



Analysis

Varieties of capitalism and environmental performance

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ABSTRACT

This paper investigates the role of institutions in decoupling economic growth from environmental impacts, employing the Varieties of Capitalism framework. It finds that Northern European countries have achieved more significant decoupling than other Western OECD countries since the 1980s, as measured by the Ecological Footprint of Consumption. Differences in corporatism, as well as the amount and type of public social expenditures, are hypothesized to play a crucial role in explaining this pattern. Multiple regression analysis reveals that larger proportions of GDP allocated to universal social expenditures — not contingent on work status — are robustly associated with stronger decoupling. This suggests that the considerable investments of Northern European countries in universal social benefits have been key for effectively reducing the environmental impacts associated with economic growth.

1. Introduction

Global surface temperatures have risen by 1.1 degrees above their 1850–1900 levels, a stark reminder of climate change (Intergovernmental Panel on Climate Change, 2023). Despite the scientific consensus on the need to limit global warming to 1.5–2 degrees by the end of the century, global efforts to reduce greenhouse gas emissions are lagging. Climate change is just one of nine planetary boundaries impacted by human activities, with six already exceeding their safe limits (Richardson et al., 2023).

These challenges fall within the broader scope of social dilemmas concerning the management of common pool resources. Social scientists, dating back to Lloyd (1833), have recognized the tension between individual incentives and the sustainable use of shared resources. Today, this tension is exemplified by climate change, which “menaces our planet and looms over our future like a Colossus” (Nordhaus, 2019).

Historically, institutions have played a pivotal role in aligning individual actions with the collective good. Examples include the successful avoidance of a nuclear holocaust during the Cold War through diplomatic and arms control institutions, and the reversal of ozone layer depletion via the crafting and implementation of the Montreal Protocol. As the world now grapples with the multifaceted challenge of sustainable development, the role of institutions in effectively decoupling economic growth from environmental impacts becomes increasingly crucial. However, significant variations exist in the structure of economic and political institutions across countries, influencing their capacity to deepen and sustain this decoupling.

This paper employs the Varieties of Capitalism (VOC) framework to hypothesize which institutional structures might best support decoupling economic growth from environmental impacts. It posits that a robust Welfare State, particularly through generous universal social expenditures that do not depend on work status, can facilitate stronger decoupling by nurturing broad support for costly environmental policies.

An econometric model was applied to OECD economies, utilizing the Ecological Footprint of Consumption as a measure of environmental impact. The results indicate that Northern European countries have been more effective in decoupling their economic growth from environmental impacts compared to other OECD countries. Further analysis reveals that universal social expenditures are robustly associated with lower environmental impacts at a given level of economic growth, suggesting that the robust and universal Welfare States of Northern European countries have supported their superior performance.

2. Conceptual framework and hypotheses

2.1. Capitalism, growth, and environmental degradation

Can capitalism turn around its history of environmental degradation? As economic growth drives anthropogenic impacts on the environment (Dietz et al., 2007), the answer to this question depends on whether economic growth can be decoupled from environmental impacts or, alternatively, if a capitalist economy could be conceived without economic growth.

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Building on the seminal contributions of Meadows et al. (1972) and Daly and Cobb (1989), ecological economists have pioneered the theoretical envisioning of capitalism within planetary boundaries. This research agenda has contributed to the limits-to-growth debate at various levels. Firstly, it has pushed the interdependency between the economy and the environment into mainstream economics, where Integrated Assessment Models (IAMs) are now widely recognized as a sound conceptual framework to evaluate climate policy (Nordhaus, 2019). Secondly, it has developed IAMs to identify the challenges that a market economy would face if converging towards zero growth and suggested alternative policies to address them (Lawn, 2011; Malmaeus et al., 2017; Victor, 2012). Thirdly, scholars have theorized on the sources of the “growth imperative”, i.e., the economic and social forces that make capitalist societies dependent on economic growth to thrive (Gordon and Rosenthal, 2003; Johnson, 2015; Strunz et al., 2015).

Some scholars have been critical of this research agenda, arguing that capitalism cannot be stripped of its growth imperative (Smith, 2010). In their view, economic growth and environmental degradation are intrinsic to capitalism, rendering efforts to green capitalism hypocritical. This position overlooks the rich varieties of forms that capitalism has taken, testifying to its potential for positive change.

At the other extreme, some trust in what they deem to be capitalism's inherent traits, such as technological innovation, to put a check on environmental degradation without hindering economic growth. This position is illustrated by the Environmental Kuznets Curve hypothesis, which posits that countries reduce environmental degradation after reaching a wealth threshold (Grossman and Krueger, 1995). However, evidence for this hypothesis is mixed, especially when considering resource consumption and CO₂ emissions (Dinda, 2004; Stern, 2004, 2017).

Both sides of the debate hold an essentialist conception of capitalism, as an abstract phenomenon experienced in different degrees of purity. This paper embraces a non-essentialist conception of capitalism, anchored in the variety of forms capitalism has taken across time and space. Instead of examining whether capitalism can turn around its history of environmental degradation, the paper delves into what forms of capitalism, as identified by the Varieties of Capitalism literature, are better positioned to deepen the decoupling of economic growth from environmental degradation. While the question of whether the least destructive forms of capitalism are sustainable in the long term will remain unanswered, the hope is that identifying the institutional configurations that sustain the most sustainable forms of capitalism will contribute to the ongoing struggle of forging a sustainable future.

2.2. Corporatism and environmental performance

The VOC literature has emphasized certain institutions that consistently vary among advanced capitalist economies and may play a significant role in their relative environmental performance. One such distinction lies in the degree of corporatism, representing the extent to which economic activity and national politics are mediated by interest groups capable of coordinating actions within an institutional space that serves as an alternative to the market (Soskice and Hall, 2001). Scruggs (1999) suggests that corporatism can enhance the implementation of environmental policies by providing an institutional framework for negotiating their execution with affected stakeholders. This involvement of firms and trade unions in policy design from the outset can increase their willingness to comply. However, Scruggs also highlights challenges, such as the possibility that more corporatist economies may harbor stronger and better-organized interests favoring economic growth, potentially undermining environmental performance.

Additionally, the developed world has widely adopted a range of market-based instruments for environmental governance, where the advantage of corporatist institutions is not evident (Jordan et al., 2003).

As a result, the effectiveness of corporatism in improving environmental performance remains an open question. Scruggs (1999, 2001) found that economies with higher degrees of corporatism demonstrated better environmental outcomes across various indicators between 1970 and 1990. In contrast, Jahn (2016b) documents a negative association between corporatism and environmental performance up to the 1980s, which then becomes positive in subsequent years.

2.3. Welfare state and environmental performance

Beyond corporatism, the VOC literature also emphasizes the crucial role of social policies in mitigating market risks as a dimension that distinguishes countries. Building upon Esping-Andersen (1990)'s seminal work, Estevez-Abe et al. (2001) study how social policy characteristics in various countries contribute to the development of unique skill sets. They suggest that a generous Welfare State facilitates investment in specialized skills by assisting workers through challenging periods and ensuring they find employment where their skills are valued. This robust Welfare State, acting in conjunction with corporatism, endows countries with a competitive advantage in sectors requiring specialized skills and ongoing innovation. Thus, the combination of corporatism and social policy support shapes two primary VOC archetypes: Liberal Market Economies (LME), defined by market-driven coordination and limited welfare support, and Coordinated Market Economies (CME), characterized by a corporatist structure complemented by extensive welfare benefits.

The Welfare State can play a crucial role in determining environmental performance, primarily for two reasons. First, by mitigating inequalities, it can reduce the political pressure for economic growth. This occurs not only because these policies serve as an alternative to economic growth by providing income security, but also because high levels of inequality can drive increased consumption in societies where relative status is important (Alpizar et al., 2005; Bursztyrn et al., 2017). Second, robust welfare systems often adopt a more institutionalized approach to support and reintegrate individuals who may be adversely affected by policies aimed at redirecting the economy towards sustainability (Martin and Thelen, 2007).

2.4. The evolution of welfare states since the 1980s

Since the 1980s, welfare systems across the developed world have been strained by the structural shift towards a service economy. Iversen and Wren (1998) proposes that countries faced a policy trilemma, compelled to prioritize only two out of three policy goals under these circumstances: employment growth, budgetary restraint, and income equality.¹ Northern European countries prioritized income equality and employment by expanding public employment. In contrast, Continental European countries favored income equality and budgetary restraint by limiting labor market participation, while LMEs prioritized employment growth and budgetary restraint. A substantial portion of public employment growth in Northern European countries has been directed toward services provided by the welfare system, potentially nurturing post-materialist values associated with higher support for costly environmental policies (Gingrich and Häusermann, 2015; Inglehart, 1995).

