring the role of institutional and social structures in shaping policy outcomes. Social government spending in Austria boosts female employment and narrows gender gaps, while green government spending in Spain benefits both genders but disproportionately men. By linking ecological and gender dimensions, the paper highlights how feminist macroeconomics can inform equitable, gender-responsive climate policy and contribute to accompany a socio-ecological transition.

1 Introduction

In current times of polycrisis, the need for a transition towards a post-carbon economy and more equitable society is evident and largely undisputed within current research agendas. The claim for a socio-ecological and just transition goes back to the 1960ies and originally stems from the labor unions in the US, where Tony Mazzocchi affiliated with the Oil, Chemical and Atomic Workers' Union tied up with the origins of the climate justice movement (Stevis & Felli, 2020). At that time, just transition was understood as a way to remunerate workers in polluting industries for their service to society, while upholding their dignity (Abraham, 2017). A collaboration between workers' representatives and environmentalists as well as companies constructed reemployment plans focusing on job security, reinvestment, and development of afflicted communities.

As the body of research on (just) transition has developed, researchers discerned that one should aim for alleviating the standing of jobs at the core of concept to prevent the "job vs climate" frame (McCauley & Heffron, 2018). Even though jobs are of undoubted importance in a just transition and interrelated state interventions are evidently necessary, decarbonizing policies go beyond the labor market. Thus, the field of knowledge started to utilize climate, energy and environmental justice research to foster understanding and consequently embellish an equitable and fair transitional process away from fossil fuels and towards a post carbon economy and society. According to the understanding of Velicu and Barca (2020), the multiple crisis we are facing, in particular the ecological and the social crisis, all stem from inequalities. Biesecker and Hofmeister (2010) put a special emphasis on the separation of the productive and reproductive sphere in industrial economies as the key determinant of current crisis. Thus a just transition cannot solely constitute a transition out of fossil fuels but needs to dismantle the logic of these unequal relations (Velicu & Barca, 2020).

This thesis investigates the labor market, with particular attention paid to the employment effects of a socio-ecological transition. This is in this regard understood as encompassing government spending in the green and social sectors as well as public investment. The deeply gendered nature of employment is conceptualized as the gender-segregated labor market in feminist Post-Keynesian Economics (PKE) (Braunstein et al., 2019; Onaran et al., 2022b). Largely shaped by social norms, women are overrepresented in the Social sector, while substantially underrepresented in the green economy. Henriques et al. (2025) has shown that countries with a greater green transition index, which captures the value of the progress in the transition towards environmental sustainability, score a distinct lower gender equality index within the green sector, which included the dimensions employment, wages, working time, innovation, and leadership. This finding can especially be attributed to the sectoral segregation in the labor market, since women are initially underrepresented in green industries and greater transitional dynamics is not found to lead automatically to a simultaneous closure of the gender gap.

In the debate on limited budgets we are confronted with today, the general realm is pointing to increased saving pressure within budgets rather than expanded investments for the socio-ecological transition. At a more conceptual level, debates within Modern Monetary Theory building on Godley

and Cripps (1983) and Godley and Lavoie (2007), Wray (2015) among others, might not agree on the limit reached for money creation. While others like Palley (2015) pose significant critique and disagreement on MMT especially regarding its undervaluation of risks exposed. Generally, MMT is greatly interlinked with the sovereignty of the money market and thus not suitable for any economy. In the European Union, the deepening budgetary deficits following COVID-19 and the energy crises have reinforced calls for fiscal consolidation and balanced budgets (e.g. Heimberger, 2023).

Within the debate on limited budgets, it is crucial to recognize that budgets function less as rigid constraints and more as instruments of political power, reflecting priorities rather than immutable boundaries (e.g. Mazzucato, 2022). As Krebs and Weber (2025) note, recent developments in Germany, where the debt brake has been circumvented to enable a shift toward Military-Keynesianism, illustrate how fiscal capacity can be mobilized for chosen objectives. In this case, substantial resources have been channeled toward military production, expanding capacity for armaments rather than accelerating the decarbonization of the economy and thereby undermining climate protection goals. Given the urgency of the climate crisis, such choices underscore the need to reframe fiscal policy as a question of democratic priority-setting, with sustained political pressure to ensure that climate mitigation is addressed proactively and at an adequate pace, rather than reactively when climate breakdown becomes unavoidable (e.g. Truger, 2023).

When setting such priorities, it is essential not to overlook the gendered dimensions of the socio-ecological transition. While green industries — especially in the energy sector — are vital for decarbonization, they are often capital-intensive and aggregate employment effects remain contained (Vandeplas et al., 2022). By contrast, the care sector is both labor-intensive and low-emitting, making it a de facto "green" sector in terms of carbon footprint. Investing in care infrastructure contributes to decarbonization through lower production intensity and reduced emissions, while simultaneously advancing gender equality by creating employment opportunities for women and alleviating the unpaid care burden (Onaran & Oyvat, 2023b). Building on the seminal work by Onaran et al. (2022a) and subsequent work (e.g. Onaran & Oyvat, 2023a, 2023b; Onaran et al., 2022b; Oyvat & Onaran, 2022), we aim to illustrate in this thesis the gendered employment effects of government spending and investment which target socio-ecological goals for 6 different EU countries including Austria, Germany, Finland, France, Italy, and Spain.

As argued by Huwe and Rehm (2022), Post Keynesian economics (PKE) can be deployed to model the triple crisis we are facing to date, which they refer to as the ecological overshoot, wealth inequality, and the economic system structured around a growth imperative. Conditioned on the integration of these 3 dimensions, PKE may contribute fruitful insights for guiding a socio-ecological transition.

In the subsequent Section 2, I will outline the starting points for an integration of Post Keynesian Economics (PKE) with Ecological Economics (EE) and Feminist Economics (FE) and point to the fruitful synergies created by the complementarities of the perspective on labor from the three distinct theoretical strands. Section 3 covers the data sources used for the Structural Vector Autoregressive model (SVAR) for 6 countries within the European Union and highlight the main dynamics for the

underlying theoretical feminist Post-Keynesian/Kaleckian structural modeling framework. Section 4 emphasizes the differences of the economic systems between the countries and Section 5 presents the main results of the SVAR analysis and commonalities and differences between institutional contexts will be outlined. Implications for current policy debates are discussed in Section 6.

2 Literature Review

Environmental degradation and climate breakdown have long been recognized as intrinsic outcomes of the core dynamics of capitalism. Particularly the relentless drive for profit and rent extraction shows interdependencies of the economic and environmental sphere and should therefore be included in the conceptualization of an ecological macroeconomic framework (Hinton, 2020; Stratford, 2020; Strunk et al., 2022). While Ecological Economics (EE) has grappled with these challenges by foregrounding biophysical limits and the ecological consequences of growth (Strunk et al., 2022). Yet, EE has often struggled to articulate a coherent macroeconomic framework, which is capable of seize dynamics of employment, income distribution, and financial instability (Huwe & Rehm, 2022; Rezai et al., 2013). Feminist Economics (FE) has historically been centered in microeconomic analysis, and the absence of a macroeconomic perspective has long obscured important insights into structural gender differences (van Staveren, 2010). In addition, applying a feminist lens to macroeconomics allows researchers to be better equipped to abstract from real-world economics (Zuazu, 2024).

Post-Keynesian Economics (PKE), with its established macroeconomic foundations, offers a promising framework through which to address these gaps. Although tensions exist between PKE and EE, particularly in terms of growth and productivity, scholars argue that these can be reconciled in ways that enrich EE's framwork of the ecology with PKE's theoretical rigor (e.g. Huwe & Rehm, 2022). Alongside, FE's structuralist emphasis on the gendered nature of growth, employment, and distribution aligns with PKE's concern for demand-led dynamics and the institutional determinants of labor markets (Blecker & Braunstein, 2022). Taken together, these traditions offer complementary insights for theorizing a socio-ecological transition that places both acting within planetary boundaries and gender equality at its core.

This review of the literature does not aim to provide a comprehensive overview of Ecological PKE or Feminist PKE. Rather, emphasis is placed on the connecting points between these three strands PKE, EE, and FE in order to outline a more integrated macroeconomic perspective for theoretical debates and policy discussions. For broader overviews of the respective fields, we refer the reader to recent surveys such as van Staveren (2010) and Zuazu (2024) for feminist macroeconomics and Fontana and Sawyer (2016), Huwe and Rehm (2022), and Strunk et al. (2022) for ecological macroeconomics.

2.1 Feminist Economics and PKE

The core of Feminist economics constitutes the critique of the androcentric bias in economic theory and thereby includes how the household as well as care provisioning is conceived (Blecker & Braunstein, 2022). In particular, portraying it as "an oasis of altruism in the midst of the competitive and self-interested marketplace" (Blecker & Braunstein, 2022, p. 3).

Feminist economics, however not aiming for full agreement, is commonly defined as a lens through which researchers conduct economic analysis, while not categorizing it as a separate school of thought (van Staveren, 2010). Thereby a variety of heterodox but also orthodox methodological approaches are supplied to tackle pressing issues (Blecker & Braunstein, 2022).

Historically centered primarily in microeconomics, the macro orientation and thereby PKE it thus argued by Waller (1999) remained long absent on the questions of gender. However, this cannot be regarded as justification since other microeconomic concepts are as well at the core of PKE, including social relatedness of agents (herd behavior) and concepts of agency (expectations) (van Staveren, 2010).

Additionally, the household as patriarchal institution following Veblen (1898), should not only be viewed as "the site for consumption and labour supply but also as an institution of production and investment, through unpaid work, reproduction of the labour force, as well as, in the case of household-based firms, production for the market" (van Staveren, 2010, p. 1129). Unpaid work and caring are central to this conceptualization and are situated within this largely asymmetric institutional environment of the household, where men are conceded more opportunities and fewer constraints both within and outside the household (van Staveren, 2010).

It is important to recognize that in the recent decade great advances were attained in the field of Feminist macroeconomics. By examining most recent literature reviews on Feminist (Post-Keynesian) Macroeconomics e.g. Onaran and Oyvat (2023b) and Zuazu (2024), it becomes evident that a great amount of theoretical and empirical contributions were made. Going back to the 2010s, in the paper by van Staveren (2010) solely the mentioning of Joan Robinson or Rosa Luxembourg were regarded as contribution to Feminist macroeconomics. This should not act as a critique, but point to the systematic underrepresentation of Feminist Macroeconomics until recently, while still recognizing substantial contribution beginning with articles in the 1980s. Here, Humphries and Rubery (1984) observed that social reproduction maintains a degree of autonomy from the macroeconomy, with macroeconomic aggregates both shaping and being shaped by how paid and unpaid work is distributed within households and thereby particularly highlighting the importance for the labor market(Zuazu, 2024). This was followed by contributions in the journal of World Development in the 1990s, such as the foundational methodological work by (Ertürk & Çağatay, 1995). Today, a substantial body of research on Feminist macro-modeling builds upon the growth model by Bhaduri and Marglin (1990), including the seminal model of (Onaran et al., 2022a) and subsequent related studies.

By this means, the authors elucidate the critical importance of gendered division of labor —

both paid and unpaid — in understanding the dynamics of the macro economy (Zuazu, 2024). The central role of care in the social organization of production, sustaining processes of accumulation, enabling exploitation, and reinforcing the creation of inequality (Blecker & Braunstein, 2022). Thus, central feminist concerns are reflected in labor-market oriented strands of Post-Keynesian literature (King, 2001), while still reaching further than just covering the labor market.

The commonalities between Post-Keynesian and Feminist Economics are outline by various scholars (e.g. Fontana & Sawyer, 2016; Onaran et al., 2022b; Strunk et al., 2022; van Staveren, 2010). Based on King (2001), van Staveren (2010) highlights the issue of discrimination, the endogeneity of tastes, dual and segmented markets and the strong critique on the notion of worker and consumer sovereignty as the key shared topics across the two disciplines. van Staveren (2010) highlights that one should rather be recognizing, following Lawson (2006), the shared dissatisfaction with neoclassical paradigm as the central linkage between FE and PKE. As illustrated by Onaran and Oyvat (2023b), Post-Keynesian macroeconomics can enrich Feminist Economics, particularly when drawing on Kaleckian and demand-led growth literature. These frameworks permit the integration of gender and class inequalities into both demand- and supply-side analyses of wage and employment disparities while also assessing how different forms of public expenditure can foster more equitable and sustainable outcomes in income distribution, employment, and productivity (Zuazu, 2024).

Lawson (2006) points to the shared social ontological approach, which aims at contrasting heterodox schools of though from neoclassical economics. Essential in this regard is then the ontology of process, openness and internal-relationality (Lawson, 2006). The former refers to the significant emphasis placed on process in Post Keynesian theories of money and the examinations of labor market discrimination in FE, which can as well seen as a process forming labor market outcomes. In addition, the openness in the macroeconomics of PKE translates to bargaining approaches in FE. The last point of Lawson (2006) - internalrelationality - points to the animal spirit in PKE and the caring spirit in FE, as the main theories of herd behavior. Feminist Economics thereby emphasizes the role of social norms, power dynamics, and affective relations in caring practices. Drawing on these theoretical insights, van Staveren (2010) consolidates following commonalities within PKE and FE: the importance of social embeddedness, distributional issues and institutions and differentiates between Gender matters and Money matters to highlight the different focus.

Both schools behold agents as socially embedded, engaged in a two-way relationship with social structures that are shaped by power, conflict and inequality (Danby, 2004; King, 2001). In addition, they share a focus on distributional issues, though Post Keynesian economics emphasizes class, financial instability, and global inequality, while Feminist Economics centers on gender, poverty, and the interplay of gender and class (van Staveren, 2010). Both acknowledge intersections with race and ethnicity. Lastly, each school recognizes the critical role of institutions alike but differ in perspective: Post Keynesianism sees institutions (e.g., money, state) as stabilizing responses to uncertainty, whereas Feminist Economics highlights their asymmetric and often unequal impacts(van Staveren, 2010). Nonetheless, both view institutions as contested arenas through which groups seek to manage uncertainty (van Staveren, 2010).

Onaran and Oyvat (2023b) emphasis on structural features, such as import dependency, oligopolistic pricing, sectoral composition, balance-of-payments constraints, currency hierarchies, and unequal bargaining power between labor and capital (Onaran & Oyvat, 2023b), all have gendered implications. And are further consistent with van Staveren (2010)'s call to integrate key Post-Keynesian principles of uncertainty, market power, and endogenous dynamics, referred to as Money matters, into Feminist analysis.

Uncertainty is often times implicitly assumed within FE, yet the relatively limited attention it receives is unexpected, given that women's position in the economy is strongly influenced by fundamental uncertainties (van Staveren, 2010). In addition, both traditions reject the idea of market-clearing equilibrium as well as the assumption that perfect competition will eliminate discrimination, where van Staveren (2010) highlights the market power dimension. Most importantly, historical time, hysteresis and path-dependency are of great relevance to the income distribution as already emphasized by Robinson (1969) and exhibit significant impact on gendered outcomes.

Onaran and Oyvat (2023b) highlight the role of excess capacity and involuntary unemployment in PKE, relating to the endogeneity of labor demand. Feminist economics thus benefits from exploring "demand-side reasons behind women's economic inactivity, underemployment, or unemployment" (Zuazu, 2024, p. 227). Conversely, PKE should be more open to including the endogeneity of labor supply, since labor power must be viewed as a produced input since without unpaid work within the household, labor power would not exist (King, 2002). This is commonly defined as social reproduction and recognizes the provision of time, commodities, and financial resources necessary to create, sustain, and invest the labor force and thereby exhibits both a short- and long-run dimension (Seguino, 2020). Moreover, endogenizing labor would contribute to the advancing the notion of social reproduction with unpaid work to ensure its integration into labor market analysis (van Staveren, 2010).

Another dimension of the endogenous dynamics is the money endogeneity, whereby money cannot be viewed neutral, and the gender dimension of money can be illustrated within local exchange networks as well as through informal or local forms of money (Williams, 1996). Thereby the main tents of the money matters category are captured.

van Staveren (2010, p.1123) underlines that "gender, the household and unpaid work and caring as key concepts in Feminist economics" and refers to this as the Gender matters category used to expand PKE with FE. Hence, gender is perceived as the key analytical category, utilized to capture differences in economic outcomes between women and men. The emphasis on the strong connectedness of the economy, market, and money in PKE might thus come at the expense of non-market and non-monetary production (Danby, 2004). The integration of gender into economic analysis not only helps researchers understand the different positions of men and women in the economy but, more importantly, enables them to grasp gender dualisms as fundamental to analyzing economic dynamics throughout the entire economy (van Staveren, 2010).

Finally, to finish with a comprehensive definition of Feminist Macroeconomics we refer to Blecker and Braunstein (2022), capturing the gender system as being both the cause and the consequence of

macroeconomic outcome, processes, and policies. Thus, macroeconomic Feminist perspectives being expanded from simply identifying differences between women and men to uncovering the gendered organization of the macroeconomy, the social dimensions of macroeconomic policy, and the pivotal role of care in enabling market production (Elson & Cagatay, 2000). Seguino (2013) ascertain three distinct strands in research agendas within Feminist Macroeconomics, firstly, covering feminist growth theory and gender dimensions of policies on the macro-level, secondly, social infrastructure and intra-household research allocation and lastly, theoretical foundations and macro-modelling of the care economy. This thesis will focus its empirical contribution the the second and third part in particular.

2.2 Ecological Economics and PKE

The central connecting point between Post-Keynesian Economics (PKE) and Ecological Economics (EE) is the analysis of the moderation of negative effects stemming from the system's dynamics and thereby aiming to capture fundamental dynamics of capitalism, especially regarding its growth and distribution outcomes (Huwe & Rehm, 2022).

Fontana and Sawyer (2016) argue that PKE enhances the macroeconomic perspective of EE by building on demand-led Growth theory and Monetary Circuit theory. The "modern economy is a monetary production economy, i.e., an economy where money is crucial for the production of goods and services and the distribution of income" (Fontana & Sawyer, 2016, p. 187), and thereof is inclined to financial instability and solvency issues. In contrast to the mainstream, Post-Keynesian growth theory explicitly integrates demand effects, distributional impacts and effects of emissions implied by adjustment efforts in their macroeconomic analysis (Fontana & Sawyer, 2016; Huwe & Rehm, 2022; Taylor et al., 2016). Built on the axiom of interdependence between aggregate demand and supply in both the short and long run, this framework recognizes fundamental uncertainty, path dependence, and the persistent prevalence of labor underutilization and excess capacity in modern capitalism (Fontana & Sawyer, 2016). In this view, investment is the driver of demand, determining both current utilization and the future productive potential of the economy. Through fundamental uncertainty, the possession of full information is ruled out and prevents further the derivation of optimization under rational expectations. Growth is thus demand-led and contingent on the rate and composition of investment rather than tending toward a predetermined equilibrium (Fontana & Sawyer, 2016). Aggregated demand levels are central in "determining the degree of utilisation of existing productive resources as well as the expansion of these resources over time." (Fontana & Sawyer, 2016, p. 190). Full employment and economic growth have always been central to Post-Keynesian economics, representing key contributions of the approach. The research emphasizes the absence of automatic market forces that maintain output at levels ensuring full employment (Fontana & Sawyer, 2016). Consequently, energy and resource constraints have generally played a minor role, although recent efforts aim to more fully integrate the ecological effects of capitalism (Huwe & Rehm, 2022).

Acknowledging the economic, biophysical, and social interconnections, theories of Ecological Economics stress that lower growth, while necessary to avoid catastrophic environmental outcomes, would have serious macroeconomic consequences (Fontana & Sawyer, 2016). These would include reduced capacity utilization, a lower profit rate, and diminished use of labor resources, necessitating deliberate control over investment volume and composition, regulation of bank lending, and active government intervention to steer the economy toward a post-carbon/ post-growth future (Fontana & Sawyer, 2016). Here, the skepticism towards growth is openly expressed by the authors, how can be associated according to Jimenez and Woodgate (2025) to the Degrowth and Zero-Growth strand of Ecological PKE. Growth is seen as a double-edged sword: essential for reducing unemployment but potentially incompatible with ecological limits without structural governmental policy change and social norm shifts (Fontana & Sawyer, 2016). The current growth rate of aggregated demand is above the ecological sustainable growth path and thereby not only the scale but even more the speed of decoupling matters in meeting the carbon target (Jimenez & Woodgate, 2025).

Ecological economists further challenge the compatibility of high economic growth with strong environmental policies, questioning growth fetishism (Spash, 2015) and emphasizing the empirical link between labor productivity and energy use, where increases in output per worker translate directly into higher energy consumption (Strunk et al., 2022). Historically, gains in labor productivity have not led to proportional reductions in working hours but have primarily fueled output growth, consumption, and resource depletion, creating a self-reinforcing cycle integral to capitalism and the current economic order (Strunk et al., 2022). Without sufficient economic growth to absorb productivity improvements, unemployment rises. A phenomenon termed the "productivity trap" (Jackson & Victor, 2011; Strunk et al., 2022). This complex interplay highlights the necessity for Post-Keynesian economics to critically reconsider growth paradigms and labor relations in light of ecological limits. As Cahen-Fourot (2022) was able to show theoretically, continuous growth is not necessarily tied to a monetary system and thereby dismantles the growth imperative with concurrent working time reduction. This is based on, as Fontana and Sawyer (2016) argue the issue that economic growth is fundamentally driven by aggregate demand and can be constrained by labor availability as economies approach full employment. However, they emphasize that "the growth of aggregate demand tends to be greater than the sustainable growth of depletion of 'natural capital'" (Fontana & Sawyer, 2016, p.187), underscoring the necessity of an ecological dimension within the labor theory of post-Keynesian economics.

Jimenez and Woodgate (2025) classify besides the Post-Growth strand of PKE the Green Keynesianism highlighting the need of a Green New Deal and do not view a degrowth scenario as likely from a political economic perspective. According to Pollin (2019), at the core of the green new deal is the transition to a decarbonized economy by increasing energy efficiency and attaining absolute decoupling of economic activity from fossil fuel consumption.

Central to ecological economic thought is the restructuring of wage labor, with policies targeting labor institutions serving as the "single silver bullet" (Weiss & Cattaneo, 2017, p. 277) for the socio-ecological transition (Barca, 2017). Proposed measures include here a basic income, work-sharing,

and decoupling labor from income, proposed as vital policy tools to lower working hours and achieve a socio-ecological transformation (Dengler & Strunk, 2018; Kallis et al., 2013; Knight et al., 2013; Strunk et al., 2022). Thus, the assumption is that a reform and reduced working time will result in a reduction in consumption and production that adheres to planetary boundaries while potentially improving quality of life (Rezai et al., 2013; Strunk et al., 2022). To meaningfully address biophysical limits and the broader implications of climate change, the conceptualization of wage labor should occupy a central role in the discussion (Strunk et al., 2022), thereby serving as a key entry point for EE within PK frameworks.

Subsequently, a Post-Keynesian labor theory will be outlined following Strunk et al. (2022) and concurrently offers a foundation for integrating insights from feminist and ecological economics. Post-Keynesians have historically sought to reduce unemployment indirectly by stimulating aggregate demand (Strunk et al., 2022). In this regard the hierarchical view of the goods market placed above the labor market is revealed. Hence, labor is typically treated as a residual variable and not a variable of interest for policy intervention in short-run growth models (Lavoie, 2014; Strunk et al., 2022). Still, researchers deal with labor in the light of the functional income distribution between labor and capital or structural unemployment, while not explicitly modeling it (Strunk et al., 2022). What PK economists widely agree on is the fact that labor market cannot be considered a market in the (strict) Walrasian sense (King, 2015; Lavoie, 2014). While PKE lacks an unifying labor theory, King (2019) attributes this to labor economics being primarily micro-focused, in contrast to the fundamentally macroeconomic orientation of PK theory. The reason why labor theory remained underresearched and did not receive adequate attention, while some lament unsuccessful attempts in constructing a labor theory e.g. King (2002) were made, others reject it as inept for the macrostructure of PKE as a microeconomic framework, fundamentally. It is thus argued by Strunk et al. (2022) that the inclusion of a post-Keynesian perspective on labor supply in the demand-side view of PKE by including a labor theory, an entry point is made explicit. For now, EE need to draw on neoclassical labor theory due to the blank spot in PKE (see Hardt & O'Neill, 2017). A system operating below full capacity ensures a continuous availability of labor, based on the idea that demand generates its own supply, reversing the Say's law type of argument (Strunk et al., 2022). From this, three core elements of labor theory emerge - labor demand, labor supply, and their interactions - all shaped by context and institutions, with employment relations arising from involuntary unemployment and the necessity to work (Strunk et al., 2022).

As outlined earlier, a deficiency in extensive labor theory in PKE is documented. Labor demand essentially results from aggregated product demand and acts as a residual, but overlooks the supply side and interactions between demand and supply. Thus, Strunk et al. (2022, p. 107) propose 3 building blocks for a Post-Keynesian labor theory: determination of labor demand ("Principle of involuntary unemployment from lack of effective demand"), determination of labor supply ("Principle of (vital or social) necessity to work"), and demand–supply interactions ("Principle of Hobbesian production" and "Principle of mediating policies"). The first principle captures that underutilization of labor resources can arise if an economy faces inadequate demand in the goods market

and structural involuntary unemployment evolves (Strunk et al., 2022). Contrary to mainstream assumptions, wages are assumed to face changes in the short run, but are rather institutionally determined, thus wage flexibility and labor market deregulation might lead to a destabilization of the model (Strunk et al., 2022). The second principle, Principle of (vital or social) necessity to work, essentially goes back to Robinson (1937), who stated that a decline in wages will more likely result in an increase in working hours/ employment by workers to keep up their living standards (Strunk et al., 2022). We face hierarchically ordered preferences while in certain categories minimum of consumption are for certain, thus work should not be perceived as a choice but vital necessity within a market-based provisioning system. In addition, we find a "social necessity to work, which is shaped by the institutions that allow for satisfying behavior, by emulating peers, and by the behaviors of firms and employers themselves" (Strunk et al., 2022, p. 110).

Since PKE assumes the way demand and supply-regimes interact is context dependent and influenced by the institutional set-ups, the interactions of the preceding two principles are summarized by the principles of Hobbesian employment relations and that of mediating policies (Strunk et al., 2022). Employment relations deemed as Hobbesian phenomen since contracts depict a power relationship and are not set as beneficial exchanges for both parties in the Walrasian sense. In addition, power is determined by involuntary unemployment and the necessity to work, vitally or socially, thus the institutional and policy environment shaping these factors can either reduce or amplify the power of firms over workers.

PKE has to this point put its primary focus on involuntary unemployment rather than on reducing dependence on wage labor itself (Strunk et al., 2022). In contrast, Ecological (macro)economists argue that the presumed virtuous cycle of technological progress and economic growth becomes detrimental when environmental damage is considered (Fontana & Sawyer, 2016). They advocate for policies such as reducing working hours to redirect labor productivity gains toward less wage work without increasing output, or even slowing labor productivity growth by shifting production toward less energy-intensive and more labor-intensive sectors (Jackson & Victor, 2011; Rezai et al., 2013).

2.3 Intersecting Strands: Feminist and Ecological Post-Keynesian Economics

To conclude this section of the literature review, we now bring together two interconnected strands: Feminist Economics and Ecological Economics, in relation to PKE. Much of the existing literature has argued that Feminist PKE is particularly well-suited to engage with ecological concerns, given the urgency of climate breakdown and the broader ecological crisis. Accordingly, the policy debate has increasingly focused on integrated approaches, seminal work by Onaran and Oyvat (2023b) advocates for a "purple-green-red-transition", explicitly incorporating the green sector into macroeconomic analysis. Such integration appears feasible within a Feminist PKE framework, as its modeling architecture already includes the social sector, which facilitates parallel extensions to environmental issues such as green government spending or the embedding of a distinct green sector

in the economy.

The present work therefore seeks to close the theoretical gap concerning the compatibility between Feminist PKE and Ecological PKE and utilizes the PKE labor theory by Strunk et al. (2022) as a starting point. The central tenet of convergence, we argue, lies in the theorization of labor markets and labor policy.

From an ecological perspective, the development of a distinct labor theory within PKE is indispensable, as work constitutes a pivotal leverage point for socio-ecological transformation (Barca, 2017; King, 2002).

As Strunk et al. (2022) emphasize, a comprehensive PKE labor theory must address the demand side, recognizing that involuntary unemployment arises from insufficient effective demand, while wage-setting remains institutionally determined through bargaining processes rather than through short-run market adjustments. While Post-Keynesians incline to focus on involuntary unemployment, EE highlights the need to reduce structural dependence on wage work itself. Ecological macroeconomists argue that the conventional virtuous cycle of technological change and economic growth becomes a vicious cycle once the environmental consequences of growth are considered (Strunk et al., 2022). Policy proposals such as reducing working hours, channeling productivity gains into leisure rather than increased production, or shifting toward less energy-intensive, more labor-intensive sectors represent concrete interventions that connect EE's ecological priorities with PKE's macroeconomic framework (Jackson & Victor, 2011; Rezai et al., 2013). From a FE standpoint, labor market segmentation, persistent gender wage gaps, and discriminatory wage-setting processes, explainable within a Kaleckian mark-up pricing framework, underscore that labor demand is structured by power and social norms rather than by neutral market forces (Blecker & Braunstein, 2022; Onaran et al., 2022b).

On the labor supply side, EE emphasizes the social and material necessity of work while advocating for the strengthening of local commons and public infrastructure to reduce households' reliance on wage labor and attenuate consumption- and energy-intensive patterns in order to fulfill individual and collective needs (Strunk et al., 2022). However, if such infrastructural expansion depends heavily on state financing, new growth dependencies may arise at the state level and control over the volume and consumption of investment must be granted by governmental institutions (Fontana & Sawyer, 2016). FE enriches this labor supply perspective by noting that gender wage disparities generate heightened economic vulnerability for women, while social norms shape women's labor force participation and perpetuate unequal burdens of unpaid care work. Recognizing care and social reproduction as central to economic functioning suggests that policies designed to reduce ecological pressures may simultaneously advance gender equality, especially if economic analysis incorporates interrelational dynamics akin to Lawson (2006)'s "caring spirit" as a complement to Keynes's "animal spirits."

At the intersection of these perspectives, a Hobbesian view of production underscores that contracts reflect asymmetrical power relations rather than mutual benefit (Strunk et al., 2022). With EE noting that capital owners wield disproportionate influence in determining whether production

shifts toward less resource- and energy-intensive activities, FE highlights that such bargaining processes, both in the labor market and within households, tend to yield systematically worse outcomes for women. Mediating policies, in turn, can either mitigate or reinforce these imbalances (Strunk et al., 2022): for PKE, institutions are stabilizing responses to uncertainty (van Staveren, 2010), yet EE and FE caution that institutional arrangements can perpetuate existing asymmetries and differential impacts unless explicitly designed to promote equality and prevent ecological breakdown.

3 Data and Methodology

The analysis draws upon national account data spanning a 25-year period from 1995 to 2020. Specifically, we examine six countries within the European Union, including Austria, Finland, France, Germany, Italy, and Spain. The countries were chosen based on the varying institutional contexts and North/South divide within Europe, which provide different baseline levels of social and green infrastructure development. The primary data source constitutes the Eurostat database, covering the following variables: Value added by NACE categories, Government spending by COFOG categories, Employment shares of women and men of the working-age population and GDP. Public Gross Fixed Capital Formation data were collected from the AMECO database. Subsequently, the data processing methodology is outlined and key descriptive insights are presented.

Value added ($nama\_10\_a64$) data are reported at current prices in Million EUR for 64 NACE categories (Eurostat, 2025). For the purposes of the main descriptive analysis, the selected data are grouped into three broad sectors, following the NACE classification, in order to illustrate more comprehensively the relative importance of the Green sectors and the care economy. An overview of this grouping is provided in Table 1, which distinguishes between industries in the Green sector, industries Providing for the green sector, and the Social sector.

The classification of green sectors is based on the definition set out in the EU Taxonomy Delegated Act for Sustainable Activities and draws, in particular, on the mapping of sustainable finance provided by Platform on Sustainable Finance (n.d.). This classification is aligned with the NACE industry classification system and the description of economic activities covered by the EU Taxonomy Delegated Act adopted in 2021 by the European Commission.

The mapping presented by Platform on Sustainable Finance (n.d.) is divided into seven sections, Mitigation, Adaptations, Water, Waste, Pollution, Biodiversity and Nuclear & Gas. The latter categories was excluded for the subsequent analysis. The remaining categories are grouped according to their degree of association with green production: some are more directly related, while others are less clearly connected. This definition was applied to the NACE categorizations of industries to classify them into Green sector and sectors that Providing for green production.

For the Social sector, the categorization is based on analytical judgment and is constrained by the fact that the category "Public administration and defense; compulsory social security (O)" includes defense. Nevertheless, public administration and social security are of undoubted importance and are therefore included in the definition of the Social sector. The issue arising from the inclusion of

defense in the value added of the Social sector is addressed by deducting public defense expenditure according to the COFOG classification. The detailed approach is outlined in the subsequent section.

Employment data are also considered, disaggregated by gender, and expresses as percentages of the population aged 15 to 64 ($lfsi\_emp\_a\_h$) (Eurostat, 2022a). An individual is defined as employed if they have performed at least one hour of work for pay or profit during the reference week, or if they were temporarily absent from such work, in line with the resident population concept. Accordingly, this definition of employment share reflects the proportion of employed persons relative to the total population. For France, gender-disaggregated data were not available before 2003. Therefore, "Metropolitan France" data are used as a proxy for the years prior to 2003.

Table 1: Industries grouped after Green, Providing for green and Social sectors

NACE	Sector	Industries
A02	Green	Forestry and logging
C16	Green	Manufacture of wood and of products of wood and cork, except furniture manufacture of articles of straw and plaiting materials
C17	Green	Manufacture of paper and paper products
C25	Green	Manufacture of fabricated metal products, except machinery and equipment
C33	Green	Repair and installation of machinery and equipment
E36	Green	Water collection, treatment and supply
E37-39	Green	Sewerage, waste management, remediation activities
H53	Green	Postal and courier activities
K65	Green	Insurance, reinsurance and pension funding, except compulsory social security
M71	Green	Architectural and engineering activities; technical testing and analysis
M72	Green	Scientific research and development
N77	Green	Rental and leasing activities
S95	Green	Repair of computers and personal and household goods
C22	Providing for Green	Manufacture of rubber and plastic products
C23	Providing for Green	Manufacture of other non-metallic mineral products
C26	Providing for Green	Manufacture of computer, electronic and optical products
C27	Providing for Green	Manufacture of electrical equipment
C28	Providing for Green	Manufacture of machinery and equipment n.e.c.
H49	Providing for Green	Land transport and transport via pipelines
H50	Providing for Green	Water transport
J62_J63	Providing for Green	Computer programming, consultancy, and information service activities
R90-R92	Providing for Green	Creative, arts and entertainment activities; libraries, archives, museums and other cultural activities; gambling and betting
O	Social	Public administration and defence; compulsory social security
P	Social	Education
Q86	Social	Human health activities
Q87_Q88	Social	Residential care activities and social work activities without accommodation

Notes: This table gives an overview of the NACE codes included in each of the three sectors and a detailed description of the Industry categories. The industry codes are grouped after the mapping of the Platform on Sustainable Finance (n.d.). Thereby, NACE gives the abbreviation of the NACE code, Sector captures the category used for the subsequent analysis and Industries lists the industries inculded in each NACE code.