Thelen (2014) adds to Iversen and Wren (1998)'s policy trilemma by conceptualizing distinctive paths of liberalization that countries have adopted to reform their welfare systems under increasing fiscal strain. LMEs have followed a path of deregulation, which entailed dismantling the coordinating capacity of corporatist institutions and a substantial decline in the proportion of the economy covered by

¹ The trilemma is a consequence of intrinsically slower productivity growth in services, which implies that employment growth must be achieved through lower wages (more inequality) or public employment (higher taxes or debt).

such institutions. CMEs in Continental Europe have pursued a dualization path, maintaining the strength of corporatist institutions while experiencing a decrease in the proportion of workers covered by collective arrangements. Lastly, CMEs in Northern Europe have adopted a path of embedded flexibilization, incorporating more market-based coordination into the economy while overhauling the Welfare State to collectivize the risks associated with increased flexibility.

The different liberalization paths followed by Continental and Northern European CMEs are associated with differences in the evolution of budget priorities for welfare benefits among them, with Northern European CMEs prioritizing universal benefits, such as education and health, and Continental European CMEs focusing on work-related benefits, like unemployment and survival insurance (Scruggs and Ramalho Tafoya, 2022; Sowula et al., 2023). While work-related benefits can directly compensate those who stand to lose from more stringent environmental regulations, the share of the population covered by these benefits has shrunk in CMEs under increasingly dualized labor markets (Emmenegger et al., 2012). Hence, relying on work-related social benefits risks alienating an ever-growing segment of the population (Schwander, 2019). In contrast, while universal benefits are not targeted towards compensating and reactivating workers, they provide a safety net that serves workers who might otherwise feel threatened by environmental regulations, plausibly nurturing wider support for costly environmental policies.

2.5. Hypotheses

The conceptual framework developed here supports the main hypothesis of this study: a robust Welfare State is associated with enhanced environmental performance. This connection is attributed to the Welfare State's capacity to cultivate broader support for environmental policies by influencing income inequality, compensating and reactivating individuals facing potential losses from more stringent environmental regulation, and fostering a public workforce inclined toward post-materialist values. Furthermore, given increasing labor market dualization, the effectiveness of the Welfare State in promoting environmental policies is anticipated to be more pronounced when universal benefits encompass a larger share of social expenditures. Finally, given that the previous literature has found mixed results on the environmental impacts of corporatism and has developed theoretical arguments supporting both positive and negative effects, the paper formulates no specific hypothesis on the impact of this variable on environmental performance.

3. Sample and data

3.1. Sample

The paper focuses on a sample of countries and years where environmental performance is expected to have played a relevant role in domestic politics. Specifically, it targets advanced capitalist economies due to their large environmental footprint. The time period considered is from 1961 to 2015, a critical era that includes the rise of the global environmental movement in the 60s and 70s and aligning with the growing consensus in the scientific community about anthropogenic factors being primary drivers of climate change. Since most of the OECD data used in this study is available from the 1980s onwards, the sample includes Western OECD countries that were members in 1980 and had populations exceeding one million. The countries in this sample are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

3.2. Data

This paper employs the Ecological Footprint of Consumption (EFC) as a metric for environmental performance. Conceived by Mathis Wackernagel and William Rees at the University of British Columbia, the EFC is currently developed by the Global Footprint Network. The index, available annually from 1961 to 2018, represents an attempt to condense environmental impacts from six different realms (agriculture, cattle raising, timber production, fishing, carbon intake, and built-up land) into one unit. It is defined, for any given population, as “the total area of productive ecosystems that the population requires, on a continuous basis, to produce the bio-resources it consumes (e.g., plant-based food and fiber products, livestock and fish products, timber and other forest products, space for urban infrastructure) and to assimilate its wastes, particularly carbon dioxide emissions, wherever on Earth the relevant ecosystems are located” (Rees and Wackernagel, 2023). For worldwide comparability, the index utilizes the amount of hectares of global average productivity required in the production process of various goods and services.²

The EFC has been developed for over thirty years, with subsequent versions addressing the observations that have emerged from an active ongoing debate around the strengths and shortcomings of the index (Rees and Wackernagel, 2023). In addition to its wide adoption in applied environmental research, the EFC has been selected for the analyses of this paper because of two specific advantages. Firstly, the EFC utilizes trade data to calculate the environmental footprint for production, imports, and exports. Thus, the environmental impact of consumption for each country can be derived from the identity $\text{consumption} = \text{production} + \text{imports} - \text{exports}$.³ This approach addresses a limitation of studies that focus solely on environmental impacts within a specific geographical boundary, which overlook the outsourcing of pollutant processes (Özler and Obach, 2009). Secondly, data on the components that make up the index across the different realms allow to check the robustness of the results to considering standard environmental realms that have a more straightforward interpretation, such as emissions of greenhouse gases.

For the economic variables, this paper utilizes absorption (consumption plus investment) at chained purchasing power parity 2017 dollars from the World Penn Tables (Feenstra et al., 2015).

The public social expenditure and its components as a fraction of GDP are sourced from OECD open stats, available from 1980 to 2022 (OECD, 2016). The nine components that make up total public social expenditure are defined as follows (OECD, 2019): (i) *Old Age*: Cash expenditures on pensions, comprising guaranteed income once a person has reached a pensionable age and fulfilled a level of contributions. This also includes other in-kind services to the elderly; (ii) *Survivors*: Benefits provided to the spouse or descendant of a deceased person, including the transfer of pension benefits or other means-tested benefits; (iii) *Incapacity-related benefits*: Cash benefits for those who cannot participate in the labor market due to congenital disabilities or illness; (iv) *Health*: Government expenditure in health, including social health insurance scheme; (v) *Family*: Benefits that support families, often related to the cost of raising children or supporting other dependents; (vi) *Active labor market programmes*: Social expenditures other than education aimed at improving beneficiaries' chances of finding gainful employment or increasing earnings; (vii) *Unemployment*: Cash expenditure aimed at compensating people dismissed through no fault of their own or older workers who retire early; (viii) *Housing*: Rent subsidies and other benefits that help cover housing costs; (ix) *Other Social Policy Areas*: Social expenditures for people that fall outside the scope of other relevant programmes that cover particular contingencies.

² For a detailed explanation of the methodology used to construct the index, refer to Borucke et al. (2013) and Lin et al. (2018).

³ In this framework, consumption includes domestic investments. Thus, the identity follows from the canonical macroeconomic identity $Y = C + I + XN$.

The nine components of public social expenditures are divided into two groups based on whether most of the benefits are contingent on formal employment (either current or past). The work-related benefits group comprises Old Age, Survivor, and Unemployment, whereas the universal benefits group comprises the remaining components. This classification is supported by the brief definitions provided above and the detailed descriptions and examples available in [OECD \(2019\)](#). Among the nine components, Old Age proves the most challenging to classify as either universal or work-related, as most countries combine contribution-based pensions with benefits that are not contingent on past working status or earnings. Nevertheless, the level of benefits is still closely tied to contributions: given the current design of pension systems in OECD countries, workers with average earnings and a full contribution history are expected to receive half of their earnings while working. On the other hand, people without a contribution record receive, on average, only 21% of the average wage, and only after passing a means test in most countries ([OECD, 2023](#)). For this reason, the paper classifies Old Age as a work-related benefit but tests the robustness of the results by omitting this category from the definition of work-related benefits in the Appendix.

Detlef Jahn's Corporatism Index serves as a time-variant measure of corporatism. The index, developed for 42 countries by [Jahn \(2016a\)](#), is publicly available from 1960 to 2018 ([Jahn, 2022](#)). The index is based on the evaluation of the structure, function, and scope of trade unions. In terms of structure, the author quantifies the level of centralization, the relationships between different layers of labor organizations, and the legal rights associated with each layer. Regarding function, the evaluation focuses on the interaction between trade unions and the State, quantifying the extent to which trade unions participate in national politics and the degree of national government intervention in industrial relations. Lastly, scope quantifies the societal impact of trade unions' negotiation outcomes. The index offers the advantage of capturing corporatism beyond wage bargaining institutions, including the involvement of unions and trade associations in shaping public policy, including environmental regulations.⁴

Data on characteristics of the political systems of countries is derived from The Comparative Political Data Set (CPDS). This dataset, an outcome of a project led by Klaus Armigeon and supported by the Swiss National Science Foundation ([Armigeon et al., 2017](#)), offers yearly data spanning from 1960 onward. The dataset encompasses a diverse range of variables characterizing the political systems of advanced capitalist economies. This study utilizes information on the classification of electoral systems (majoritarian, modified proportional, and proportional) and the degree of federalism (absent, weak, and strong).