Source: Platform on Sustainable Finance (n.d.)

Government expenditure (gov_10a_exp) is reported at current prices in Million EUR classified according to COFOG categories (Eurostat, 2022c)). The COFOG framework captures the functional classification of governmental activities. A detailed categorization of the aggregated COFOG items into expenditure classes is provided in Table 2, which presents the Social and Green Expenditure. The detailed expenditure breakdown is discussed only in the Descriptive section 4 and not included in the structural model, since data gaps exist for most countries prior to 2000.

The COFOG categories related to environmental protection largely coincide with the EU Taxonomy definition of NACE categories (Platform on Sustainable Finance, n.d.). This correspondence underscores the suitability of the two definitions for the analysis, as government spending categories align closely with the broader categorization of NACE value-added industry groups. Accordingly, EU Taxonomy categories can be mapped onto, and in respects take precedence over, individual NACE categories.

In addition, the data set *nama_10_gdp* is used to measure GDP at current prices in Million EUR, along with the GDP deflator ($PD10\_EUR$), which is indexed to 2010 (=100) and reflects the implicit deflator (Eurostat, 2022a).

Finally, Public GFCF data (in billion EUR) are obtained from the AMECO database and report the Gross Fixed Capital Formation of the general government, following the ESA 2010 definition (European Commission, 2025). The data are derived from both Eurostat national accounts and national statistical sources, thereby covering a longer time span. Public GFCF includes fixed assets produced within a period as well as a proportion of the value of non-produced assets realized by productive activity. Assets are classified as fixed if they are used in production for more than a year.

Table 2: Social and Green Expenditure Categories

Expenditure Category	**Sector**	**Detailed expenditure**
Social protection	Social	Sickness and disability
	Social	Survivors
	Social	Family and children
	Social	Unemployment
	Social	Housing
	Social	Social exclusion n.e.c.
	Social	R&D Social protection
	Social	Social protection n.e.c.
	Social	Social protection
	Social	Old age
Housing and community amenities	Social	Housing development
	Social	Community development
	Social	Water supply
	Social	Street lighting
	Social	R&D Housing and community amenities
	Social	Housing and community amenities n.e.c.
Health	Social	Medical products, appliances and equipment
	Social	Outpatient services
	Social	Hospital services
	Social	Public health services
	Social	R&D Health
	Social	Health n.e.c.
Education	Social	Pre-primary and primary education
	Social	Secondary education
	Social	Post-secondary non-tertiary education
	Social	Tertiary education
	Social	Education not definable by level
	Social	Subsidiary services to education
	Social	R&D Education
	Social	Education n.e.c.
Environmental protection	Green	Waste management
	Green	Waste water management
	Green	Pollution abatement
	Green	Protection of biodiversity and landscape
	Green	R&D Environmental protection
	Green	Environmental protection n.e.c.

Notes: This table gives an overview of the government spending categories after COFOG and divides relevant sectors into Social and Green government spending. Expenditure Category indicates the aggregated COFOG categories, Sector depicts the two sectors used for the analysis and Detailed expenditure illustrates the sophisticated mapping of government spending categories.

Source: Eurostat (2022c)

Data are converted to a common unit, Million Euro, and deflated using the price index (implicit deflator) with base year 2010 (Eurostat, 2022b). In the APPENDIX, Figure A.1 presents a comparison of implicit GDP deflators with varying base years (2010, 2015, 2020) and different currency units (national currency and euro), thereby assessing deviations to inform a robust empirical strategy. No substantial deviations are observed. Accordingly, the base value anchored in 2010 is selected for the subsequent analysis. In addition, two different deflators are employed: a decomposed deflator for all NACE categories (value added data) and the (implicit) GDP deflator for GDP, government expenditure, and public GFCF.

For Finland no data are available prior to 1996 for the majority of variables. Therefore, 1995 is excluded from the SVAR estimation for Finland. For the data preparation of the structural VAR, the value added data for Green sector and the sectors Providing for green are aggregated to reduce

the number of variables included in the SVAR specifications to preserve degrees of freedom. This is particularly crucial for the reliability of statistical inference and the incorporation of test statistics (Pandey & Bright, 2008). Detailed information on the data preparation for the SVAR is elaborated in Section 5.2.1.

3.1 Value Added decomposition

Value added in the Social Sector for the purpose of this model comprises NACE category O - Public administration and defense, compulsory social security , P - Education, $Q86$ - Human health activities and $Q87\_Q88$ - Residential care activities and social work activities. NACE category O includes economic activities carried out by the public administration (Statistical Office of the European Union, 2013). Governmental activities are not further disaggregated in the Eurostat database, which creates the methodological challenge that defense-related value added is included but cannot be separately attributed within the Social Sector. To address this limitation, the aggregated value added in the Social Sector is adjusted by subtracting government expenditure corresponding to the COFOG category *Defence*, which encompasses *Military defence; civil defence; foreign military aid, R&D related to defence; defence n.e.c.*.

To approximate the share of defense spendings within value added, a reconstructed Sector O is created by aligning NACE categories with government expenditure data following the COFOG definition. In a second step, the share of defense expenditure in the reconstructed Social Sector, derived from COFOG definition, is applied to the Social Sector by NACE category .

A detailed inspection of the defense share in the Social Sector proceeds as follows: the first step examines the aggregated categories of the COFOG classification (Figure 2a), while the final figures refer to more granular subcategories (Figure A.2).

The overall share of defense expenditure (COFOG) relative to value added in NACE sector O is presented in the Figure 1a. This represents the most straightforward approach: deducting government expenditure on defense from the government-related value added. The figure suggests that for all countries under study, the indicates that, across all countries under study, the defense share of value added is relatively stable over time.

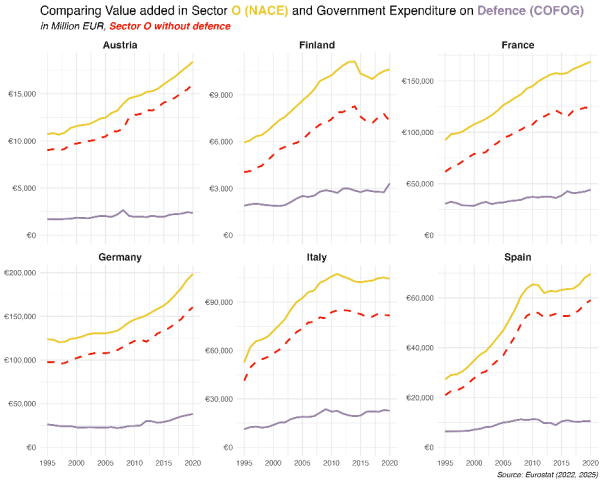
Figure 1b contrasts the Social Sector as defined by NACE categories in this model with the reconstructed Social Sector based on COFOG categories, thereby contextualizing the relative scale of defense expenditure. Inspection of the y-axis scales reveals considerable differences in magnitude between the COFOG and NACE definitions. The purpose of this comparison is to evaluate the share of defense expenditure within the COFOG category. The figure shows that defense expenditure represents only a small fraction of the overall COFOG category equivalent to NACE Sector O, constituting a minor component of total social spending.

Overall, the reconstructed sector O in COFOG is substantially larger in magnitude than its NACE counterpart. Within COFOG, social protection constitutes the largest share, followed by health expenditure, whereas the housing category is markedly smaller compared to the equivalent

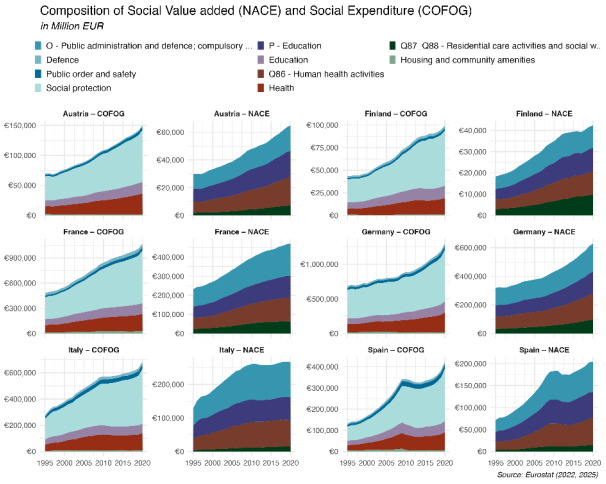
NACE classification.

Figure 1: Overall share of defense spendings and detailed decomposition of Social sector groups

(a) Share of defense spending in NACE Sector O



(b) Social sector for NACE vs COFOG categories



Notes: The left figure illustrates the evolution of the share of defense spending. The right figure depicts the composition of the Social Sector constructed after NACE and COFOG categories in the sample.
Data: Eurostat (2022c, 2025), based on own calculations.

In the subsequent section, we construct the ratio of defense expenditure to total social expenditure, where the latter is defined as the sum of all NACE categories comprising the value added of the Social Sector. Initially, aggregated sectors are presented, which serves as the foundation for reconstructing sector O of the NACE classification exclusively. Followed by a more detailed decomposition, which is illustrated in the A. be Data availability differs between the aggregated and detailed sectors, with more granular COFOG categorization data generally available only from 2001 onward.

As shown in Figure 2a, the share of defense expenditure within the reconstructed COFOG Sector O versus the NACE Sector O exhibits substantially different magnitudes. However, since the subsequent SVAR analysis focuses specifically on the deviations from trend, this discrepancy does not pose a significant methodological concerns.

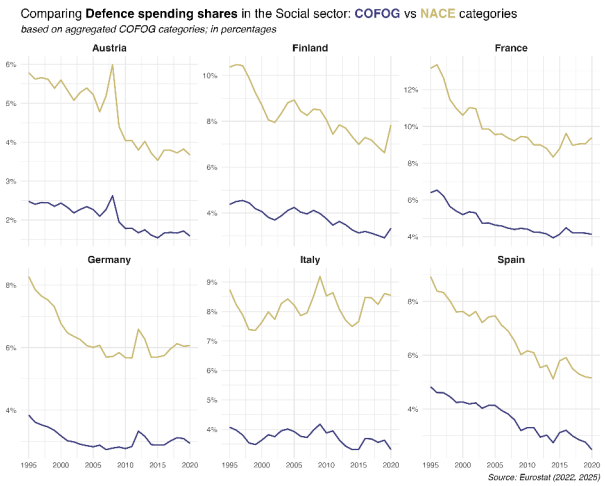
To enhance the understanding of its composition and obtain a more precise approximation of defense expenditure, a more granular sectoral decomposition of COFOG defense expenditure is used. Further details are provided in Figure A.2 in the Appendix.

The final step, illustrated Figure 2b, compares the shares of defense expenditure within the reconstructed Sector O from COFOG and Sector O (NACE). With the exception of Finland, the proportions exhibit considerable overlap and displays broadly similar trends across countries. Again, a granular sectoral decomposition is employed.

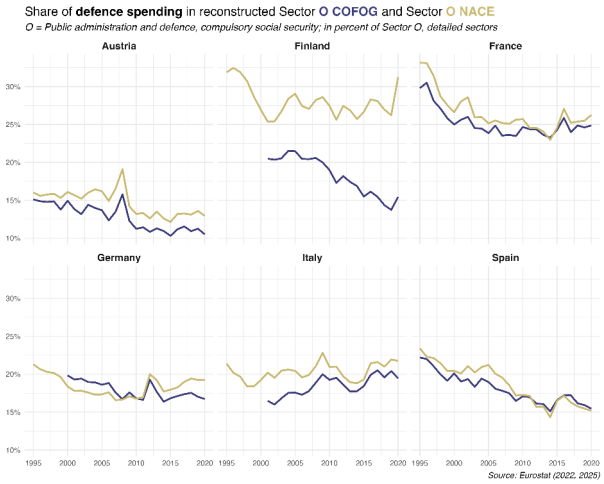
To conclude this methodological digression, the initial approximation - obtained by subtracting the defense expenditure from the NACE category O - is retained, as the analysis demonstrates that

Figure 2: Share of defense spending and the reconstructed NACE Sector O

(a) Share of defense spending in COFOG and NACE



(b) Defense spending share on NACE and COFOG sector O



Notes: Figure 2a compares the share of defense spending after the COFOG category on the Social Sector constructed by NACE and COFOG. Figure 2 illustrates the same juxtaposition, however applying a more granular definition of defense spending after COFOG. For both, data are measured in percentage of the respective social Sector.
Data: Eurostat (2022c, 2025)

the share of the defense expenditure in the reconstructed sector O (COFOG) and sector O NACE converge to a substantial degree.

3.2 Theoretical Model

The feminist structuralist post-Keynesian/Kaleckian synthesis model developed by Onaran and Oyvat (2023b) builds on the gendered macroeconomic frameworks of Braunstein et al. (2011) and Seguino (2010, 2012), as well as earlier models by Onaran and Oyvat (2023a) and Onaran et al. (2022a, 2022b). It places inequality - across both class and gender - at the center of output and demand determination, integrating the dual role of wages as both a cost of production and a source of demand. The model is demand-led, allowing for involuntary unemployment, underemployment, and excess capacity, with aggregate demand components determined by behavioral equations rather than the optimizing agents of neoclassical theory. Wages are modeled as an outcome of bargaining processes, and gender wage gaps are tied to the relative bargaining power of men and women vis-à-vis capital, shaped by social norms and occupational segregation. These norms also underpin women's disproportionate share of unpaid care work, which in turn affects their labor market participation and educational attainment.

The framework synthesizes and extends earlier feminist macroeconomic models into a three-sector, gendered, open economy: (i) the care economy (public spending in education, childcare, healthcare, social care), (ii) the rest of the market economy (physical sector), and (iii) the unpaid care sector (Onaran et al., 2022b). On the demand side, the model explicitly distinguishes household

consumption in physical and social sectors, private investment, net exports, and disaggregated public spending in social versus physical infrastructure. Gendered differences in marginal propensities to consume alter the composition of demand, with women presumed to allocate a larger share of their income to household needs and social expenditures. On the supply side, social spending reduces unpaid labor burdens, increases women's paid employment, and can shift gender norms, while productivity evolves endogenously over the long run in response to wages, public and private investment, and unpaid domestic care work. Employment is modeled in hours, by gender and sector, capturing how sectoral composition, occupational segregation, and productivity changes jointly shape labor demand.

In its most recent extension Onaran and Oyvat (2023b), the model adds five innovations: (i) the introduction of a distinct green economy sector - including current and capital spending on renewable energy, energy efficiency, public transport, organic agriculture, forestry, and the circular economy - separate from generic public capital formation; (ii) endogenous labor supply; (iii) endogenous wage bargaining for men and women; (iv) endogenous changes in occupational segregation; and (v) explicit modeling of the price effects of wages. These additions make it possible to examine how fiscal policy across care, green, and physical infrastructure interacts with wage and labor market dynamics to influence GDP, productivity, employment composition, income distribution, and social reproduction. Although the current version does not yet incorporate environmental indicators such as carbon emissions, it provides a unified platform for analyzing how intertwined gender, class, and ecological priorities can be addressed within a coherent macroeconomic framework. This subsequent analysis concentrates on the effects of green and social fiscal spending, public infrastructure investment, and their implications for gendered employment outcomes.

3.3 Empirical Model: SVAR

Since the seminal contribution by Sims (1980), Vector Autoregressive models (VAR) have been widely adopted to conduct multivariate macroeconometric analysis (e.g. Onaran & Oyvat, 2023a; Oyvat & Onaran, 2022; Stockhammer & Onaran, 2004). VAR models are suited to investigate dynamic relationships in a multi-dimensional setting, as they incorporate interactions between variables and allow effects to be traced throughout an entire system, in contrast to single-equation estimation where only isolated effects are inspected.

To derive (causal) contemporaneous effects, the correlation of endogenous variableness is addressed by imposing restrictions on the covariance matrix, typically through a lower triangular Cholesky decomposition (Lütkepohl, 2005). Thereby, structural shocks are disentangled from reduced-form residuals. Through this process, a structural Vector Autoregressive model (SVAR) is obtained. The identification strategy commonly relies on recursive restrictions imposed via Cholesky decomposition (lower triangular matrix), whereby the order of the variables plays a central role and the most exogenous variables are placed first in the system (Lütkepohl, 2005). Thus, variables are ordered according to their assumed speed of adjustment, with slow-moving or policy variables

typically placed first (Nakamura & Steinsson, 2018).

SVAR models are therefore well suited to address endogeneity and identify interrelations between variables within an economically informed framework.

The empirical model is grounded in the feminist Post-Kaleckian framework as elaborated in the preceding section 3.2. To illustrate the relationship between gendered employment shares, government expenditure, production, and growth, a subset of variables from the theoretical model is employed. A key limitation arises from the relatively small number of annual observations in the national accounts: the inclusion of lags to capture endogenous and multidimensional relationships quickly exhausts the available degrees of freedom.

To further preserve degrees of freedom, $Y_{prov-green}$ and Y_{green} are consolidated into a single variable Y_{green}, representing value added in the Green sector. Public Gross Fixed Capital Formation ($pGFCF$) is included to capture public investment expenditure and thereby, taking precedence over the inclusion of the corresponding secondary value added sector.