Refer to [Appendix A](#) for a detailed description of the data between 1980 and 2015.

⁴ [Jahn \(2016a\)](#) initially constructed the index using data from the Institutional Characteristics of Trade Union, Wage Setting, State Intervention, and Social Pacts database, compiled by Jelle Visser ([Visser et al., 2009](#)). To represent structure, the author employs (i) an index of trade union fragmentation and the division of authority based on the methodology of [Iversen \(1999\)](#), (ii) the relationship between labor organizations at the firm level and national trade unions, and (iii) the rights of labor organizations at the firm level. For function, the author uses (i) an index classifying government intervention in wage bargaining, (ii) the dominant level of wage bargaining, and (iii) an index capturing the frequency of unions and employers participating in government decisions on social and economic policy. For scope, the author considers (i) the level at which wage bargaining is coordinated and (ii) the extent to which collective agreements are legally extended to non-participant organizations. The latest version of the index, utilized in this paper, includes an additional dimension on the sectoral organization of employment relations. The author constructs a single index from the first factor of a principal component analysis on these variables, standardized to have a mean of zero and a standard deviation of one.

4. Empirical analysis

4.1. Econometric model

The relationship between economic growth, institutions, and environmental impacts is modeled through the non-linear relation

$$EFC_{it} = \exp(\alpha_i + \gamma_t + \varepsilon_{it}) ABS_{it}^{\lambda + X_{it}\beta}, \quad (1)$$

where EFC_{it} and ABS_{it} are the country-level aggregated Environmental Footprint of Consumption and absorption (consumption plus investment) for country i in period t ; X_{it} is a vector of K variables describing country i 's institutions on period t ; α_i , γ_t , λ , and β , are vectors of coefficients of dimensions 1, 1, 1, and K ; and ε_{it} is a zero-mean disturbance. The equation is linearized applying the natural logarithm to obtain

$$\log(EFC_{it}) = \lambda \log(ABS_{it}) + \log(ABS_{it})X_{it}\beta + \alpha_i + \gamma_t + \varepsilon_{it}, \quad (2)$$

which is estimated with the Ordinarily Least Square estimator, with country and period fixed effects (α_i and γ_t). The data is aggregated in 5 years periods (1961–1965, 1955–1970, ..., 2011–2015) to average out short-term fluctuations and focus on the long-term evolution of environmental impacts across countries.

This econometric specification offers various advantage. First, the coefficients λ and β are part of a linear combination that equals the absorption elasticity of EFC (henceforth denoted by $\eta_{EFC,ABS}$), defined as the percentage change in EFC when absorption increases in 1%. This follows from differentiating Eq. (1) with respect to ABS_{it} and rearranging to obtain

$$\eta_{EFC,ABS} = \frac{\frac{\partial EFC_{it}}{EFC_{it}}}{\frac{\partial ABS_{it}}{ABS_{it}}} = \lambda + X_{it}\beta. \quad (3)$$

Hence, λ equals the value of $\eta_{EFC,ABS}$ when $X_{it} = 0$, and β_k the marginal effect of the k variable of X_{it} , x_k , on $\eta_{EFC,ABS}$. A negative β_k indicates that higher values of x_k are associated to a smaller absorption elasticity of EFC , i.e., a stronger decoupling between economic growth and environmental impacts.

Second, the coefficients γ_t also have a convenient interpretation, capturing the log-point difference between period t and the baseline period after taking into account the effect of absorption growth. Follows that $\exp(\gamma_t) - 1$ equals the percentage change in the EFC relative to the baseline period.

Third, the specification allows for the inclusion of country and period fixed effects, controlling for unobserved confounders that are constant across time within a country, such as geography or climate, or across countries within a given time period, such as technology or the international interest rate. Note, however, that such characteristics could still bias the results if they modify $\eta_{EFC,ABS}$, a possibility that is addressed by incorporating country dummies in X_{it} .

Finally, the specification is consistent with the intuitive notion that there are no environmental impacts from consumption if there is no absorption (the intercept of Eq. (1) is zero).

The focus on decoupling overlooks the possibility that countries might choose to reduce their growth to lessen their environmental impacts. This approach is justified on the grounds that a decrease in the environmental impacts of growth signifies an unambiguous policy gain. In contrast, considering that economic growth often remains a top priority for policymakers and the general public, a decline in environmental impacts due to slowed growth might more likely indicate a country's failure to meet its growth expectations rather than a concerted pursuit of environmental goals. Consequently, a stronger decoupling is seen as reflective of deliberate efforts to improve environmental outcomes, whereas reductions in environmental impacts resulting from lower growth rates may also capture the unintended consequence of failing to grow as intended.⁵

⁵ While economic de-growth has gain considerable traction in academic debates and some NGOs, it remains marginal in policy debates. A keyword

4.2. Divergent environmental trajectories of VOC archetypes

It follows from the Conceptual Framework developed in Section 2 that, on top of the canonical distinction between Liberal Markets Economies and Coordinated Market Economies proposed by Soskice and Hall (2001), it is convenient to split the latter group into Continental European Countries and Northern European Countries, as their Welfare States have undergone different processes of liberalization (Thelen, 2014). In addition, Southern European Countries are added as a fourth group given their lower level of economic development in the 1960s. Thus, four groups of countries are proposed as archetypes for this study: Northern European Countries (NOR: Denmark, Sweden, Norway and Finland), Continental European Countries (CON: Germany, Austria, Switzerland, Netherlands, France, and Belgium), Liberal Market Economies (LME: USA, Canada, Great Britain, Ireland, Australia, and New Zealand), and Southern European Countries (STH: Portugal, Spain, Italy, and Greece).

To summarize the relative performance of the four groups of countries across the study period (1961–2015), X_{it} is set equal to three dummies encoding these groups in Eq. (2), setting Continental European Countries as the omitted category. Panel a of Fig. 1 present the results. Whereas a 1% in absorption is associated to an increase of 0.42% in EFC for Continental European Countries, the same percentage increase in absorption is associated with a 0.07% increase in the EFC for Northern European Countries. The difference is significant at the 1% level. The same figures are 0.61% and 0.32% for Southern European Countries and Liberal Market Economies; which are not statistically different from the level of Continental European Countries. Thus, Northern European Countries have decoupled environmental impacts from economic growth to a considerably larger extent than other countries.

To investigate the timing of this divergence, X_{it} is removed from Eq. (2) and a separate set of period dummies is estimated for each VOC archetype (γ_{ijt} for $j \in \{CME, LME, NOR, STH\}$), setting 1961–1965 as the omitted period. Panel b of Fig. 1 display the trajectory of environmental impacts of VOC archetypes relative to the trajectory of Continental European Countries. The lines in the figure, accompanied by 95% confidence intervals in semi-transparent colors corresponding to each archetype, represent the average percentage change in the EFC from the baseline period to the specific period on the x-axis, relative to Continental European Countries, while controlling for absorption growth.

A clear pattern emerges from the analysis. After the 1970s, a period when environmental degradation became a prominent issue in public debate, Northern European countries consistently outperformed the rest of the sample. By the final period of the study (2011–2015), their environmental footprint, adjusted for absorption growth, had increased 30% less than that of Continental European Countries. Interestingly, there are no large differences between Liberal Market Economies and Continental European Countries, suggesting that the institutions that distinguish Northern European Economies from other CMEs are crucial to sustain their superior environmental performance. Southern European Countries underperformed until the early 2000s, peaking at 30% additional growth in absorption-adjusted environmental impact compared to Continental European Countries. However, they have since rapidly converged toward the rest of the sample. This pattern aligns with the lower income levels in Southern European Countries during the 1960s and their subsequent economic convergence. It is plausible that environmental concerns became prominent in domestic politics only after these countries reached a critical income level by the end of

the 20th century, in line with the Environmental Kuznets Curve (EKC) Hypothesis (Grossman and Krueger, 1995).⁶

4.3. The institutions that make a difference for the environment

Section 2 hypothesizes that the level of generosity of the welfare state, particularly in terms of universal benefits, underpins the differences in environmental performance among VOC archetypes documented in Fig. 1. To test this hypothesis, social expenditures are divided in two categories: work-related social expenditures, encompassing Old Age, Survivor, and Unemployment; and universal social expenditures, encompassing Incapacity-related benefits, Health, Family, Active labor market programmes, Unemployment, Housing, and Other Social Policy Areas. In addition to social expenditures, previous studies have highlighted that corporatism can play a pivotal role in explaining countries' relative environmental performance. Hence, the analysis also includes this variable.