As outlined in the following section 3.3.1, two distinct models are constructed for each economy: the GREEN model, which incorporates both the value added in the Green sector and green government expenditure and the SOCIAL model, which focuses on government expenditure and value added within the Social sector. Cross-sectoral feedback effects are deliberately omitted to ensure model parsimony and interpretability. The GREEN and SOCIAL models are specified separately for each economy - Germany, Austria, France, Italy, Spain, and Finland.

3.3.1 Model Specification

In the following, the specification of the structural Vector Autoregressive model (SVAR) is presented. The structural form is identified via a Cholesky decomposition of the reduced-form errors, which allows the interpretation of structural, orthogonalized shocks within the system. Thereby, the scoring method is deployed for estimating the SVAR model, which utilizes the scoring algorithm ("scoring") to find estimates as an alternative to minimizing the negative log-likelihood directly ("direct") (Pfaff, 2008).

Four different specifications were deployed for the GREEN (starting with 1) and SOCIAL (starting with 2) models: Model 1 (2) includes government spending in absolute terms; Model 1.1 (2.1) converted the from percentages into proportions by dividing by 100; Model 1.2 (2.2) represents $employment\_ratio$ as the ratio E_f/E_m, capturing the relative employment effect of women to men; and the final specification, Model 1.3 (2.3), expresses government spending as a percentage of GDP. To attain stationarity in the time series data, all variables are log-transformed, with the exception of the employment shares of women and men, which are retained in levels (percentages) to preserve interpretability.

Structural form:

$$AX_t = A_0 + A_1X_{t-1} + A_2X_{t-2} + e_t$$

Reduced form:

$$X_t = C_0 + C_1 X_{t-1} + C_2 X_{t-2} + u_t$$

Vector of endogenous variables:

X_t depicts a 7×1 vector of variables (in logarithmic first differences based on test criteria):

$$X_t^{\text{green}} = \begin{bmatrix} \Delta \log(G_t^{\text{green}}) \\ \Delta \log(Y_t^{\text{green}}) \\ \Delta \log(pGFCF_t) \\ E_t^M \\ E_t^F \\ \Delta \log(Y_t) \end{bmatrix}, \quad X_t^{\text{social}} = \begin{bmatrix} \Delta \log(G_t^{\text{social}}) \\ \Delta \log(Y_t^{\text{social}}) \\ \Delta \log(pGFCF_t) \\ E_t^F \\ E_t^M \\ \Delta \log(Y_t) \end{bmatrix}$$

X_t^{green} represents the GREEN model, capturing dynamic effects within the model environment. Here, we include Government spending in the Green sector and Value added in the Green sector and examine the effects on employment shares by gender. This framework is transferable to the SOCIAL model X_t^{social}, where government spending and value added variables are applied to the Social sector instead of the Green sector environment.

4 Descriptive Statistics

This section covers the variables used for the SVAR analysis and provides insight into cross-country differences. Detailed data are presented for the six countries, including value added for disaggregated sectors, government spending in the Green and Social sectors, public Investment (pGFCF), GDP, and employment shares.

4.1 Comparative Overview of Key Variables

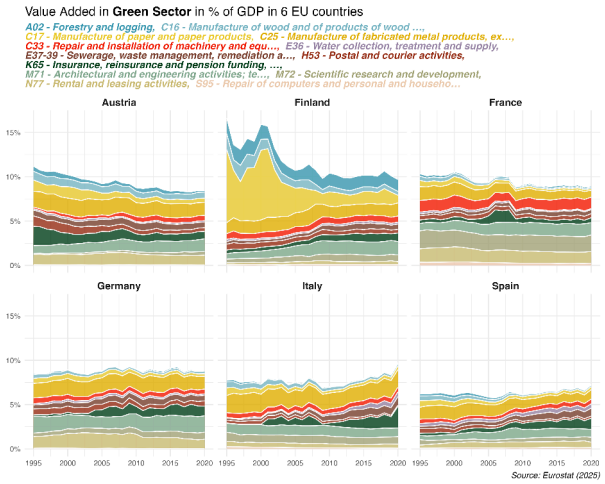
First, the subcategory shares of value added are presented below to reveal the industrial composition of each country, with a focus on the relative significance of Social and Green sectors.

Across all countries, $C17$ - Manufacturing of paper and paper products and $C25$ - Manufacturing of fabricated metal products, except machinery and equipment exhibit the highest shares of value added within green industry sectors, as illustrated by Figure 3a. These shares remain relatively stable over time, except for Finland during the late 1990s and early 2000s, where the elevated share of the $C17$ - Manufacturing of paper and paper products stands out. Subsequently, Finland converged with the other countries.

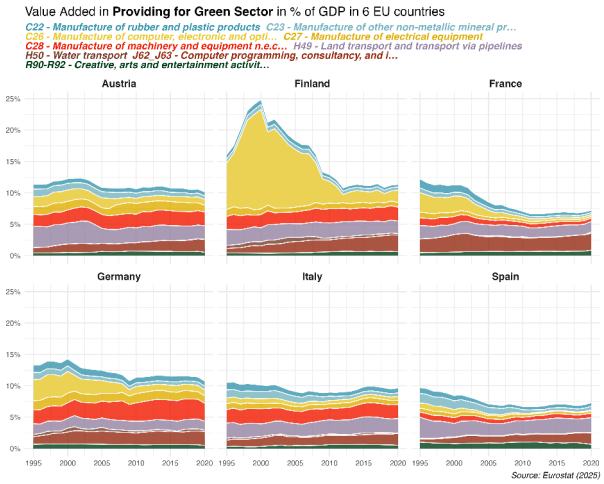
In the sector Providing for Green industries (Figure 3b), Finland exhibits the highest value-added share, followed by Austria and Germany. Finland experienced a sharp decline in this sector, primarily due to the substantial reductions in $C26$ - Manufacture of computer, electronic and

Figure 3: Evolution of Value added for Green and Providing for green Sector from 1995 until 2020

(a) Value added in Green sector



(b) Value added in Providing for Green sector



Notes: Evolution of the detailed composition of value added data in the Green and Providing for green Sector for the six countries included in the dataset.

Data: Eurostat (2022b, 2025)

optical products. Southern European countries, including France, Italy and Spain, display lower shares overall.

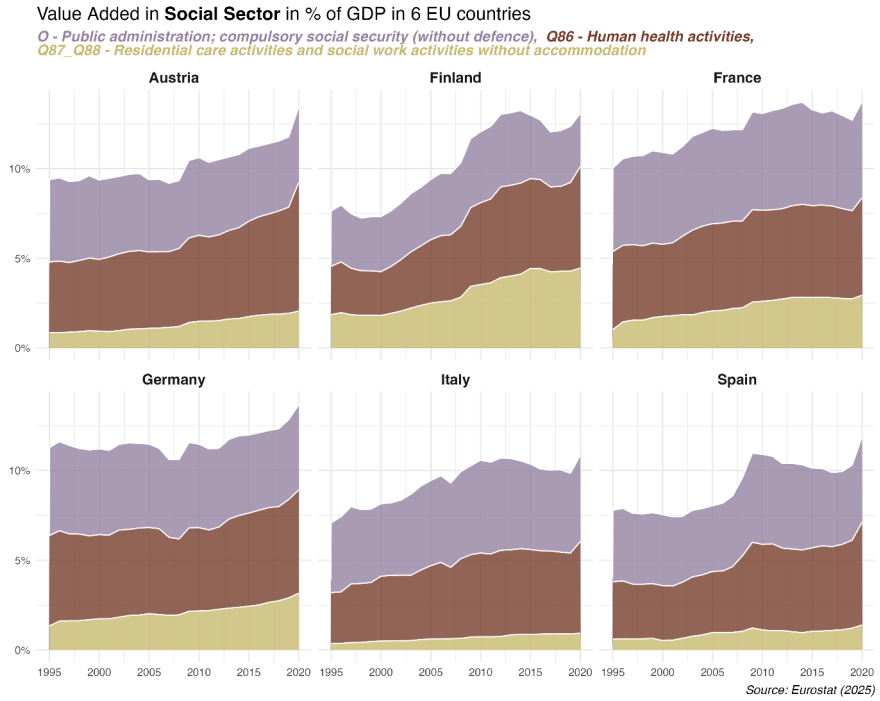
The $C26$ - Manufacture of computer, electronic and optical products was historically significant in Finland, Germany, and France but has been gradually replaced by $J62\_J63$ - Computer programming, consultancy, and information service activities which now leads in value added contributions to GDP. $H49$ - Land transport and transport via pipelines remains consistently important across all countries, particularly in Austria, while Germany additionally relies heavily on $C28$ - Manufacture of machinery and equipment n.e.c.. These results suggest that disaggregated Green sector are more homogeneous in value added than the broader sectors Providing for the green industries.

Within the Social sector (Figure 4), O - Public administration; compulsory social security (without defense) and $Q86$ - Human health activities display magnitudes comparable across all countries. $Q87\_Q88$ - Residential care activities and social work activities without accommodation contribute less to GDP but are increasing in almost every county, except for Italy and Spain. Finland consistently demonstrates the largest shares across social-sector industries.

Aggregating the Green and Providing for Green Sector yield approximately twice the share of GDP compared to the Social Sector. This pattern is reversed relative to government expenditure shares as illustrated below, reflecting the principles of social market economies in EU countries.

Comparing Figure 5a and Figure 5b reveals that Social expenditure dominates relative to Green expenditure across all countries. The total Social expenditure ranges from 30–40 % of GDP, whereas aggregated Green expenditure is at most 1 %. A key limitation is that COFOG categories cannot be disaggregated to identify green subsidies directed at firms. This limitation constrains the scope

Figure 4: Evolution of Value added in Social Sector from 1995 until 2020



Notes: Evolution of the detailed composition of value added data in the Social Sector for the six countries included in the dataset.

Data: Eurostat (2022b, 2025)

of the analysis.

Cross country comparison of government spending in absolute values as depicted in the Appendix Figure A.3 indicates that Social sector expenditure patterns are broadly consistent across countries, while Green expenditure shows divergent trends. Germany follows a U-shaped pattern, Italy and France generally increase, though France experiences a decline after 2015 before recovering.

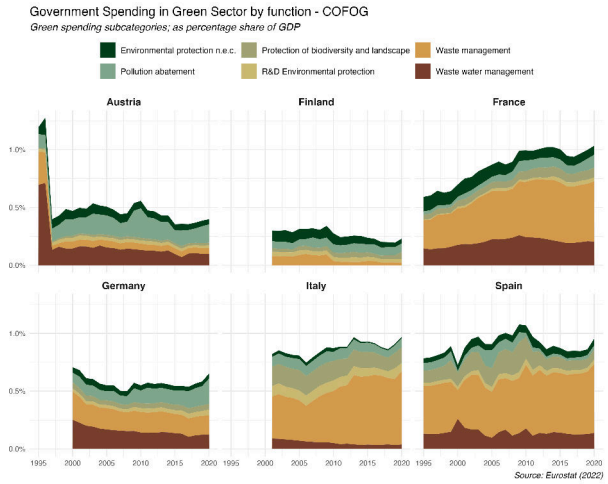
The comparison of government spending shares on GDP (Figure 5 again demonstrates that Green spending shares vary substantially, in contrast to Social spending, which remains relatively high across all countries. In Austria, Green spending peaked in the 1990s, largely due to elevated expenditure on Waste Water Management and, to a lesser extent, Waste Management.

Green spending can be disaggregated into six subcategories. As shown in Figure 5a,Waste management exhibits the highest spending share relative GDP in most countries, particularly in Southern Europe, except in Austria, where Pollution abatement dominates. Data availability becomes increasingly limited with higher levels of disaggregation, preventing the construction of a complete data set for Finland, Germany, and Italy. Consequently, aggregated values available for the full period are employed in the subsequent analysis.

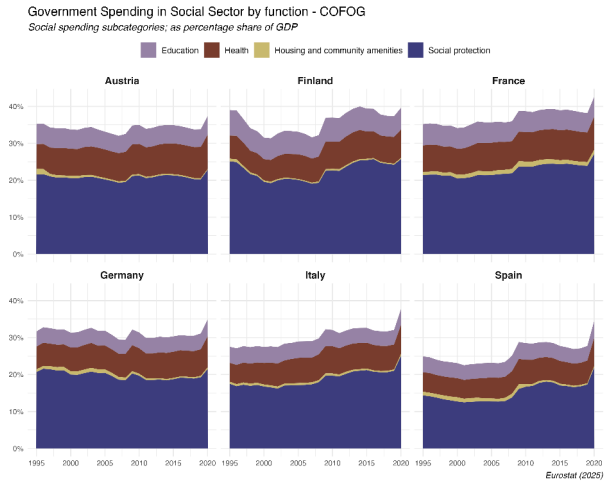
The aggregate Social spending category utilized in this analysis comprises four distinct, aggregated sectors: Education, Health, Housing and community amenities and Social protection. Figure 5b shows that the latter dimension constitutes the largest component, while the remaining cate-

Figure 5: Evolution of the Government spending as share of GDP

(a) Green Government spending as share of GDP



(b) Social Government spending as share of GDP



Notes: Evolution of the detailed composition of Green and Social Government spending data for the six countries included in the dataset. Data is depicted as share of GDP and y-axis scales diverge. For the Green spending categories, data are not available across all countries for the full period under study, thus aggregated Green Government spending data is used for subsequent SVAR analysis.

Data: Eurostat (2022b, 2022c), based on own calculations.

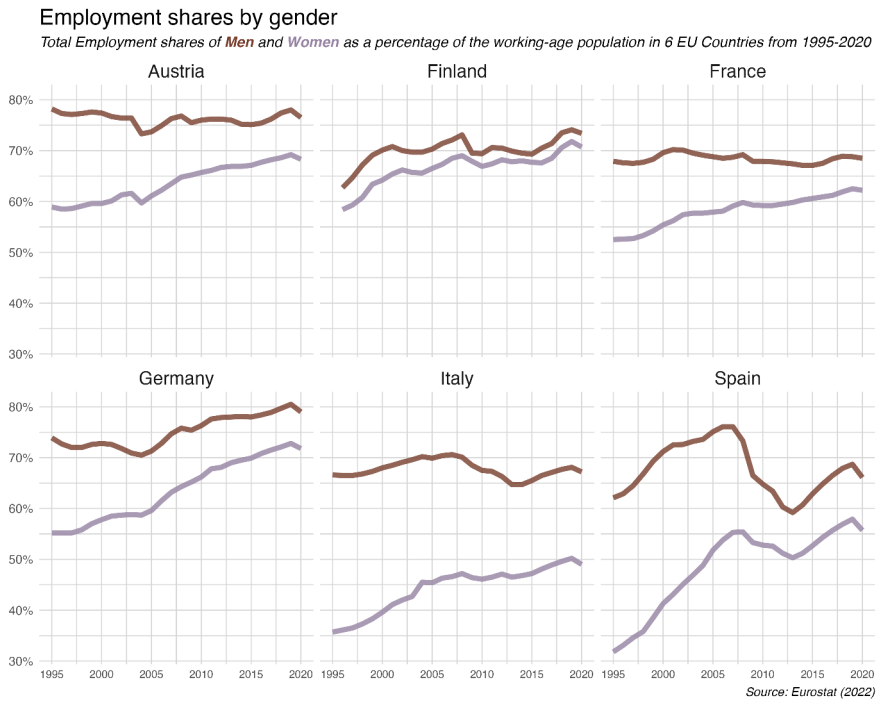
gories demonstrate relatively similar magnitudes between economies. As previously discussed, the overall magnitudes remain relatively constant across all countries, though Spain exhibits the lowest shares of Social expenditure. A modest increase is observed at the end of the period, which coincides with the COVID-19 pandemic.

Furthermore, Figure 6 illustrates the evolution of gender-disaggregated employment shares of the working-age population across six EU countries over time. A clear north–south divide emerges: the Northern member states (Austria, Germany, and Finland) display both higher overall employment levels and greater gender parity. France occupies an intermediate position, while Italy and Spain record particularly low female employment shares at the beginning of the observation period in 1995. By 2019/2020, Spain shows substantial convergence, while Italy continues to lag well behind other countries.

Notably, Finland stands out by recording the overall highest female employment share, but a comparatively lower male employment share. This pattern supports the argument that full-time employment for both genders is difficult to sustain, particularly when considering the compatibility of employment with care responsibilities. Gender norms and segregated labor markets are crucial determinants of labor market participation and gender wage gaps (Braunstein et al., 2011; Seguino, 2010, 2012). What is not shown by the graph, but of significant importance, is that largely influenced by social norms, women remain overrepresented in the Social sector while being markedly underrepresented in the green economy. Henriques et al. (2025) show that countries with a higher Green Transition Index, reflecting progress toward environmental sustainability, tend to

score lower on gender equality within the Green sector, which included the dimensions employment, wages, working time, innovation, and leadership. This pattern is largely driven by occupational segregation, as women's initial underrepresentation in green industries means that even substantial transitional dynamics do not automatically close gender gaps.

Figure 6: Employment shares of women and men from 1995-2020



Notes: Evolution of employment shares for women and men across countries and the time horizon under study. The y-axes are fixed and depict the employment shares as percentage of the working-age population.
Data: Eurostat (2022a)

4.2 Linking Employment, Value Added, and Government Spending

The relationship between gender-disaggregated employment shares and sectoral value added within the three industries of interest is presented in the APPENDIX. Visual inspection of Figure A.4a reveals a positive correlation between female employment shares and values added across sectors (as indicated by the three differently colored lines/plots). In contrast, male employment shares show no discernible correlation with sectoral value added. However, once country-specific regression lines are introduced (Figure A.4b), the observed relationship largely disappears, underscoring the importance of cross-country heterogeneity.

The relationship between government spending (as share of GDP) and employment shares is examined in the subsequent Figures 7a 7b. In the uncontrolled specifications, female employment shares display more pronounced correlations than those of men: a negative correlation with Green expenditure and a positive correlation with Social expenditure, as shown in Figure A.5 in the

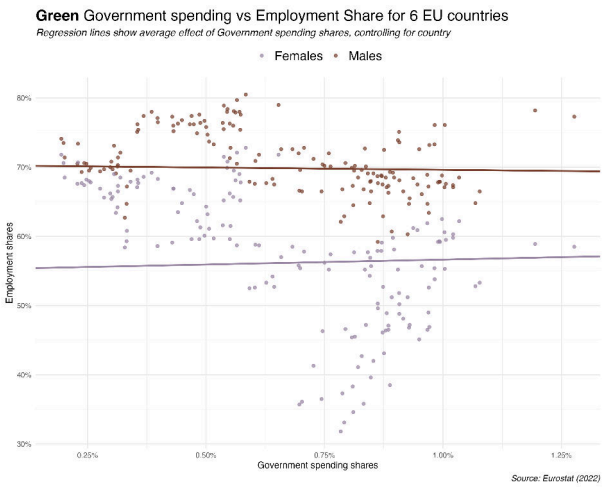
APPENDIX. When disaggregated by country, however, these relationships become less consistent. The scatter patterns also suggest potential non-linearity, which likely contribute to the heterogeneity of effects. This highlights a limitation of the SVAR framework, which assumes linear dynamics, and calls for further discussion of non-linear specifications.

Country specific regressions for Green Government spending as indicated in Figure A.6a and A.6b in the APPENDIX, yield mixed results for both genders. By contrast, the relationship between Social Government spending and female employment shares is more robust, with the notable exception of Germany, which emerges as an outlier. Excluding this case, the relationship tends to be positive, albeit not strictly linear. For male employment shares, the correlation with Social expenditure is weaker overall, though a clearly negative relationship emerges in Spain and Germany. These findings reinforce the importance of country-specific institutional and structural factors in shaping the employment effects of fiscal policy.

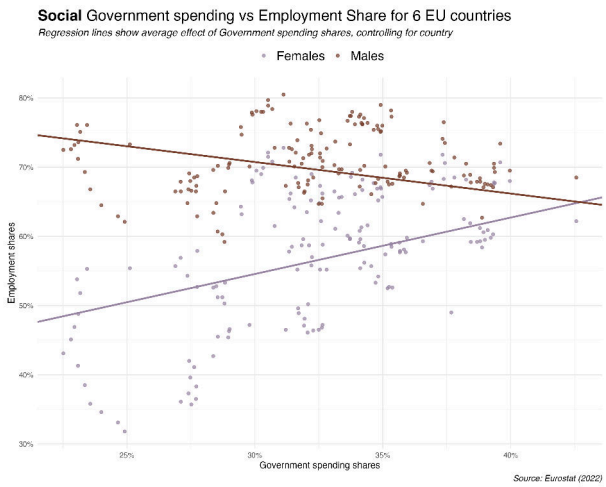
Finally, Figure 7 present regression lines that control for the country-specific effects and averages results across all six economies. No systematic relationship emerges between Green Government spending and employment shares. By contrast, Social Government spending is associated with a clear positive correlation with the female employment share and a moderately negative correlation with the male employment shares, thereby confirming previous findings.

Figure 7: Relationship between Employment Shares and Government Spending

(a) Employment vs Green Government Spending



(b) Employment vs Social Government Spending



Notes: The scatter plots reveal the relationship between employment and Green and Social government spending respectively and controls for country fixed effects. Government spending shares are in percentage of GDP and the employment shares are in percentage of the working-age population.

Data: Eurostat (2022a, 2022c), based on own calculations.

5 Findings

In the following, results of the SVAR analysis are illustrated, focusing on the effects of government spending and public investment on gendered employment shares across six European countries. Emphasis is placed on cross-country comparisons, co-movement of key variables, and the differentiated impact of green and social fiscal policies on male and female labor market outcomes.

5.1 Co-movement and Country comparison

The subsequent analysis focuses on the cross-country comparison and the co-movement of model variables. Except for the employment share of women (E_f) and men (E_m), all data are first differenced to ensure country comparability and can therefore be interpreted as percentage change differences. Figure 8a provides an overview of the different variables across countries. It becomes evident that, with the exception of Spain, all variables do not show substantial cross-country divergence, but do not significantly alter in relative magnitude and ranking of the variables. The most interesting patterns are presented by the employment share of women and men. Over time, substantial differences in the development of individual countries can be identified. More variation is observed for male employment share as well as more cyclical behavior. However this partly stems from the smaller y-scale, since the lowest values are around 60 percent. Spain represents a notable outlier and shows an upswing followed by a downward trend of male employment share, while relatively stable or slightly positive developments are observed for all other countries.

For the female employment share, the spread is much greater, with Italy starting at a share of 30 % of women being employed and Austria exhibiting the highest share at nearly 60 %. For Spain, a substantial upsurge can be observed, but it still does not reach Austria's initial level. The three highest-performing countries are Austria, Finland, and Germany, while the latter two exhibit nearly overlapping shares.

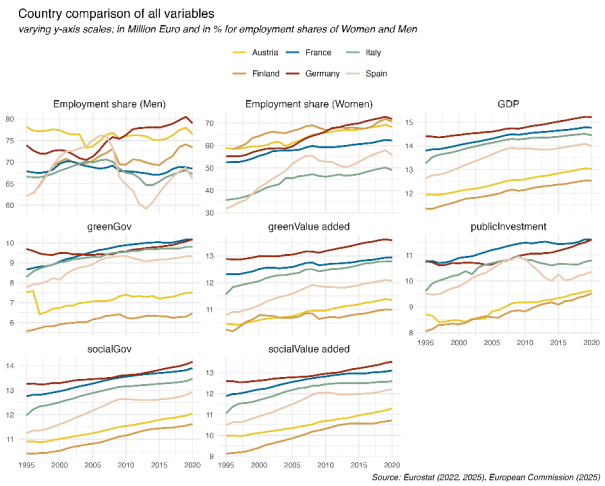
The co-movement of all variables is illustrated in the following Figure 8b. Finland demonstrates a relatively lower employment share of men compared to other Northern European countries. Consequently, the gender gap in employment shares is substantially smaller over time. This finding corresponds with an established feminist economic argument that emphasizes the inadequate compatibility of full employment for both genders with care and reproduction responsibilities (Braunstein et al., 2011; Seguino, 2010).

Among all countries, Germany exhibits the highest employment shares. As previously discussed, women's employment share in Germany surpassed Finland's level in the most recent period. Differences are particularly pronounced between Northern and Southern European countries, which can be attributed to the greater persistence of traditional gender norms and stronger adherence to androcentric structures recently frequently documented to date (e.g. Cascella et al., 2024).

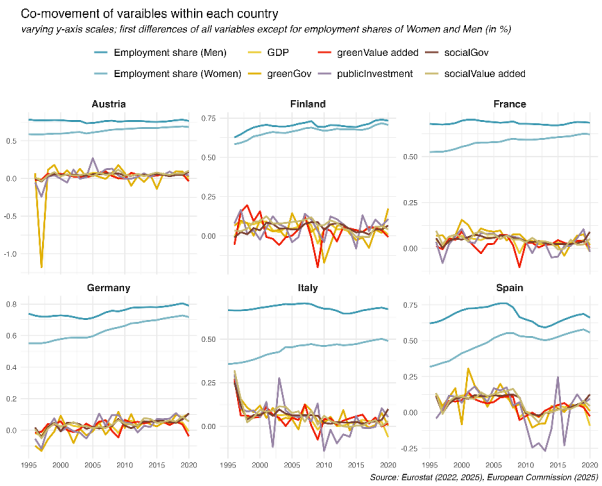
For the remaining variables, the impact of the Eurozone crisis during the 2010s was particularly severe in Southern European countries, a finding well documented in related literature (e.g. Stockhammer et al., 2020) and illustrated in the figure.

Figure 8: The co-movement of all variables included in the SVAR

(a) Country differences for all variables



(b) The co-movement within countries



Notes: Figure 8a compares the variables supplied in the SVAR analysis. Values are depicted in Million Euros, except for the employment shares by gender and cover the full time span from 1995-2020. The employment shares represent the share of person employed in the working-age population and split by gender. Figure 8b shows the first difference of the values for all variables except for employment shares and thereby illustrates the co-movement of the variables.
Data: European Commission (2025) and Eurostat (2022a, 2022b, 2022c, 2022d, 2025), based on own calculations.

Furthermore, the variables largely move together and are pro-cyclical, for some cases with a lag. This is consistent with the expected co-movements. However, this does not hold for government expenditure, while the fact that government expenditure is mostly counter-cyclical is central to (post)-Keynesian theory. The co-movement of value added and GDP as well as public investment is consistent with economic reasoning, Finally, Green government spending and public GFCF exhibit the highest volatility across all countries.

In the following specification, first differences of the variables are implemented based on the results of stationary tests as detailed in the Data and Methodology section.

Moreover, only consistent results are presented from the various model specifications employed for the impulse response functions in the analysis. Results were excluded from the analysis if they demonstrated insufficient robustness across model specifications. Specifically, findings were considered unreliable when significant positive effects were observed in only one model, while all other specifications yielded insignificant impulse responses with varying signs. Additionally, when multiple models produced results in the same direction but with different magnitudes, preference was given to those with more economically plausible scales to facilitate interpretation.

5.2 Orthogonal IRF and Cumulated IRF analysis

The orthogonal and cumulative Impulse Response Function analysis, illustrated in Figure 9 and 9 with 90-percent confidence bands, reveals substantial differences between the relative importance

of shocks. While Spain and Austria demonstrate that government spending shocks in the Green and Social sector exhibit relatively high importance importance for employment effects, public Investment ($pGFCF$) is of greater significance for Italy, Finland, and Germany. [1]

For the majority of countries, government spending in the Green sector G_{green} cannot be regarded as a significant employment driver. Numerous results were found to be insignificant or even negative. Spain serves as an outlier by demonstrating greater employment effects from Green government spending shocks compared to Social expenditure.

An one-off increase by one percent in the growth of G_{green} produces positive and significant effects for both the employment rate for men (E_m) for one period and for women for almost two periods in Spain. The employment share of men reaches a peak of approximately 8 %-points increase, while the employment share of women reaches its peak at around 5 %-points. The cumulative effect (Figure 10) is more pronounced for the employment share of men with a peak of 25 %-points, demonstrating greater effects than for that of women, though it is significant for both - for six and for two periods, respectively.

Therefore, the analysis of the Spanish economy indicates that Green government spending is significantly more important for employment creation than public Investment, but effects still diverge between genders. This results in greater gender inequality, as men are more strongly affected by Green government spending and achieve higher employment rates compared to women, as illustrated in the third plot of 9a through the negative and significant *emp_ratios* between women and men for the first 2.5 periods. The respective cumulative effect is significant and negative for five periods, but remains close to 0.

In contrast, insignificant effects are observed for France regarding the effect of Green government spending on the employment share of females and a slightly negative effect on the employment share of males for 1.5 periods, peaking at around -7 %-points. However, this decrease in male employment does not lead to an increase in the employment share of women and furthermore, the *employment_ratio* indicate a negative gender equality effect for at least one period . The cumulative effects demonstrates significant and negative values for the employment share of men for up to two periods, reaching a peak of around -10 %-points. Similarly to Spain, the cumulative effect for *employment_ratio* is significant but very close to zero for five periods.

Across various specifications, no significant effects are obtained for women's employment share in France, including the effects of a government spending in the social sectore, which are found to be insignificant.

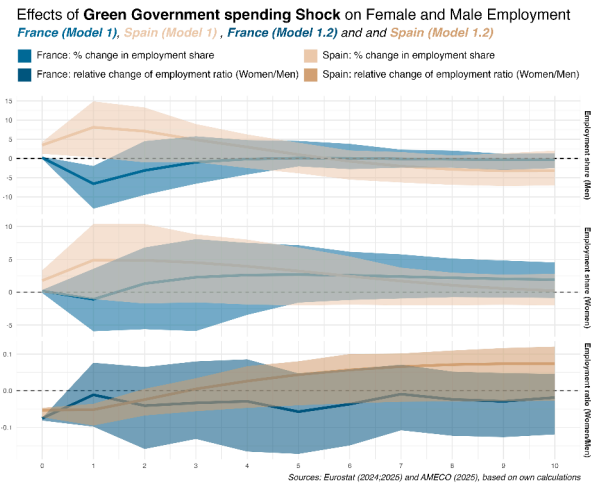
Significant results from a government spending shock in the Social sector G_{social} on the employment shares of females and males are exclusively found for Austria. The effect sizes are smaller in magnitude, since the employment shares for men and women were divided by 100 for Model 2.1.

[1] The analysis builds on SVAR adopting the scoring method. For Austria Models 1.1 and 2.1 are utilized, for Italy Models 1.3 and 2.3 and for Germany, Finland, France and Spain Models 1 and 2. The *employment_ratio* variable describes the relative development between emplyoment share of women as a share of men and is included in Models 1.2 and 2.2., respectively.

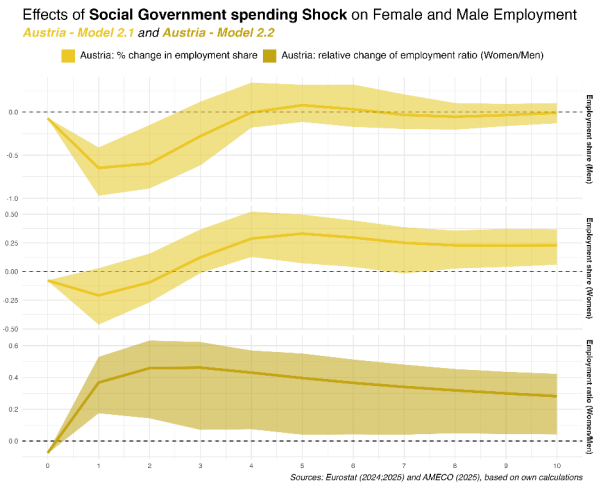
Positive and significant effects of Social government spending G_{social} on the employment share are documented for female employment E_f, while significantly negative effects are observed for the male employment share E_m as illustrated by Figure 9b. Specifically, a 1 % increase in government spending growth initially decreases E_f in the first period by 20 %-points, but from period 3.5 onward increases E_f by up to 30 %-points, remaining relatively stable at this elevated level. For the employment share of men a decline is observed for 2.5 periods, reaching its peak decline of 60 %-points in the second period. This is corroborated by the relative effect of female to male employment share captured by $employment\_ratio$, which reaches its peak in the second period at 0.5.

Figure 9: Transmission of shocks in government spending and investment across countries

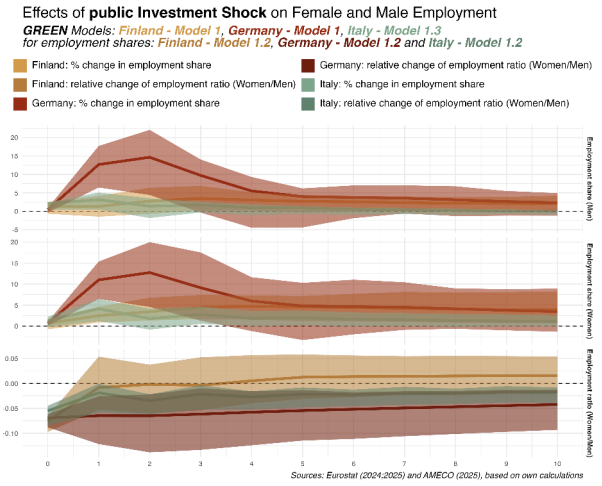
(a) Effects of Green government spending shock



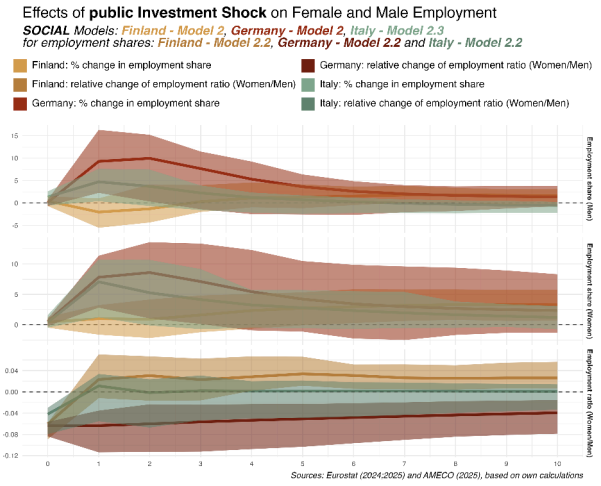
(b) Effects of Social government spending shock



(c) Effects of public Investment shock in GREEN Model



(d) Effects of public Investment shock in SOCIAL Model



Notes: The plots depict the effect of a 1 % increase in the respective spending category on male and female employment shares as well as the ratio between the two from period 0 to 10. The different colors illustrate different country values and the intensity of the color express the models used, the darker tone points to the model which solely includes the ratio of employment shares. Scales on the y-axis vary for each plot accordingly to effect sizes. The shaded areas around the estimated response curve depict the 90 % confidence intervals and responses are labeled significant if the confidence interval is in the same quadrant as the response path. In 9a, a 1 % increase in Green government spending simultaneously results in a significant 4 %pt. increase of the male employment share and a significant 2 %pt. increase of the female employment share, causing the gender employment ratio to be negative and significant at -0.5 %pt.. The subsequent periods can be interpreted as the orthogonal, single period effect of the shock in period 0.