The analysis proceeds in two steps. First, a clustering algorithm is employed to test whether the specified variables effectively characterize the VOC archetypes. Subsequently, the model outlined in Eq. (2) is utilized to examine which differences across the institutional dimensions, as captured by these variables, explain the divergent trajectories of environmental performance among VOC archetypes.

4.3.1. Characterizing VOC archetypes through differences in corporatism and social expenditures

A clustering algorithm is used to test if the four VOC archetypes considered in this study (CON, LME, NOR, STH) can be distinguished based on three variables representing key institutional differences: corporatism, universal social expenditures, and work-related social expenditures. These variables are averaged for each country in the sample where data are available (1981–2015) and standardized to have a mean of zero and a standard deviation of one across the 20 countries. The standardized variables are then input into a Gaussian Mixture Model (GMM) aimed at identifying four distinct clusters. The GMM, an unsupervised clustering algorithm, calculates the probability of each country belonging to each cluster (with the number of clusters being a predetermined hyperparameter).⁷ Importantly, the algorithm does not use any information about the countries' VOC archetypes; it solely relies on the institutional variables. A strong correlation between the VOC archetypes and the algorithm-defined clusters would suggest that the institutional differences represented by these variables are meaningful in differentiating the VOC archetypes.

Table 1 presents the results. The first two columns categorize the countries according to their VOC archetypes, with the average for each archetype displayed following the individual country values. The subsequent three columns report the average values of the three variables of interest: corporatism, universal social expenditures, and work-related social expenditures. The final four columns display the probabilities estimated by the GMM, shaded from white (0%) to blue (100%). The correspondence between the VOC archetypes and the GMM groups is strikingly strong. For Continental European Countries, the GMM places all countries, except Switzerland and the Netherlands, in Group 1. All Liberal Market Economies are grouped in Group 2. Northern European Countries, except for Finland which is split between Groups 1 and 3, are in Group 3 together with the Netherlands. Southern European Countries, along with Switzerland, are grouped together in Group 4.

⁶ The EKC hypothesis suggests an inverted U-shaped relationship between economic prosperity and environmental impacts, where environmental degradation initially increases with economic growth but eventually declines as societies prioritize environmental quality. However, critiques of the EKC note that the decreasing section of the curve, particularly concerning global pollutants like CO_2 , is not consistently observed within empirical income ranges (Stern, 2004, 2017).

⁷ The simplest model is chosen due to the dataset's size, resulting in 21 parameters: 12 for the means (one for each variable-group combination) and a common covariance matrix with 9 parameters.

search for degrowth in the Manifesto Project has zero matches, and a search in Google's N-grams reveals that the term only emerges in Google Book's corpus after 2005.

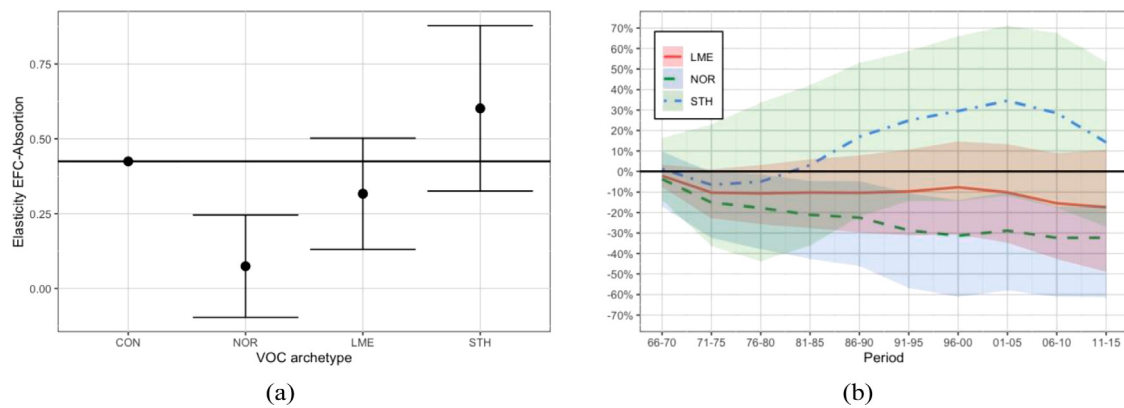


Fig. 1. Divergent environmental trajectories of VOC's archetypes—Panel a shows estimates of the absorption elasticity of the EFC for Continental European Countries (CON), Northern European Countries (NOR), Liberal Market Economies (LME), and Southern European Countries (STH). Panel b shows the different trajectories in the percentage growth of the EFC from its 1961–1965 level for LME, NOR, and STH relative to the trajectory of CON, after taking into account the effect of absorption growth.

Table 1

VOC archetypes—The table shows the average values of corporatism, universal social expenditures, and work-related social expenditures for each country in the sample, along with the probabilities predicted by a Gaussian Mixture Model for classification into four groups, based on these variables. VOC archetype anachronisms are: CON for Continental European Countries, LME for Liberal Market Economies, NOR for Northern European Countries, and STH for Southern European Countries. Countries anachronisms are USA for United States, CAN for Canada, GBR for United Kingdom, IRL for Ireland, AUS for Australia, AUT for Austria, NZL for New Zealand, AUT for Austria, BEL for Belgium, CHE for Switzerland, DEU for Germany, FRA for France, NLD for Netherlands, DNK for Denmark, FIN for Finland, NOR for Norway, SWE for Sweden, ESP for Spain, GRC for Greece, PRT for Portugal, and ITA for Italy.

VOC archetype	Country	Variable			Groups			
		Corporatism (Index)	Universal social expenditure (%GDP)	Work-related social expenditure (%GDP)	1	2	3	4
CON	AUT	0.96	12.45	13.73	100%	0%	0%	0%
	BEL	0.68	13.06	12.56	100%	0%	0%	0%
	CHE	0.27	7.95	6.58	0%	0%	0%	100%
	DEU	0.42	12.83	11.75	99%	0%	1%	0%
	FRA	0.08	14.67	13.75	100%	0%	0%	0%
	NLD	0.75	12.82	7.92	2%	0%	98%	0%
	AVERAGE	0.53	12.30	11.05	67%	0%	16%	17%
LME	AUS	-0.41	10.45	5.33	0%	100%	0%	0%
	CAN	-1.25	11.68	5.35	0%	100%	0%	0%
	GBR	-0.90	12.09	6.39	0%	100%	0%	0%
	IRL	-0.11	11.41	6.56	0%	99%	0%	0%
	NZL	-0.86	12.65	6.46	0%	100%	0%	0%
	USA	-1.27	8.97	6.62	0%	100%	0%	0%
	AVERAGE	-0.80	11.21	6.12	0%	100%	0%	0%
NOR	DNK	0.51	16.66	8.47	0%	0%	100%	0%
	FIN	0.96	13.86	11.03	62%	0%	38%	0%
	NOR	0.73	13.75	7.87	0%	0%	100%	0%
	SWE	0.57	17.15	10.24	0%	0%	100%	0%
	AVERAGE	0.69	15.35	9.40	16%	0%	84%	0%
STH	ESP	0.33	9.20	11.07	0%	0%	0%	100%
	GRC	0.15	7.27	11.10	0%	0%	0%	100%
	ITA	0.43	9.26	13.75	1%	0%	0%	99%
	PRT	0.07	8.96	8.64	0%	0%	0%	100%
	AVERAGE	0.24	8.67	11.14	0%	0%	0%	100%

The rows displaying the averages of the institutional variables give a clear indication of why the algorithm effectively clustered countries in line with their VOC archetypes. Liberal Market Economies are characterized by their low corporatism (−0.8) and work-related social expenditures (6.1). In contrast, Northern European Countries stand out with high values of corporatism (0.7) and universal social expenditures (15.4). Southern European Countries are characterized by their low levels of universal social expenditures (8.7) but high levels of work-related social expenditures (11.1). Continental European Countries are identifiable by their medium to high values in corporatism and universal social expenditure (0.5 and 12.3, respectively) and high work-related social expenditure (11.1). The countries that were misclassified are outliers within their groups: Switzerland shows the lowest values

for social expenditures among Continental European Countries, the Netherlands is distinguished by high values of corporatism and universal social expenditures but low work-related social expenditure, and Finland aligns with Continental European Countries in terms of work-related social expenditures. Overall, the accurate classification of 17 out of 20 countries using only three variables underscores the significance of these institutional variables in characterizing VOC archetypes.

4.3.2. VOC institutions and environmental performance

This section estimates Eq. (2) by including different sets of institutional variables in X_{it} to investigate which institutional differences are associated with better environmental performance. The analysis focuses on the institutional variables highlighted by the conceptual framework

and the empirical analysis in the previous section as distinguishing between VOC archetypes: corporatism and social expenditures, with a distinction between universal and work-related expenditures. Additional institutional variables identified by previous studies as relevant determinants of environmental performance are also included as controls, as they may correlate with the variables of interest. These controls include the electoral system, the degree of federalism, and baseline per capita GDP.

The sample is composed of 7 five-year periods where data are available, from 1981–1985 to 2011–2015. Table 2 presents the results. Column 1 includes the Corporatism index and total social expenditures as a fraction of GDP. No impacts are detected for these variables on the absorption elasticity of EFC, which is estimated at 0.358 in the first row. Column 2 splits total social expenditures into universal social expenditures and work-related social expenditures (four observations are lost due to missing information). The null result of social expenditure in column 1 masked an interesting heterogeneity. The results indicate that each additional percentage point of GDP spent on universal social expenditures is associated with a reduction of 0.21 percentage points in the absorption elasticity of EFC, significant at the 1% level. Conversely, each additional percentage point of GDP spent on work-related social expenditure is associated with a 0.13 percentage-point increase in the absorption elasticity of EFC, significant at the 5% level.

Column 3 adds the natural logarithm of per capita GDP in 1981 to X_{it} to account for the EKC hypothesis, along with dummies representing the electoral system and federalism of countries.⁸ Scruggs (1999) argues for the relevance of the electoral system and federalism as institutional determinants of environmental performance. Majoritarian electoral systems are expected to be slower in incorporating emerging issues into the policy agenda because it is harder for new parties to win seats in parliament. Federal governments may encounter difficulties in implementing environmental policies at the local level, though local autonomy can act as a safeguard for environmental policies when federal policies are less favorable to environmental goals. The inclusion of these variables barely affects the point estimate of universal social expenditures, which remains significant at the 1% level, while rendering the point estimate associated to work-related social expenditures not significant at conventional levels. Additionally, the results suggest that federal countries are associated with worse environmental performance (with unitary states as the omitted category), while no significant difference is detected between proportional and majoritarian electoral systems (the latter being the omitted category). The point estimate for baseline per capita GDP aligns with the ascending part of the EKC hypothesis, indicating that marginal environmental impacts decrease as a country's wealth increases, although it is not statistically significant.

Column 4 includes the same controls as column 3, but additionally excludes Southern European Countries from the sample due to their lower level of economic development at the baseline. The estimate for universal social expenditures remains largely unchanged and continues to be significant at the 1% level. Meanwhile, the estimate for work-related social expenditures flips sign and remains not statistically significant at conventional levels.

Columns 5 and 6 replicate the estimates from columns 1 and 2, but with the addition of an interaction between countries' fixed effects and $\log(ABS)$. Consequently, these estimators are derived exclusively from within-country variation, making them robust to unobserved time-invariant country characteristics that might affect their absorption elasticity of EFC. Column 5 reveals that this specification detects an impact for total social expenditures: a 1 GDP point increase in total social expenditure is associated with a reduction of 0.13 percentage points in the absorption elasticity of EFC. The coefficient for corporatism, while larger in absolute value compared to that in column 1,

remains statistically indistinguishable from zero at conventional levels. Column 6 indicates that when total social expenditures are divided into universal and work-related components, only the former yields a statistically significant point estimate at conventional levels ($p < 10\%$). Reassuringly, this point estimate closely aligns with those obtained in columns 2–4.

Overall, the consistency of the estimated impact of universal social expenditures on the absorption elasticity of EFC, as shown in Table 2, is remarkable. The pattern is also observed when using the CO₂ emissions component of the Environmental Footprint of Production as the dependent variable in the analysis, showing the result is robust to how environmental impacts are measured (Table B.3); or when removing Old Age from work-related benefits (Table B.4), showing the result is robust to the classification of Old Age social expenditures. This consistency provides strong support for the hypothesis that universal social expenditures are a significant determinant of a country's ability to decouple economic growth from environmental impacts. In contrast, the results do not lend support to the hypothesis that corporatism plays a significant role in determining a country's environmental performance.

These results align with the results presented in Fig. 1. Universal social expenditures distinguish Northern European countries from Continental European countries, plausibly playing an important role in supporting their superior environmental performance. In contrast, the higher level of corporatism in Continental European Countries does not result in better environmental performance when compared to Liberal Market Economies, which are characterized by low levels of corporatism.

5. Conclusion

This paper investigates the analytical and empirical leverage of the Varieties of Capitalism framework in explaining environmental performance across countries. It posits that three key characteristics, identified as central in differentiating various forms of capitalism, impact environmental performance: the level of corporatism, the generosity of the Welfare State, and the nature of that generosity—whether it is universal or concentrated in work-related benefits susceptible to dualization. The empirical results suggest that social expenditures, particularly those that are universal, play a crucial role in environmental performance. In contrast, corporatism does not consistently account for the differences in how countries have decoupled economic growth from environmental impacts. Consistently, Northern European countries, characterized by high levels of universal social expenditures, have decoupled environmental impacts from economic growth to a considerably greater extent than their OECD peers.

These results should not be interpreted as suggesting that emulating Northern European institutions is required or desirable to foster sustainability in other countries. Institutions are complementary to each other and to countries' comparative advantages, and institutional changes should be carefully assessed considering these complementarities. Nevertheless, the results do suggest that, in an era of increasing labor market dualization, strengthening universal social benefits within countries' welfare systems may nurture wider support for costly environmental policies.

A promising direction for future research involves exploring the mechanisms through which social expenditures, particularly universal ones, contribute to enhancing a country's environmental performance. Examining the relative importance of potential pathways, such as the higher level of environmental values in the public workforce or the provision of support for workers transitioning to a green economy, could yield valuable insights. Such research would inform the design of social policies that effectively facilitate the transitions necessary for building a sustainable future.

⁸ For each 5-year period, the mode of the categorical variables representing the electoral systems and federalism is calculated.

Table 2

Institutions and environmental performance—Estimates from econometric model of Eq. (2). Unit of observation is a country in a 5-year period between 1981 and 2015. Abbreviations of variables are: $\log(FC)$: Natural logarithm of Environmental Footprint of Consumption Index; $\log(ABS)$: Natural logarithm of absorption; Corp: Jahn (2016a)'s Corporatism index; Soc. Exp: Total public social expenditures; Univ. Soc. Exp: Universal public social expenditures (Incapacity-related benefits, Health, Family, Active labor market programmes, Housing, and Other Social Policy Areas); Work Soc. Exp.: Work-related public social expenditures (Old Age, Survivors, and Unemployment); Weak Fed.: Weak federalism; Strong Fed.: Strong federalism; Modif. Prop: Modified Proportional electoral system; Prop.: Proportional electoral system; $\log(PGDP)_{1980}$: Natural logarithm of per capita GDP at Purchasing Power Parity 2017 dollars in 1980. Standard errors clustered at the country level shown in parenthesis below point estimates. Statistical significance reported next to point estimates: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Dep. Var.	$\log(FC)$					
	(1)	(2)	(3)	(4)	(5)	(6)
$\log(ABS)$						
×1	0.3581** (0.1398)	0.5506*** (0.1481)	2.067 (1.854)	−0.1352 (1.445)		
×Corp.	−0.0023 (0.0037)	−0.0061** (0.0028)	−0.0033 (0.0038)	−0.0030 (0.0044)	−0.0041 (0.0043)	−0.0055 (0.0041)
×Soc. Exp	−0.0001 (0.0003)				−0.0013*** (0.0004)	
×Univ. Soc. Exp.		−0.0021*** (0.0004)	−0.0020*** (0.0005)	−0.0017*** (0.0005)		−0.0018* (0.0009)
×Work Soc. Exp.		0.0013** (0.0005)	0.0009 (0.0007)	−0.0002 (0.0006)		−0.0011 (0.0008)
×Weak Fed.			0.2724** (0.1220)	0.3818* (0.1924)		
×Strong Fed.			0.0044** (0.0020)	0.0064*** (0.0015)		
×Modif. Prop			0.0034 (0.0051)	−0.0631 (0.1853)		
×Prop.			0.0021 (0.0052)	0.0031 (0.0032)		
× $\log(PGDP)_{1980}$			−0.1679 (0.1869)	0.0374 (0.1547)		
<i>Fixed-effects</i>						
Country	Yes	Yes	Yes	Yes	Yes	Yes
Period	Yes	Yes	Yes	Yes	Yes	Yes
<i>Varying Slopes</i>						
$\log(ABS) \times \text{Country}$					Yes	Yes
Countries	20	20	20	16	20	20
Observations	140	136	136	110	140	136