Data: Eurostat (2022a, 2022b, 2022c, 2022d, 2025) and European Commission (2025), based on SVAR calculations.

The cumulative effects in Figure 10b demonstrate a significant decline of up to 150 percentage points for male and a corresponding increase for female employment share for Austria, with the latter being significant for the first period and again after six periods, while reaching a maximum of 150 after 10 periods. The cumulative employment share effect is significant and continuously increasing up to almost 4 percentage points, indicating a greater relative increase in female employment.

Interdependency between the employment shares becomes evident: after the decline in the male employment share, the female share increases with a lag following the government spending shock in Austria. This finding provides empirical support for the argument that full employment is not simultaneously attainable for both genders.

An interim assessment reveals that for Austria, France and Spain, government spending achieves greater effects on employment than public Investment. However, the results for France are counterintuitive, since only negative employment effects can be derived.

The continued IRF analysis indicates that public Investment serves as a greater employment driver than government spending targeted at the Green or Social sectors in Germany, Finland, and Italy.

Germany demonstrates the effects of the largest magnitude as depicted in Figure 9d and 9c: a one percent public Investment shock results in increases of 14 and 12.5 %-points in the male E_m and female E_f employment shares, respectively. The effect size should be considered with caution, as should the the cumulative effect size, which reaches up to 60 percentage points (Figure 10d and 10c) during certain periods. Moreover, the results do not diverge significantly between the GREEN and SOCIAL models for public Investment ($pGFCF$). When considering Models 1.2 and 2.2 as well, a significantly negative effect of $employment\_ratio$ manifests itself from a public Investment shock. Therefore, the effect of public investment remains larger for male employment than for female employment.

For Finland, in Models 1 and 2, a public Investment shock affects E_f positively and significantly in both the GREEN and SOCIAL model specifications. In the former, the effect is more pronounced and is consistently positive and significant, reaching its peak at a 5 %-point increase in E_f as illustrated by Figure 9c. Therefore, public investment enhances female employment more than government spending targeted at the Social sector. Male employment shares remain insignificant in the same context for the Finnish economy, and cumulative effects for both genders are exclusively significant and positive for E_f in the GREEN model (Figure 10c).

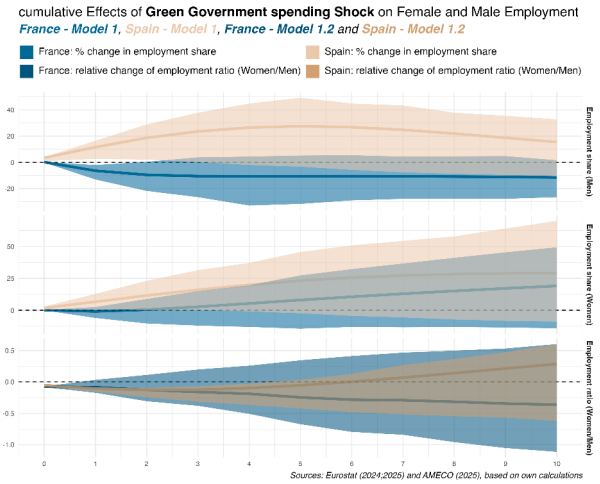
From this, it can be inferred that public investment is particularly important in Finland and Germany. This might suggest that, given the already relatively high employment shares (especially for women), public investment (e.g., in childcare, all-day schools, etc.) is more effective at mobilizing women into the workforce from the reserve army of workers than simply targeting spending toward sectors where workers are already employed (Kalecki, 1971).

Finally, employment shares of women and men in Italy are found to be least impacted by a 1 % change public Investment shock - especially in the GREEN model (Figure 9c) in terms of magnitude - and are less impacted by government spending (ranging from insignificant to predominantly nega-

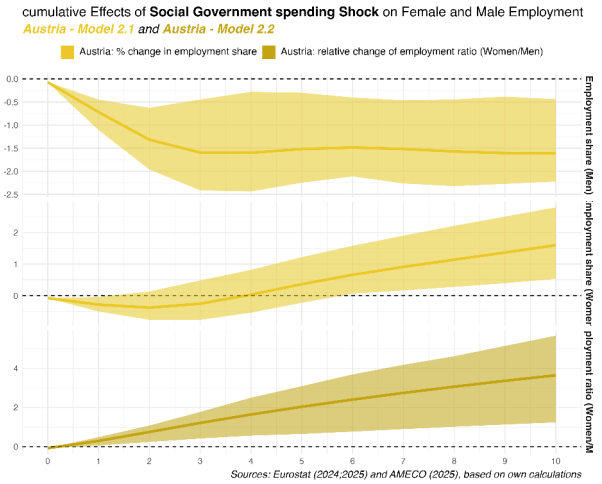
tive, while remaining rather inconsistent). The effect of public Investment on employment shares of men remains insignificant, while for both the GREEN and SOCIAL models (Models 1.2 and 2.2), for women is positively and significantly affected by a public investment shock. In the GREEN model, the effect is rather small (around 4 %-points) and remains significant for only two periods, while the peak of the SOCIAL model is also exclusively significant for the initial period and it reaches its peak at a 7 %-points increase. When comparing these results to the cumulative effects in Figure 10, the SOCIAL model in Figure 10d demonstrates the largest cumulative and significant effects for the female employment share stemming from a public Investment shock, while the the relative share of female to male employment shares is significantly negative and centering around -0.2.

Figure 10: cumulated Transmission of shocks in government spending and investment across countries

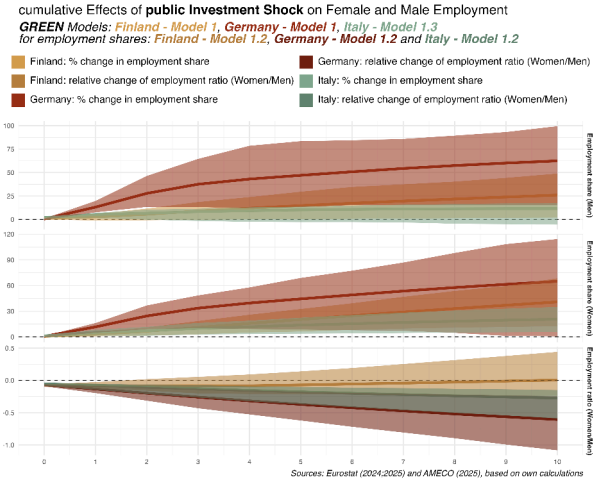
(a) cumulated Effects of Green government spending shock



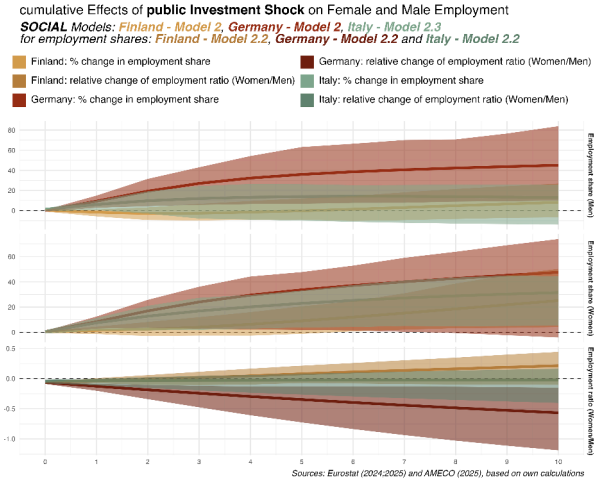
(b) cumulated Effects of Social government spending shock



(c) cumulated Effects of public Investment shock in GREEN Model



(d) cumulated Effects of public Investment shock in SOCIAL Model



Notes: The plots illustrate the cumulative effect of a 1 % increase in the respective spending category on male and female employment shares as well as the ratio between the two from period 0 to 10. The different colors depict different country values and the intensity of the color express the models used, the darker tone points to the model which solely includes the ratio of employment shares. Scales on the y-axis vary for each plot accordingly to effect sizes. The shaded areas around the estimated response curve depict the 90 % confidence intervals and responses are labeled significant if the confidence interval is in the same quadrant as the response path. In 9a, a 1 % increase in Green government spending results in a significant cumulated increase of 16 %pt. of the male employment share and a significant cumulated increase of around 10 %pt. of the female employment share in period 2, causing the gender employment ratio to be negative and significant at around -0.2 %pt.. The subsequent periods can be interpreted as the accumulated effect stemming in the respective period from the one off increase in period 0.

Data: Eurostat (2022a, 2022b, 2022c, 2022d, 2025) and European Commission (2025), based on SVAR calculations.

As emphasized above, the analysis reveals that public infrastructure is not a significant driving force for employment in Spain or Austria. Conversely, Germany, Finland, and Italy do not show substantial impacts on employment from government spending shock, with public Investment being of relatively greater importance in this regard. A general trend is difficult to infer, since the countries cannot be clearly categorized into Northern and Southern European patterns with respect to their gender-differentiated employment shares. As demonstrated in Figure 6, Finland and Germany exhibit high female employment shares, while Italy records the lowest shares across all countries. This suggests that public investment may be especially critical in countries characterized by either exceptionally low or high female labor force participation.

The presented results are overall coherent with other research agendas, while previous work has utilized different methods and focused on separate institutional contexts. Onaran et al. (2022b) investigates the interdependence of gender inequality and public Infrastructure for the case of the UK within a GMM-IV framework. Even though the institutional context is similar to the EU countries, results are not directly comparable but still point in similar directions. Other work by Onaran and Oyvat (2023a) has focused on emerging economies, which does not make it directly comparable due to the differing economic institutional structures. Nevertheless, the results fit well within the existing literature and extend current research with the application of the EU countries focus and within EU differences.

5.2.1 Robustness checks and Stationarity tests

To attain stationarity in the time series data, all variables a log-transformation was utilized, with the exception of the employment shares of women and men, which are retained in levels (percentages) to preserve interpretability.

Stationarity is assessed using both the Augmented Dickey Fuller (ADF) and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test. The specification is selected according to the first instance at which either test indicates an adequate degree of differencing. Based on economic reasoning, employment shares are exempt from differencing, as they already display largely stationary behavior in levels. To maintain interpretability, differencing beyond the first order is not undertaken.

Model stability is further examined within the SVAR framework, since stability constitutes a necessary condition for stationarity. In this context, the unit roots test validates that all moduli of the eigenvalues lie strictly within the unit root circle across all specifications. Moreover, structural stability is evaluated using the test statistics for detecting structural changes in linear regression models proposed by Zeileis et al. (2002). In particular, the cumulative sum of residuals (CUSUM) test is applied to assess the null hypothesis of parameter constancy over time as indicated by Appendix Figure A.7. Deviations of the cumulative sum outside the confidence interval are interpreted as evidence of parameter instability or potential structural breaks.

For robustness checks, different SVAR model specifications are tested, and only significant and consistent results are reported.

5.2.2 Caveats

The SVAR methodology, while revealing important dynamic relationships, imposes several constraints on the analysis. The linear relationship assumption may obscure nonlinearities suggested by the scatter plots in the descriptive analysis in Section 4, where different countries exhibit varying threshold effects and structural breaks. A key limitation arises from the relatively small number of annual observations in the national accounts: the inclusion of lags to capture endogenous and multidimensional relationships quickly exhausts the available degrees of freedom. The limitation to relatively few variables due to degrees of freedom constraints, combined with the restriction to one lag to avoid over-identification, necessarily simplifies the complex interdependencies within feminist macroeconomic systems.

Critically, the current framework does not model environmental feedback or responses, despite the central role of ecological constraints. This represents a significant gap that future research should address, particularly given the urgency of climate breakdown and the potential for environmental degradation to disproportionately affect women's economic outcomes.

In addition, green government spending focuses on environmental protection and pollution, and thereby does not include direct funding via e.g. state subsidies provided for industries to relocate their resource towards a decarbonized economy.

However, the SVAR approach successfully illustrates the dynamic relationships between fiscal policy instruments and gendered employment outcomes, revealing important heterogeneities across European institutional contexts that would be obscured by a static analysis.

6 Conclusion

This paper examines the gendered employment effects of government spending and investment within a Feminist Post-Kaleckian macroeconomic framework based on the seminal work by Onaran et al. (2022a, 2022b). By supplying a Structural Vector Autoregressive (SVAR) model for six EU countries including Austria, Germany, Spain, Italy, France, and Finland, the analysis identifies heterogeneous employment effects on women and men to fiscal shocks. Dynamic responses Embedding gender into macroeconomic modeling fundamentally alters our understanding of fiscal policy effectiveness within a socio-ecological transition. The heterogeneous effects across countries and policy instruments underscore the importance of institutional context and challenge universalist policy prescriptions.

First, the most significant empirical findings of the SVAR analysis constitutes the emergence of public Investment as the most substantial employment driver across the majority of countries analyzed. However, the analysis reveals a concerning pattern: public Investment generates negative gender effects in several contexts, disproportionately boosting male employment relative to female employment. This suggests that the composition and targeting of public investment matters critically for achieving feminist macroeconomic objectives. An extension of this analysis would

constitute the differentiation between disaggregated public investment by sector and purpose to identify which types of infrastructure spending most effectively promote gender equality alongside employment creation.

A crucial pattern emerges when examining Public investment, which appears particularly consequential in countries characterized by either very low (Italy) or high (Finland, Germany) female labor force participation. This suggests that institutional and social structures fundamentally shape the effectiveness of fiscal policy interventions.

In high-participation contexts like Finland, public investment may enable the mobilization of women from the "reserve army of workers" (Kalecki, 1971) into formal employment by addressing care infrastructure deficits. In low-participation contexts like Italy, similar investments may overcome structural barriers that have historically excluded women from the labor market.

Secondly, Government spending yields significant and consistent employment effects in only two countries: Austria and Spain, with strikingly different gendered patterns. In Austria, Social government spending (G_{social}) produces the theoretically predicted outcome for Social government expenditure: positive effects on female employment coupled with slight negative effects on male employment. This pattern supports the argument for complementarity between social reproduction and market production, where investment in care sectors enables women's labor force participation while potentially reducing male employment on the aggregate level.

Third, for Spain a finding dissent from the former cases can be observed, where green government spending generates positive employment effects for men and for women, while a more pronounced effect is found for men. This finding again resonate with the theoretical reasoning of a gender-segregated labor market. The sectoral composition of Spain's green industries appears to be taken by traditionally male-dominated industries, while some spillover effects are present for women.

Lastly, although green industries are indispensable for achieving the socio-ecological transition, the overall results indicate that they do not act as strong employment drivers. This suggests a fundamental restructuring of wage labor rather than an expansion of overall government expenditure (Rezai et al., 2013; Strunk et al., 2022). By contrast, social spending proves to be both employment-intensive and low-carbon, as the Austrian case demonstrates, thereby advancing gender equality and contributing meaningfully to the transition.

This finding supports the feminist Post-Keynesian emphasis on the institutional embeddedness of labor markets and challenges one-size-fits-all policy prescriptions. Countries with moderate female labor force participation rates may require different policy mixes that are not adequately captured by the current analytical framework.

Policy makers should prioritize public investment in care infrastructure, renewable energy systems designed with community participation, and labor-intensive ecological restoration projects. The Austrian experience suggests that Social spending can effectively promote gender equality when embedded within supportive institutional frameworks, while the Spanish case warns against assuming that "green" spending automatically promotes feminist objectives.

Lastly, the preceding analysis carries significant implications for designing feminist macroeco-

nomic policy in the context of socio-ecological transition. The dominance of public investment effects suggests that infrastructure-led approaches may be more effective than expenditure-based approaches for achieving both employment and gender equality objectives in certain contexts. However, the negative gender effects of some public investment highlight the critical importance of targeting and composition.

Future research should extend the current framework in several directions. First, a sectoral decomposition of public investment purpose would enable more targeted policy recommendations. The introduction of IO-modeling demonstrates a potential starting point. Second, incorporating environmental feedback effects through an ecological model would allow for the analysis of policies that simultaneously address ecological, employment, and gender objectives. Third, developing nonlinear specifications could capture threshold effects and structural breaks that appear important in the descriptive analysis, especially so for the case of Germany.

The puzzling case of France, where Green government spending yielded small but significant negative effects on the male employment share, while most other results proved largely insignificant, requires further investigation. This may reflect the particular institutional configuration of the French labor market or suggest that aggregated national accounts data obscure important regional or sectoral dynamics.

Finally, the theoretical integration of Post-Keynesian, Feminist, and Ecological Economics through labor theory represents a promising foundation for developing comprehensive macroeconomic models capable of addressing the interconnected crises of current times. The integration of these three theoretical strands through labor theory is not merely policy-relevant but theoretically coherent. The principle of involuntary unemployment due to a lack of effective demand (Strunk et al., 2022) manifests empirically in heterogeneous employment responses to fiscal shocks across countries. The principle of social necessity to work becomes evident in the persistent gender differences in employment shares, reflecting institutionally determined wage-setting processes rather than "neutral" market forces. Most importantly, the principle of Hobbesian production relations emerges clearly in the asymmetric employment effects between men and women, underscoring that fiscal interventions operate within existing power structures that systematically privilege male employment. The empirical findings validate the theoretical argument that labor markets constitute a pivotal leverage point for socio-ecological transformation, while simultaneously revealing the gendered dimensions of fiscal policy effectiveness.