CRediT authorship contribution statement

Felipe Jordán: Writing – review & editing, Writing – original draft, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

I, Felipe Jordán, declare that I have no financial or personal relationships with other people or organizations that could inappropriately influence or bias my work in the submitted article titled “Varieties of Capitalism and Environmental Performance”. There are no professional or financial affiliations that may be perceived as a conflict of interest in connection with the work.

Data availability

Data will be made available on request.

Declaration of Generative AI and AI-assisted technologies in the writing process

Statement: During the preparation of this work the author(s) used ChatGPT4 in order to improve readability and language. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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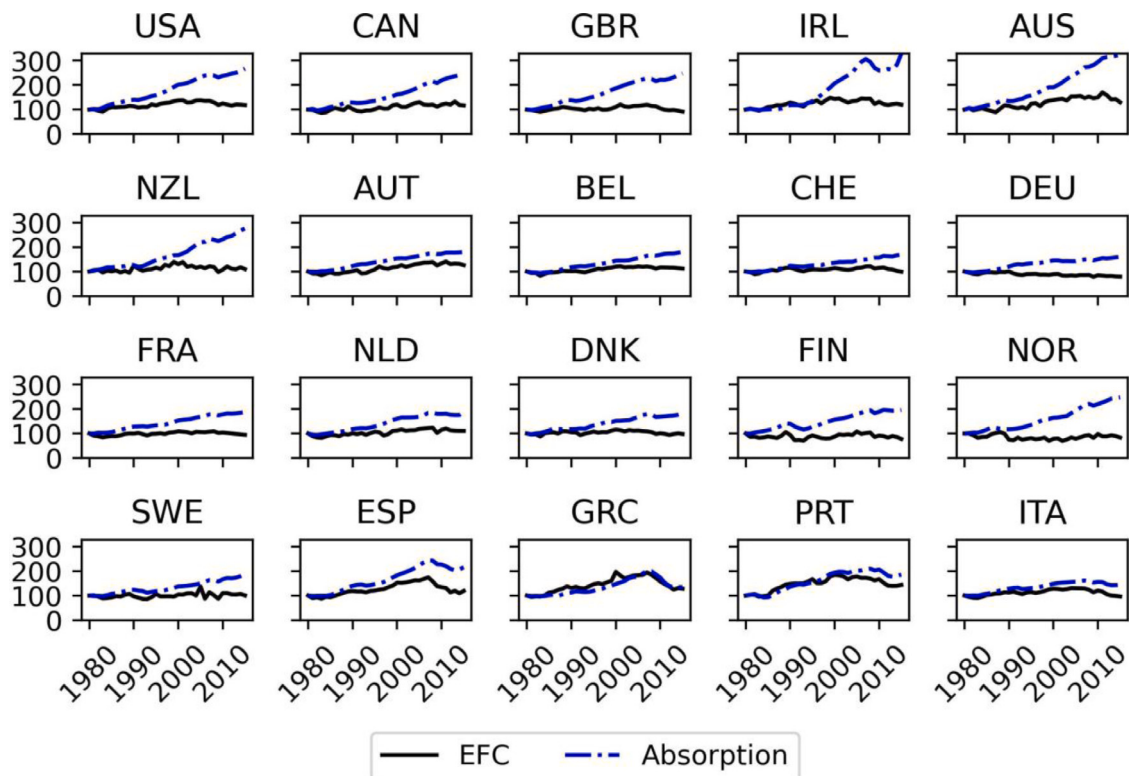


Fig. A.2. Environmental Footprint of Consumption and Absorption—Codes are: USA (United States), CAN (Canada), GBR (United Kingdom), IRL (Ireland), AUS (Australia), AUT (Austria), NZL (New Zealand), AUT (Austria), BEL (Belgium), CHE (Switzerland), DEU (Germany), FRA (France), NLD (Netherlands), DNK (Denmark), FIN (Finland), NOR (Norway), SWE (Sweden), ESP (Spain), GRC (Greece), PRT (Portugal), and ITA (Italy). Countries are ordered by type. The first row and the first column of the second row are Liberal Market Economies (USA, CAN, GBR, IRL, AUS, NZL), the last 4 columns of the second row and the first two columns of the third row are Continental European countries (AUT, BEL, CHE, DEU, FRA, NLD), the last three columns of the third row and the first column of the fourth row are Northern European countries (DNK, FIN, NOR, SWE), and the last four columns of the fourth row are Southern European countries (ESP, GRC, PRT, ITA).

Appendix A. Description of the data

Fig. A.2 presents the evolution of the Environmental Footprint of Consumption and absorption, each normalized to their values in the baseline year. It is observed that environmental impacts tend to follow economic growth more closely in Southern European countries, which were relatively poorer at the baseline, consistent with the Environmental Kuznets Curve.

Fig. A.3 displays the evolution of Detlef Jahn's corporatism index over the studied period. As anticipated, the index remains relatively stable over time, reflecting the enduring nature of corporatism as a concept deeply embedded in the organization of labor and firms within societies. However, notable exceptions exist where certain countries experienced significant changes during this period. This is particularly evident in the cases of Ireland, Australia, New Zealand, Portugal, and Italy. Additionally, countries such as Austria, Switzerland, the Netherlands, Sweden, and Spain show a mild but consistent shift in their corporatism index throughout the study period.

Fig. A.4 depicts the evolution of social expenditure as a fraction of GDP. This expenditure is categorized into work-related benefits (Old Age, Survivors, and Unemployment), which are susceptible to dualization, and universal benefits (Incapacity-related benefits, Health, Family, Active labor market programmes, Housing, and Other Social Policy Areas). A missing bar for universal expenditures means that

there is no information for that variable. The figure demonstrates that there is considerable variation in both the level and composition of social expenditure, not only between different countries but also within them over time. It is noteworthy that while the total expenditure is comparable between Northern and Continental Europe, Northern European countries allocate a larger portion to universal benefits. In contrast, Liberal Market Economies, despite devoting a higher share to universal benefits, have a significantly lower overall level of social expenditure. Lastly, Southern European countries have seen a steady increase in their total social expenditure throughout the period.

Fig. A.5 illustrates the evolution of federalism and electoral systems. Federalism is coded as 'No' for unitary countries, 'Weak' for those with a weak form of federalism, and 'Strong' for those with a strong federal structure. Similarly, the electoral system is categorized relative to the majoritarian benchmark: 'No' indicates a majoritarian system, 'Weak' represents a modified proportional system, and 'Strong' denotes a purely proportional system. It is important to note that during the study period, only three countries underwent changes in these areas: New Zealand, Belgium, and Italy.

Appendix B. Supplementary tables

See [Tables B.3](#) and [B.4](#).

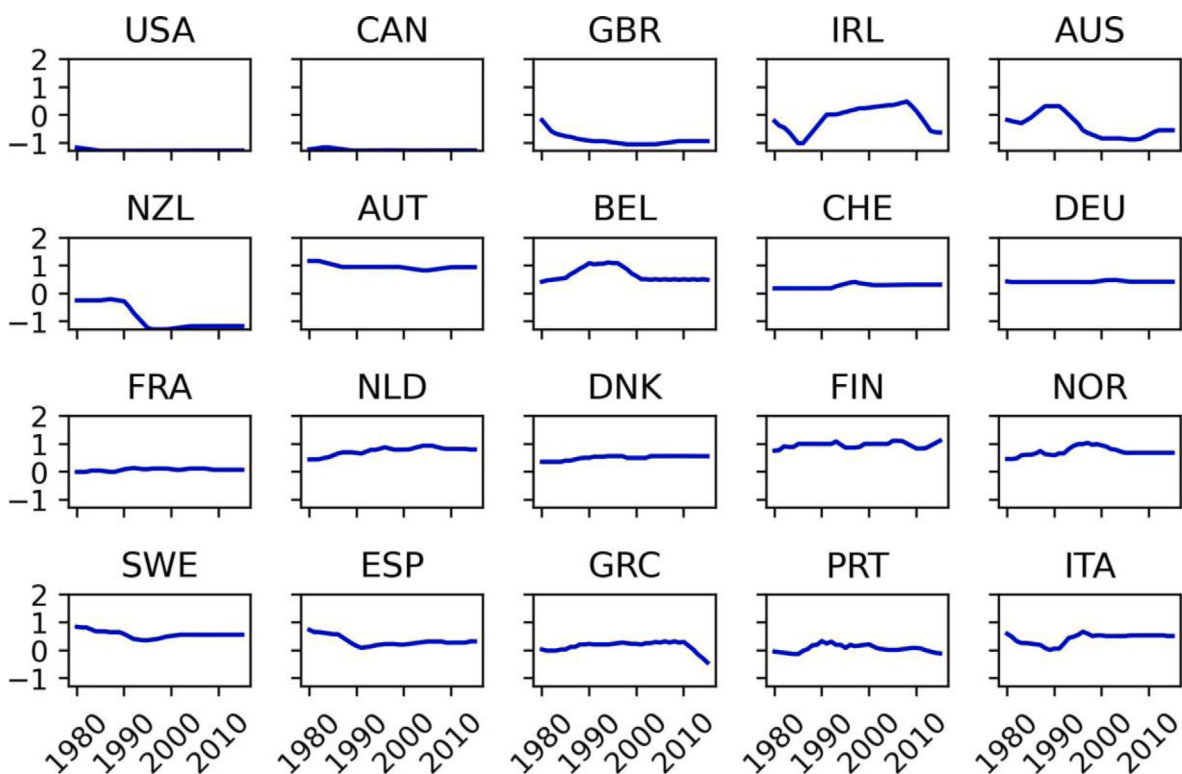


Fig. A.3. Detlef Jahn's Corporatism Index—Codes are: USA (United States), CAN (Canada), GBR (United Kingdom), IRL (Ireland), AUS (Australia), AUT (Austria), NZL (New Zealand), AUT (Austria), BEL (Belgium), CHE (Switzerland), DEU (Germany), FRA (France), NLD (Netherlands), DNK (Denmark), FIN (Finland), NOR (Norway), SWE (Sweden), ESP (Spain), GRC (Greece), PRT (Portugal), and ITA (Italy). Countries are ordered by type. The first row and the first column of the second row are Liberal Market Economies (USA, CAN, GBR, IRL, AUS, NZL), the last 4 columns of the second row and the first two columns of the third row are Continental European countries (AUT, BEL, CHE, DEU, FRA, NLD), the last three columns of the third row and the first column of the fourth row are Northern European countries (DNK, FIN, NOR, SWE), and the last four columns of the fourth row are Southern European countries (ESP, GRC, PRT, ITA).

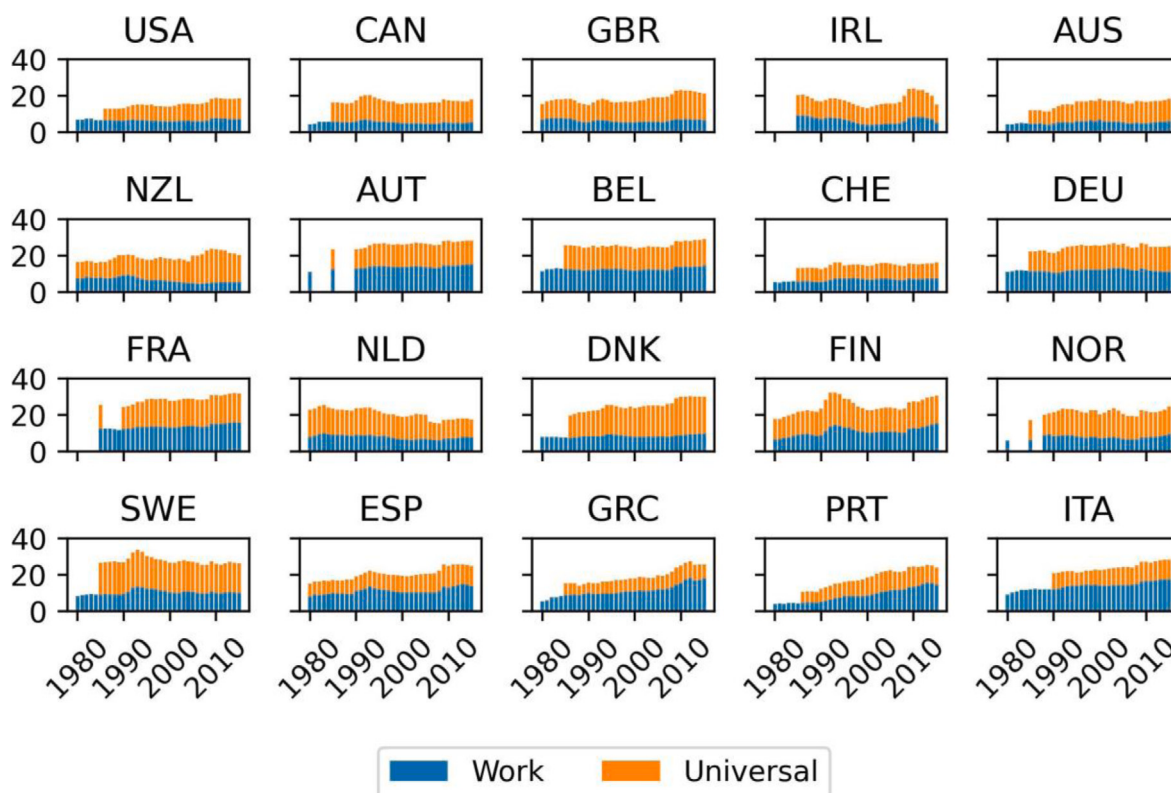


Fig. A.4. Net Public Social Expenditure by Type—Codes are: USA (United States), CAN (Canada), GBR (United Kingdom), IRL (Ireland), AUS (Australia), AUT (Austria), NZL (New Zealand), AUT (Austria), BEL (Belgium), CHE (Switzerland), DEU (Germany), FRA (France), NLD (Netherlands), DNK (Denmark), FIN (Finland), NOR (Norway), SWE (Sweden), ESP (Spain), GRC (Greece), PRT (Portugal), and ITA (Italy). Countries are ordered by type. The first row and the first column of the second row are Liberal Market Economies (USA, CAN, GBR, IRL, AUS, NZL), the last 4 columns of the second row and the first two columns of the third row are Continental European countries (AUT, BEL, CHE, DEU, FRA, NLD), the last three columns of the third row and the first column of the fourth row are Northern European countries (DNK, FIN, NOR, SWE), and the last four columns of the fourth row are Southern European countries (ESP, GRC, PRT, ITA). Work (blue bar) refers to the net social expenditures that are work-related (Old Age, Survivors, and Unemployment), while Universal (orange bar) are net social expenditure that are not narrowly targeted toward workers (Incapacity-related benefits, Health, Family, Active labor market programmes, Housing, and Other Social Policy Areas).