References

Abraham, J. (2017). Just Transitions for the Miners: Labor Environmentalism in the Ruhr and Appalachian Coalfields. *New Political Science*, *39*(2), 218–240. https://doi.org/10.1080/07393148.2017.1301313

Barca, S. (2017). The Labor(s) of Degrowth. *Capitalism Nature Socialism*, *30*(2), 207–216. https://doi.org/10.1080/10455752.2017.1373300

Bhaduri, A., & Marglin, S. (1990). Unemployment and the real wage: The economic basis for contesting political ideologies. *Cambridge Journal of Economics*, *14*(4), 375–393. https://www.jstor.org/stable/23598376

Biesecker, A., & Hofmeister, S. (2010). Focus: (Re)productivity. *Ecological Economics*, *69*(8), 1703–1711. https://doi.org/10.1016/j.ecolecon.2010.03.025

Blecker, R. A., & Braunstein, E. (2022). Feminist Perspectives on Care and Macroeconomic Modeling: Introduction to the Special Issue. *Feminist Economics*, *28*(3), 1–22. https://doi.org/10.1080/13545701.2022.2085880

Braunstein, E., Van Staveren, I., & Tavani, D. (2011). Embedding Care and Unpaid Work in Macroeconomic Modeling: A Structuralist Approach. *Feminist Economics*, *17*(4), 5–31. https://doi.org/10.1080/13545701.2011.602354

Braunstein, E., Bouhia, R., & Seguino, S. (2019). Social reproduction, gender equality and economic growth. *Cambridge Journal of Economics*, bez032. https://doi.org/10.1093/cje/bez032

Cahen-Fourot, L. (2022). Looking for growth imperatives under capitalism: Money, wage labour, and market exchange. *Post-Growth Economics Network (PEN)*, (01/2022). https://hdl.handle.net/10419/264902

Cascella, C., Pampaka, M., & Williams, J. (2024). Gender attitudes within and between european countries: Regional variations matter. *SAGE Open*, *14*(3), 21582440241259912. https://doi.org/10.1177/21582440241259912

Danby, C. (2004). Lupita's Dress: Care in Time. *Hypatia*, *19*(4), 23–48. https://doi.org/10.1111/j.1527-2001.2004.tb00147.x

Dengler, C., & Strunk, B. (2018). The Monetized Economy Versus Care and the Environment: Degrowth Perspectives On Reconciling an Antagonism. *Feminist Economics*, *24*(3), 160–183. https://doi.org/10.1080/13545701.2017.1383620

Elson, D., & Cagatay, N. (2000). The Social Content of Macroeconomic Policies. *World Development*, *28*(7), 1347–1364. https://doi.org/10.1016/S0305-750X(00)00021-8

Ertürk, K., & Çağatay, N. (1995). Macroeconomic consequences of cyclical and secular changes in feminization: An experiment at gendered macromodeling. *World Development*, *23*(11), 1969–1977. https://doi.org/10.1016/0305-750X(95)00090-Y

European Commission. (2025). *AMECO Database: Gross Fixed Capital Formation at Current Prices, General Government (UIGG)*. Retrieved July 21, 2025, from https://economy-finance.ec.europa.eu/economic-research-and-databases/economic-databases/ameco-database_en

Eurostat. (2022a). *Employment and activity by sex and age (1992-2020) - annual data*. https://doi.org/10.2908/LFSI_EMP_A_H

Eurostat. (2022b). *GDP and main components (output, expenditure and income)*. https://doi.org/10.2908/NAMA_10_GDP

Eurostat. (2022c). *General government expenditure by function (COFOG)*. https://doi.org/10.2908/GOV_10A_EXP

Eurostat. (2022d). *HICP - annual data (average index and rate of change)*. https://doi.org/10.2908/PRC_HICP_AIND

Eurostat. (2025). *Gross value added and income by detailed industry (NACE Rev.2)*. https://doi.org/10.2908/NAMA_10_A64

Fontana, G., & Sawyer, M. (2016). Towards post-Keynesian ecological macroeconomics. *Ecological Economics*, *121*, 186–195. https://doi.org/10.1016/j.ecolecon.2015.03.017

Godley, W., & Cripps, F. (1983). *Macroeconomics*. Oxford University Press.

Godley, W., & Lavoie, M. (2007). *Monetary Economics*. Palgrave Macmillan UK. https://doi.org/10.1057/9780230626546

Hardt, L., & O'Neill, D. W. (2017). Ecological Macroeconomic Models: Assessing Current Developments. *Ecological Economics*, *134*, 198–211. https://doi.org/10.1016/j.ecolecon.2016.12.027

Heimberger, P. (2023). Öffentliche Investitionen und Sozialstaat: Perspektiven der Budgetpolitik im Kontext von Energiekrise, Klimawandel und EU-Budgetregeln. *wiiw Policy Notes and Reports*, *65*.

Henriques, C., Gouveia, M., Viseu, C., Sousa, S., & Moutinho, V. (2025). Unveiling the green transition and gender disparities in the energy industry: A value-based DEA cluster analysis approach. *Sustainable Futures*, *9*, 100546. https://doi.org/10.1016/j.sftr.2025.100546

Hinton, J. (2020). Fit for purpose? Clarifying the critical role of profit for sustainability. *Journal of Political Ecology*, *27*(1). https://doi.org/10.2458/v27i1.23502

Humphries, J., & Rubery, J. (1984). The reconstitution of the supply side of the labour market: The relative autonomy of social reproduction. *Cambridge Journal of Economics*, *8*(4), 331–346. https://www.jstor.org/stable/23596643

Huwe, V., & Rehm, M. (2022). The ecological crisis and post-Keynesian economics – bridging the gap? *European Journal of Economics and Economic Policies: Intervention*, (3). https://doi.org/10.4337/ejeep.2022.03.08

Jackson, T., & Victor, P. (2011). Productivity and work in the 'green economy'. *Environmental Innovation and Societal Transitions*, *1*(1), 101–108. https://doi.org/10.1016/j.eist.2011.04.005

Jimenez, V., & Woodgate, R. (2025). The Balance-of-Emissions Constraint on Growth: Pathways to Net-Zero Greenhouse Gas Emissions in a Simple Post-Keynesian Model. *Post-Keynesian Economic Society*, *2507*. https://doi.org/10.2139/ssrn.5064263

Kalecki, M. (1971). Political aspects of full employment. In *Selected essays on the dynamics of the capitalist economy* (pp. 138–145). Cambridge University Press.

Kallis, G., Kalush, M., O.'Flynn, H., Rossiter, J., & Ashford, N. (2013). "Friday off": Reducing Working Hours in Europe. *Sustainability*, *5*(4), 1545–1567. https://doi.org/10.3390/su5041545

King, J. E. (2015). *Advanced introduction to post Keynesian economics*. EE, Edward Elgar Publishing.

King, J. (2019). Some obstacles to wage-led growth. *Review of Keynesian Economics*, *7*(3), 308–320. https://doi.org/10.4337/roke.2019.03.03

King, J. (2001). Labour and unemployment. In R. Holt & S. Pressman (Eds.), *A new guide to post keynesian economics* (pp. 65–78). Routledge.

King, J. E. (2002, May 28). Some elements of a Post Keynesian labour economics. In S. C. Dow & J. Hillard (Eds.), *Post Keynesian Econometrics, Microeconomics and the Theory of the Firm*. Edward Elgar Publishing. https://doi.org/10.4337/9781781950050.00012

Knight, K. W., Rosa, E. A., & Schor, J. B. (2013). Could working less reduce pressures on the environment? A cross-national panel analysis of OECD countries, 1970–2007. *Global Environmental Change*, *23*(4), 691–700. https://doi.org/10.1016/j.gloenvcha.2013.02.017

Krebs, T., & Weber, I. (2025). Der Militär-Keynesianismus schadet der Klimawende. *Surplus – Das Wirtschaftsmagazin*. https://www.surplusmagazin.de/militarkeynesianismus-verteidigung-schulden/

Lavoie, M. (2014). *Post-Keynesian economics: New foundations* (First edition). Edward Elgar Publishing.

Lawson, T. (2006). The nature of heterodox economics. *Cambridge Journal of Economics*, *30*, 483–505. https://doi.org/10.1093/cje/bei093

Lütkepohl, H. (2005). *New introduction to multiple time series analysis*. New York : Springer.

Mazzucato, M. (2022). *Mission economy: A moonshot guide to changing capitalism*. Penguin Books.

McCauley, D., & Heffron, R. (2018). Just transition: Integrating climate, energy and environmental justice. *Energy Policy*, *119*, 1–7. https://doi.org/10.1016/j.enpol.2018.04.014

Nakamura, E., & Steinsson, J. (2018). Identification in Macroeconomics. *Journal of Economic Perspectives*, *32*(3), 59–86. https://doi.org/10.1257/jep.32.3.59

Onaran, Ö., & Oyvat, C. (2023a). *The employment effects of public spending in infrastructure, the care economy and the green economy: The case of emerging economies*. International Trade Union Confederation. Brussels.

Onaran, Ö., & Oyvat, C. (2023b). Synthesizing feminist and post-Keynesian/Kaleckian economics for a purple–green–red transition. *European Journal of Economics and Economic Policies Intervention*, *20*(2), 317–337. https://doi.org/10.4337/ejeep.2023.0117

Onaran, Ö., Oyvat, C., & Fotopoulou, E. (2022a). A Macroeconomic Analysis of the Effects of Gender Inequality, Wages, and Public Social Infrastructure: The Case of the UK. *Feminist Economics*, *28*(2), 152–188. https://doi.org/10.1080/13545701.2022.2044498

Onaran, Ö., Oyvat, C., & Fotopoulou, E. (2022b). Gendering Macroeconomic Analysis and Development Policy: A Theoretical Model. *Feminist Economics*, *28*(3), 23–55. https://doi.org/10.1080/13545701.2022.2033294

Oyvat, C., & Onaran, Ö. (2022). The effects of social infrastructure and gender equality on output and employment: The case of South Korea. *World Development*, *158*, 105987. https://doi.org/10.1016/j.worlddev.2022.105987

Palley, T. I. (2015). Money, Fiscal Policy, and Interest Rates: A Critique of Modern Monetary Theory. *Review of Political Economy*, *27*(1), 1–23. https://doi.org/10.1080/09538259.2014.957466

Pandey, S., & Bright, C. (2008). What are degrees of freedom? *Social Work Research*, *32*. https://doi.org/10.1093/swr/32.2.119

Pfaff, B. (2008). VAR, SVAR and SVEC Models: Implementation Within *R* Package **vars**. *Journal of Statistical Software*, *27*(4). https://doi.org/10.18637/jss.v027.i04

Platform on Sustainable Finance. (n.d.). *EU Taxonomy NACE alternate classification mapping* (Excel file). Excel file. Retrieved July 21, 2025, from https://ec.europa.eu/sustainable-finance-taxonomy/

Pollin, R. (2019). Advancing a Viable Global Climate Stabilization Project: Degrowth versus the Green New Deal. *Review of Radical Political Economics*, *51*(2), 311–319. https://doi.org/10.1177/0486613419833518

Rezai, A., Taylor, L., & Mechler, R. (2013). Ecological macroeconomics: An application to climate change. *Ecological Economics*, *85*, 69–76. https://doi.org/10.1016/j.ecolecon.2012.10.008

Robinson, J. (1937). *Essays in the theory of employment*. Macmillan.

Robinson, J. (1969). *The economics of imperfect competition* (2nd ed.). Macmillan.

Seguino, S. (2010). Gender, Distribution, and Balance of Payments Constrained Growth in Developing Countries. *Review of Political Economy*, *22*(3), 373–404. https://doi.org/10.1080/09538259.2010.491285

Seguino, S. (2012). Macroeconomics, Human Development, and Distribution. *Journal of Human Development and Capabilities*, *13*(1), 59–81. https://doi.org/10.1080/19452829.2011.637376

Seguino, S. (2013). *From micro-level gender relations to the macro economy and back again*. Edward Elgar Publishing. https://doi.org/None

Seguino, S. (2020). Engendering Macroeconomic Theory and Policy. *Feminist Economics*, *26*(2), 27–61. https://doi.org/10.1080/13545701.2019.1609691

Sims, C. A. (1980). Macroeconomics and Reality. *Econometrica*, *48*(1), 1. https://doi.org/10.2307/1912017

Spash, C. L. (2015). The Future Post-Growth Society. *Development and Change*, *46*(2), 366–380. https://doi.org/10.1111/dech.12152

Statistical Office of the European Union (Ed.). (2013). *European system of accounts: ESA 2010*. Publications Office. https://doi.org/10.2785/16644

Stevis, D., & Felli, R. (2020). Planetary just transition? How inclusive and how just? *Earth System Governance*, *6*, 100065. https://doi.org/10.1016/j.esg.2020.100065

Stockhammer, E., & Onaran, Ö. (2004). Accumulation, distribution and employment: A structural VAR approach to a Kaleckian macro model. *Structural Change and Economic Dynamics*, *15*(4), 421–447. https://doi.org/10.1016/j.strueco.2003.07.002

Stockhammer, E., Constantine, C., & Reissl, S. (2020). Explaining the Euro crisis: Current account imbalances, credit booms and economic policy in different economic paradigms. *Journal of Post Keynesian Economics*, *43*(2), 231–266. https://doi.org/10.1080/01603477.2020.1734464

Stratford, B. (2020). The Threat of Rent Extraction in a Resource-constrained Future. *Ecological Economics*, *169*, 106524. https://doi.org/10.1016/j.ecolecon.2019.106524

Strunk, B., Ederer, S., & Rezai, A. (2022). The role of labor in a socio-ecological transition: Combining post-Keynesian and ecological economics perspectives*. *European Journal of Economics and Economic Policies Intervention*, *19*(1), 103–118. https://doi.org/10.4337/ejeep.2022.01.08

Taylor, L., Rezai, A., & Foley, D. K. (2016). An integrated approach to climate change, income distribution, employment, and economic growth. *Ecological Economics*, *121*, 196–205. https://doi.org/10.1016/j.ecolecon.2015.05.015

Truger, A. (2023). Die Transformation bewältigen: Gemeinsam und schrittweise! In K.-R. Korte, P. Richter, & A. Von Schuckmann (Eds.), *Regieren in der Transformationsgesellschaft: Impulse aus Sicht der Regierungsforschung*. Springer Fachmedien Wiesbaden. https://doi.org/10.1007/978-3-658-41285-2

Vandeplas, A., Vanyolos, I., Vigani, M., & Vogel, L. (2022). *The possible implications of the green transition for the EU labour market*. Publications Office of the European Union. https://doi.org/10.2765/583043

van Staveren, I. (2010). Post-Keynesianism meets feminist economics. *Cambridge Journal of Economics*, *34*(6), 1123–1144. https://doi.org/10.1093/cje/ben033

Veblen, T. (1898). The barbarian status of women. *American Journal of Sociology*, *4*.

Velicu, I., & Barca, S. (2020). The Just Transition and its work of inequality. *Sustainability: Science, Practice and Policy*, *16*(1), 263–273. https://doi.org/10.1080/15487733.2020.1814585

Waller, W. (1999). Post keynesian economics. In J. Peterson & M. Lewis (Eds.), *The elgar companion to feminist economics* (pp. 622–628). Edward Elgar.

Weiss, M., & Cattaneo, C. (2017). Degrowth – Taking Stock and Reviewing an Emerging Academic Paradigm. *Ecological Economics*, *137*, 220–230. https://doi.org/10.1016/j.ecolecon.2017.01.014

Williams, C. (1996). The New Barter Economy: An Appraisal of Local Exchange and Trading Systems (LETS). *Journal of Public Policy*, *16*, 85–101. https://doi.org/10.1017/S0143814X0000787X

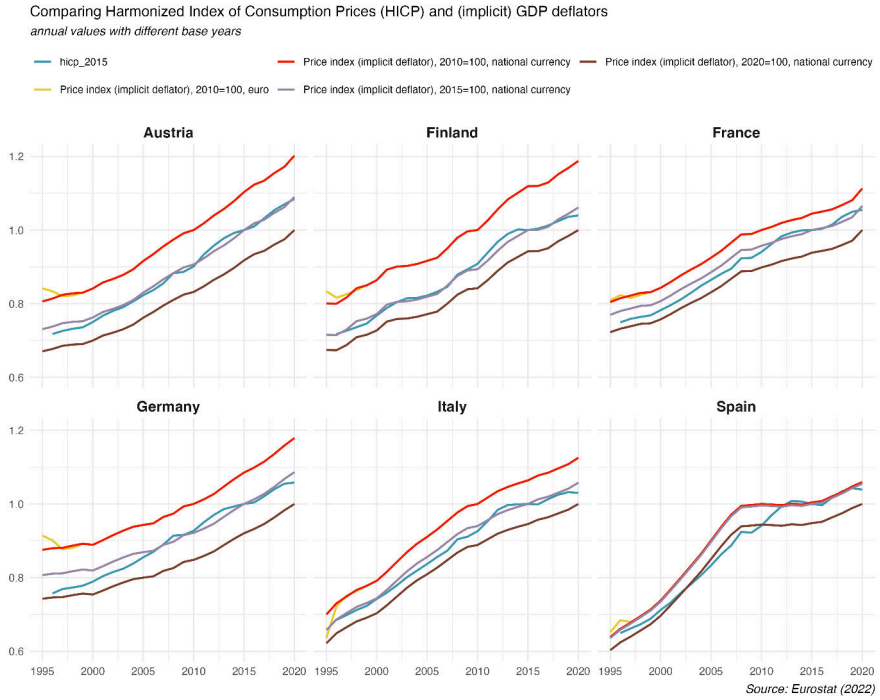
Wray, L. R. (2015). *Modern Money Theory: A Primer on Macroeconomics for Sovereign Monetary Systems* (2nd ed. 2015). Palgrave Macmillan UK. https://doi.org/10.1057/9781137539922