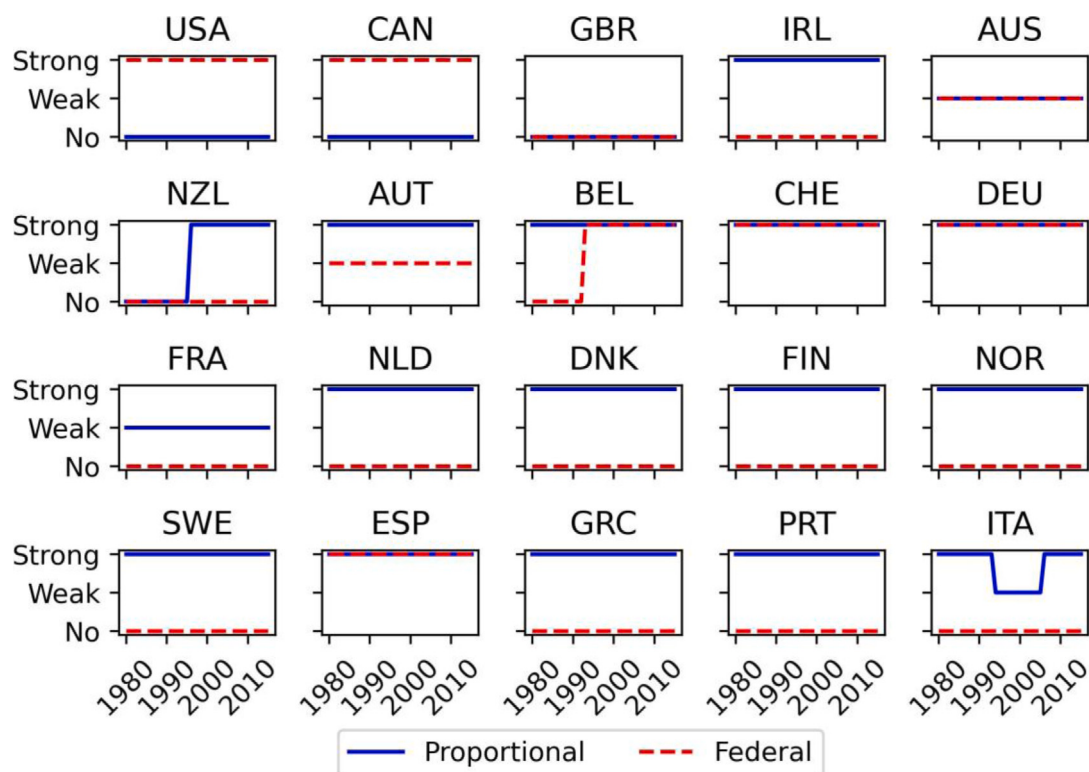


Fig. A.5. Federal Governments and Proportional Electoral Systems—Codes are: USA (United States), CAN (Canada), GBR (United Kingdom), IRL (Ireland), AUS (Australia), AUT (Austria), NZL (New Zealand), BEL (Belgium), CHE (Switzerland), DEU (Germany), FRA (France), NLD (Netherlands), DNK (Denmark), FIN (Finland), NOR (Norway), SWE (Sweden), ESP (Spain), GRC (Greece), PRT (Portugal), and ITA (Italy). Countries are ordered by type. The first row and the first column of the second row are Liberal Market Economies (USA, CAN, GBR, IRL, AUS, NZL), the last 4 columns of the second row and the first two columns of the third row are Continental European countries (AUT, BEL, CHE, DEU, FRA, NLD), the last three columns of the third row and the first column of the fourth row are Northern European countries (DNK, FIN, NOR, SWE), and the last four columns of the fourth row are Southern European countries (ESP, GRC, PRT, ITA). Proportional (blue line) is coded as No when a country has a majoritarian electoral system, Weak when it has a modified proportional electoral system and Strong when it has a proportional electoral system. Federal (red dashed line) is coded as No when a country has a unitary government, Weak when it has a weak form of federalism and Strong when it has a strong form of federalism.

Table B.3

Institutions and environmental performance—Estimates from econometric model of Eq. (2), using the CO₂ component of the Environmental Footprint of Production as the dependent variable. Abbreviations of remaining variables are: $\log(ABS)$: Natural logarithm of absorption; Corp: Jahn (2016a)'s Corporatism index; Soc. Exp: Total public social expenditures; Univ. Soc. Exp: Universal public social expenditures (Incapacity-related benefits, Health, Family, Active labor market programmes, Housing, and Other Social Policy Areas); Work Soc. Exp.: Work-related public social expenditures (Old Age, Survivors, and Unemployment); Weak Fed.: Weak federalism; Strong Fed.: Strong federalism; Modif. Prop: Modified Proportional electoral system; Prop.: Proportional electoral system; $\log(PGDP)_{1980}$: Natural logarithm of per capita GDP at Purchasing Power Parity 2017 dollars in 1980. Unit of observation is a country in a 5-year period between 1981 and 2015. Standard errors clustered at the country level shown in parenthesis below point estimates. Statistical significance reported next to point estimates: *p < 0.1, **p < 0.05, ***p < 0.01.

Dep. Var.	$\log(CO_2)$					
	(1)	(2)	(3)	(4)	(5)	(6)
$\log(ABS)$						
×1	0.6960** (0.2645)	0.9950*** (0.2936)	−1.395 (2.870)	−5.178** (1.871)		
×Corp.	−0.0072 (0.0049)	−0.0115** (0.0050)	−0.0014 (0.0042)	−0.0016 (0.0058)	−0.0039 (0.0066)	−0.0037 (0.0055)
×Soc. Exp	0.0000 (0.0006)				−0.0009** (0.0003)	
×Univ. Soc. Exp.		−0.0026** (0.0010)	−0.0031*** (0.0009)	−0.0030** (0.0011)		−0.0024 (0.0018)
×Work Soc. Exp.		0.0025** (0.0010)	0.0039*** (0.0011)	0.0032* (0.0018)		0.0006 (0.0019)
×Weak Fed.			0.1516 (0.2205)	0.4217 (0.2674)		
×Strong Fed.			0.0040 (0.0025)	0.0059** (0.0025)		
×Modif. Prop			0.0344*** (0.0080)	−0.2847 (0.2648)		
×Prop.			0.0350*** (0.0078)	0.0385*** (0.0066)		
× $\log(PGDP)_{1980}$			0.2483 (0.2948)	0.6214*** (0.2037)		
<i>Fixed-effects</i>						
Country	Yes	Yes	Yes	Yes	Yes	Yes
Period	Yes	Yes	Yes	Yes	Yes	Yes
<i>Varying Slopes</i>						
$\log(ABS) \times \text{Country}$					Yes	Yes
Countries	20	20	20	16	20	20
Observations	140	136	136	110	140	136

Table B.4

Institutions and environmental performance—Estimates from econometric model of Eq. (2) removing Old Age from work-related benefits. Abbreviations of remaining variables are: $\log(ABS)$: Natural logarithm of absorption; Corp: Jahn (2016a)'s Corporatism index; Soc. Exp: Total public social expenditures; Univ. Soc. Exp: Universal public social expenditures (Incapacity-related benefits, Health, Family, Active labor market programmes, Housing, and Other Social Policy Areas); Work Soc. Exp.: Work-related public social expenditures (Survivors and Unemployment); Weak Fed.: Weak federalism; Strong Fed.: Strong federalism; Modif. Prop: Modified Proportional electoral system; Prop.: Proportional electoral system; $\log(PGDP)_{1980}$: Natural logarithm of per capita GDP at Purchasing Power Parity 2017 dollars in 1980. Unit of observation is a country in a 5-year period between 1981 and 2015. Standard errors clustered at the country level shown in parenthesis below point estimates. Statistical significance reported next to point estimates: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Dep. Var.	$\log(FC)$					
	(1)	(2)	(3)	(4)	(5)	(6)
$\log(ABS)$						
×1	0.3581** (0.1398)	0.4280*** (0.1331)	2.968 (1.894)	−0.2390 (1.406)		
×Corp.	−0.0023 (0.0037)	−0.0061* (0.0032)	−0.0045 (0.0036)	−0.0026 (0.0045)	−0.0041 (0.0043)	−0.0058 (0.0042)
×Soc. Exp	−0.0001 (0.0003)				−0.0013*** (0.0004)	
×Univ. Soc. Exp.		−0.0017*** (0.0004)	−0.0016*** (0.0005)	−0.0014*** (0.0005)		−0.0015* (0.0007)
×Work Soc. Exp.		0.0003 (0.0014)	−0.0006 (0.0011)	−0.0023** (0.0009)		−0.0029** (0.0010)
×Weak Fed.			0.2950** (0.1126)	0.4365** (0.1825)		
×Strong Fed.			0.0039* (0.0021)	0.0059*** (0.0016)		
×Modif. Prop			−0.0002 (0.0046)	−0.1043 (0.1769)		
×Prop.			−0.0022 (0.0043)	0.0042 (0.0034)		
× $\log(PGDP)_{1980}$			−0.2723 (0.1861)	0.0384 (0.1503)		
<i>Fixed-effects</i>						
Country	Yes	Yes	Yes	Yes	Yes	Yes
Period	Yes	Yes	Yes	Yes	Yes	Yes
<i>Varying Slopes</i>						
$\log(ABS) \times \text{Country}$					Yes	Yes
Countries	20	20	20	16	20	20
Observations	140	136	136	110	140	136

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