Zeileis, A., Leisch, F., Hornik, K., & Kleiber, C. (2002). **Strucchange**: An*R*Package for Testing for Structural Change in Linear Regression Models. *Journal of Statistical Software*, *7*(2). https://doi.org/10.18637/jss.v007.i02

Zuazu, I. (2024). Reviewing feminist macroeconomics for the twenty-first century. *Review of Evolutionary Political Economy*, *5*(2), 271–299. https://doi.org/10.1007/s43253-024-00123-3

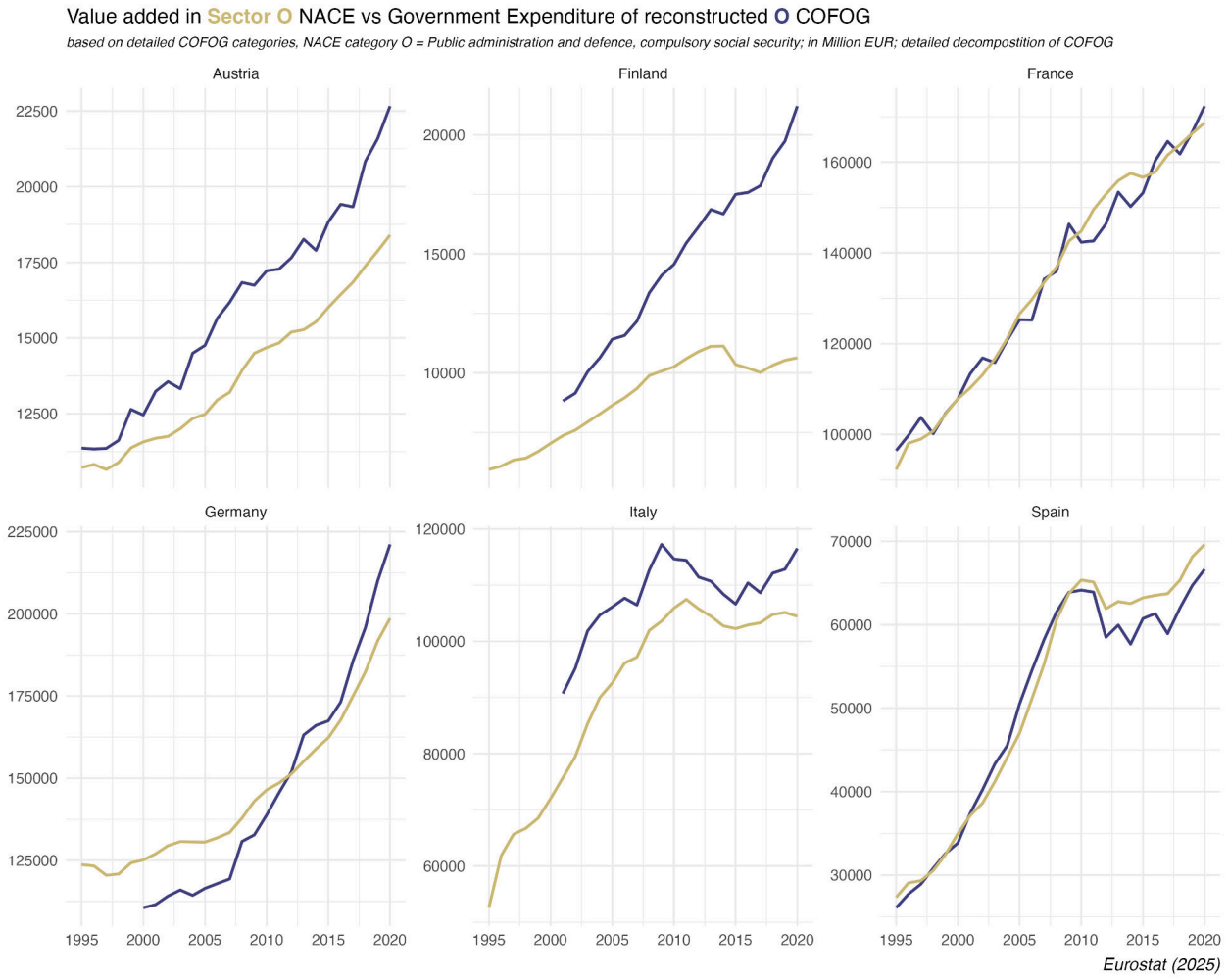
A APPENDIX

Figure A.1: Deflator comparison



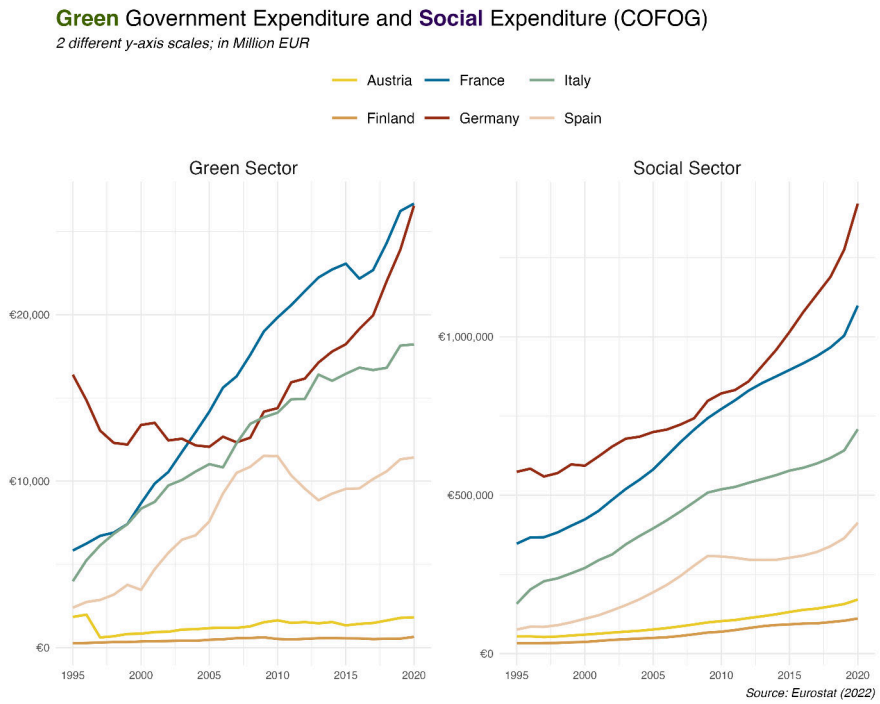
Note: Figure A.1 provides an overview of GDP deflators and contrasts these with the Harmonized Index of Consumption Price (HICP) benchmarked to 2015 (Eurostat, 2022d). To evaluate which deflator to use, the violet and blue lines should be exramined. For *Austria, Finland, France and Italy* the development of the deflator and HIPC overlap substantially. More pronounced deviations are observed in Germany, while greater divergence between the two measures is detected for Spain. In the latter case, the deflator reached a plateau after 2005, which is in contrast to the trajectory of the HIPC. Subsequently, data employed for the empirical analysis is deflated by the implicit deflator with 2015 as the base year. For robustness checks, the HIPC is utilized to account for potential differences. However, from this comparison stems that the implicit deflators with alternative base years yield comparable results. Value added data are deflated by industry-specific value added deflators, whereas all remaining variables are deflated using the implicit GDP deflator.
Data: Eurostat (2022b), based on own calculations.

Figure A.2: Detailed Reconstructed O vs NACE O



Note: Figure A.2 examines the share of defense expenditure through a more granular sectoral decomposition, in order to improve the understanding of its composition. The defense expenditure category encompasses Military defense, Civil defense, Foreign military aid, Defence n.e.c.. A comparison of Sector O (NACE) with the reconstructed Sector O (COFOG), shown in Figure A.2, yields a reasonably high approximation for most countries, with Finland constituting a noticeable exception. Germany represents another outlier, as the reconstructed sector O initially understates and subsequently overstates the NACE value added category.
Data: Eurostat (2022c, 2025), based on own calculations.

Figure A.3: Green and Social Government expenditure

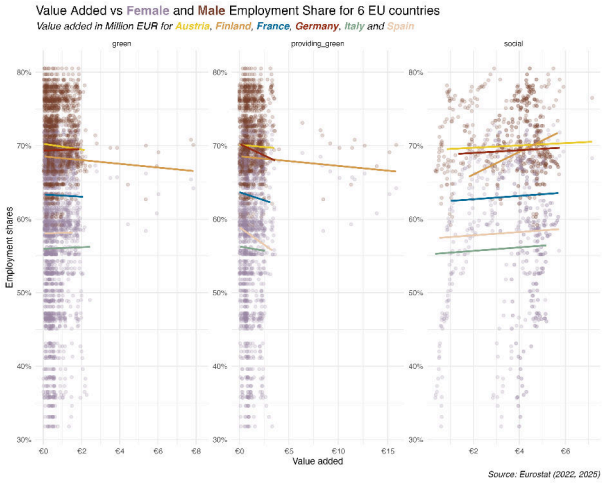


Note: This figure depicts the evolution of the aggregated government spending categories in Million Euro for the period under study. The x-axis shows the value added share of the respective category on GDP and the y-axis depicts the employment share of the two genders.
Data: Eurostat (2022c)

Figure A.4: Scatterplots of Employment Shares vs Value added - country level

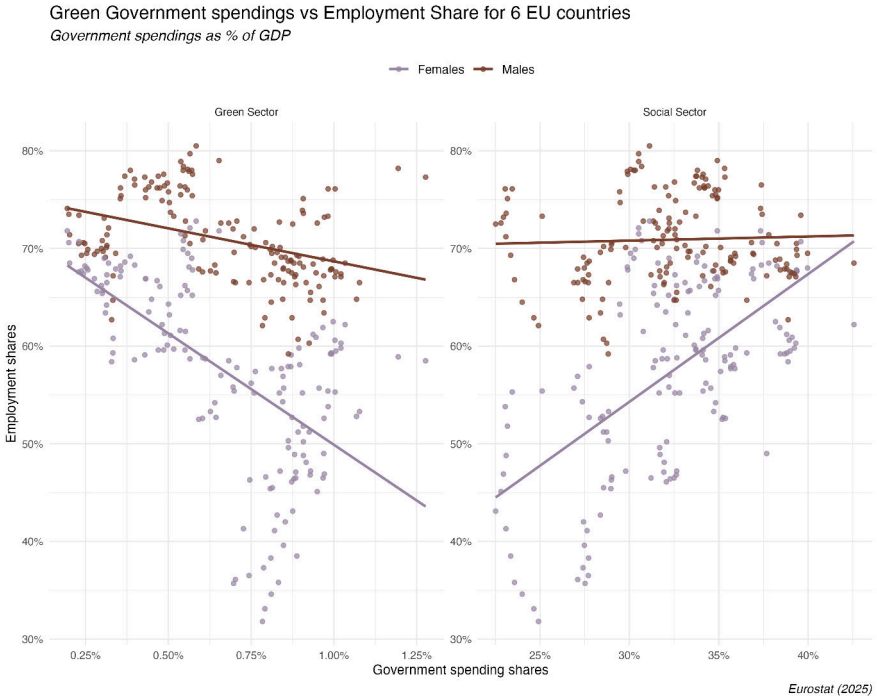
(a) Scatterplot: Employment shares vs Value added

(b) Scatterplot: Employment shares vs Value added - controlled for country



Note: The scatterplots depict the relationship between value added and employment shares of Women and Men. Value added data is expressed as share of GDP. The each Figure is split into green, providing for green and social value added. The x-axis shows the value added share of the respective category on GDP and the y-axis depicts the employment share of the two genders. The left plot shows the average relationship across the sample with an unweighted regression line. For the right plot country-specific regression lines are constructed. The datapoints are colored in red and violet, according to male and female employment shares.
Data: Eurostat (2022a, 2025), based on own calculations.

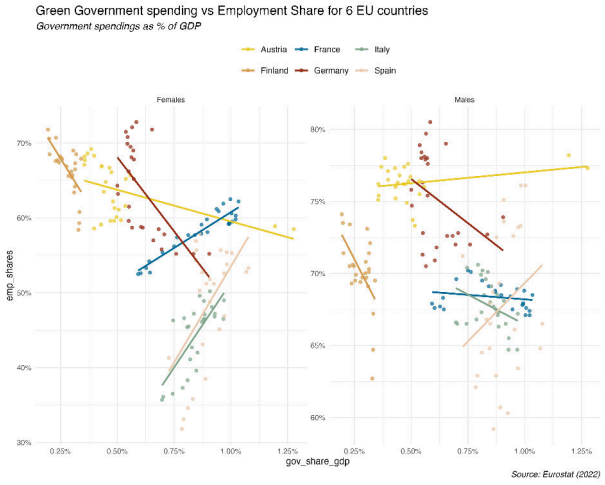
Figure A.5: Scatterplot: Employment shares vs Government spending



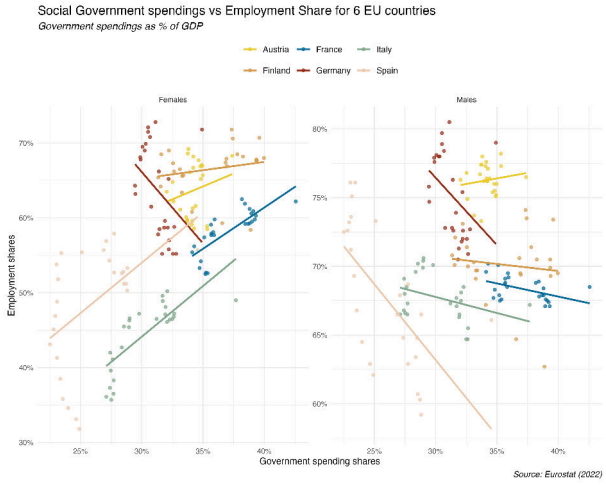
Note: The scatterplot illustrates the uncontrolled relationship between government spending and employment shares of Women and Men. The x-axis shows the government spending share of the respective government share on GDP and the y-axis depicts the employment share of the two genders. Data are included for all countries and thus an average effect is created.
Data: Eurostat (2022a, 2022c), based on own calculations.

Figure A.6: Scatterplots of Employment Shares vs Government Spending - country level

(a) Employment vs Green Government Spending



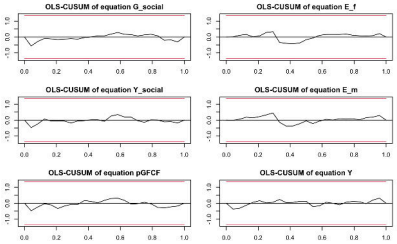
(b) Employment vs Social Government Spending



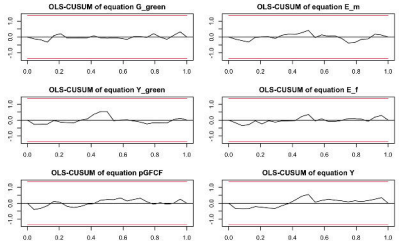
Note: The scatterplots depict the relationship between government spending and employment shares of Women and Men. The different regression lines illustrate the regression for each country under study. The x-axis shows the government spending share of the respective government share on GDP and the y-axis depicts the employment share of the two genders. The left plot examines Green government spending and the right plot illustrates Social government spending. The subplots of each Figure are split by gender, where the right one covers the female employment share and the left one the male employment share.
*Data:*Eurostat (2022a, 2022c), based on own calculations.

Figure A.7: Stability plots

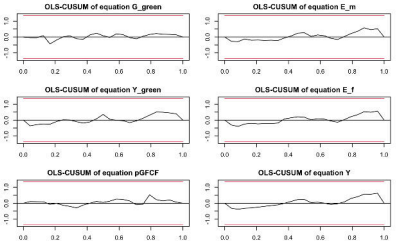
(a) Austria SOCIAL model



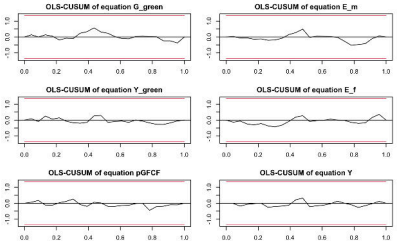
(b) France GREEN model



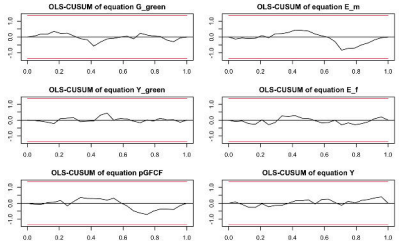
(c) Spain GREEN model



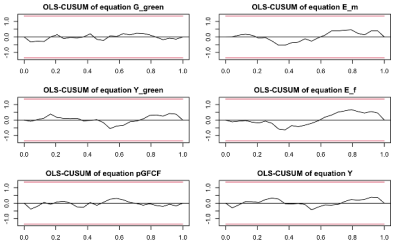
(d) Finland GREEN model



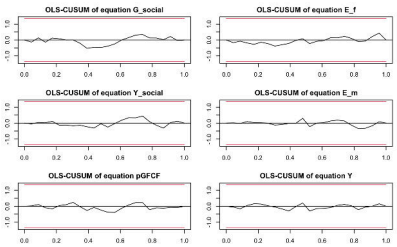
(e) Italy GREEN model



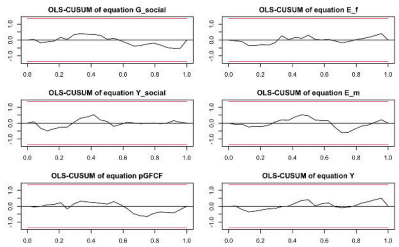
(f) Germany GREEN model



(g) Finland SOCIAL model



(h) Italy SOCIAL model



(i) Germany SOCIAL model