After the Shock
Reform, Resilience, and Economic Transformation in MENA
ERF 32nd Annual Conference
June 14-16 | Cairo, Egypt

2026

The Impact of the EU's Emissions Trading System on 3rd Countries in the Middle East and North Africa (MENA)

Camilla Jensen

ECONOMIC RESEARCH FORUM
منتدى البحوث الاقتصادية

The Impact of the EU's Emissions Trading System on 3rd Countries in the Middle East and North Africa (MENA).

Camilla Jensen

Dept. for Social Sciences & Business, Roskilde University (RUC),

Universitetsvej 1, DK4000, Roskilde, DENMARK

camje@ruc.dk

Abstract

Could the European Union's Emission Trading System (EU's ETS) have both negative (carbon leakage) and positive (technology spillover) impacts on a 3rd country such as Türkiye or Egypt? The primary objective with this paper is first to calibrate a structural equation model (SEM) with the World Bank's Enterprise Survey data for Türkiye to answer this question and then apply it to all relevant samples, where the same data is available for the Middle East and North Africa (MENA) region. The theoretical foundation of the model is DiMaggio and Powell's seminal work on institutional isomorphism and translations. The results suggest a SEM at three levels: institutions (formal, informal and self-management), actions (technology adoption) and outcomes (energy intensity). The calibrated SEM is then applied to test for the 3rd country impact of the ETS on Türkiye and other MENA economies: Egypt, Lebanon, Morrocco and Tunisia. The main results are that the ETS is best modelled as a pure external economy (positive or negative spillover), such as through specialisation effects driven by carbon leakage and technologies embedded in imported machinery from the Union into the 3rd country, and, that on balance, it is found that the ETS has a positive spillover effect on Turkish and Moroccan firms, whereas the same effect is negative for Egypt and Tunisia (for Lebanon the results are inconclusive). These contrasting results are consistent with Egypt and Tunisia being net-exporters of fossil fuels and Morocco and Türkiye being net-importers.

JEL Codes: O31, C38, Q48, Q55

Keywords: Green Behaviour, Innovation, Emissions Trading Systems (ETS), 3rd Countries, Structural Equation Modelling, Trade Policy Spillovers

1. Introduction

The European Union's Emissions Trading System (EU's ETS or simply ETS) has been accelerating forward with the climate crisis. The ETS is now viewed as one of the central instruments towards achieving behavioural change in European firms operating inside and outside the Union (EC, 2024a). The ETS system is known as a quota or cap-and-trade system, where the primary incentive on the regulated firms is to either pay the higher cost of emitting carbon in the Union or incur the abatement cost to reduce the firms' emissions typically through technological changes (innovation) (Calel, 2020). However, due to the threat of carbon leakage, where firms can escape the regulation by relaying their production to outside the regulated area, has developed a system of free allocations that alleviates this immediate threat on the system (Martin et al, 2014). Therefore, the current phasing out of free allocations (see EC, 2021), and with it the introduction of the Carbon Border Adjustment Mechanism (CBAM), represents an important momentum in trade policy changes underway (EC, 2024b). Countries likely to be affected by these changes are European rim countries (3rd countries bordering on the EU). Such countries do not participate in the ETS system as 1st (member) or 2nd (linked) countries (Narassimhan et al, 2018). Yet they are likely to have already been affected by trade policy spillovers caused by the ETS. The most studied 3rd country impact has been that of carbon leakage. Carbon leakage is defined as the problem of when the emissions intensive activities are moved to another jurisdiction without the same regulations and once climate policy is implemented at home (Michalek and Schwarze, 2015, Peters and Hertwich, 2008).

Following Michalek and Schwarze (2015), carbon leakage has a strong and weak interpretation in the empirical and policy evaluating literature. In the strong version, leakage must be caused by the enactment of new climate policies 1:1. The weak hypothesis has a more general aim in the definition of what leakage entails. It does not require a direct cause-effect link between policy reform and initiated changes in the productive system. Leakage according to the weak version could include both direct, indirect and secondarily induced effects, such as an increase in emissions caused by the displacement or relocation of production for other reasons than climate policy alone.

In the pessimistic scenario of carbon leakage (defined as a negative trade policy spillover in this paper which lends on the weak definition mentioned above), there could be a negative impact on the emissions, innovatory capacity, and energy intensity of 3rd country firms. However, there could also be a positive spillover from the ETS policy, due to the introduction of new technologies with firms in the ETS regulated jurisdiction. The new energy conserving technologies can diffuse out to firms in the unregulated jurisdiction through technology transfer, knowledge spillovers, or through energy conserving solutions embedded in imported machinery and other solutions (Gerlagh and Kuik, 2014).

Past research has sought to document the carbon leakage impact. But this research seldomly takes a specific focus on impacts in 3rd countries, and how the regulations affect the 3rd countries' local adaptation strategies to climate policies enacted in the 1st countries. Concurrently, there is a general lack of research on how the EU's ETS impacts on the innovative behaviour of firms, inside and outside the European Union, and, again, especially for 3rd country contexts on the European Rim (Rogge, 2016, Martin, Muûls and Wagner, 2016, Teixidó, Verde & Nicolli, 2019, Joltreau and Sommerfeld, 2019). See also the literature review in Section 3 for a more in-depth discussion of past findings on leakage rates.

The present research is the first that seeks to estimate the combined effects of negative (leakage) and positive (technology) spillover impacts of the EU's ETS on 3rd countries. It is proposed that past challenges of documenting carbon leakage (where emissions intensive production is moved to 3rd countries), has been obscured by a lack of attention to the counteracting or main anticipated impact of the ETS system: technological change or innovation towards the implementation of energy conserving technologies and solutions with firms (see also Eskeland and Harrison, 2003). Another contribution of the paper, to a relatively large literature seeking to empirically evaluate the impact of the EU's ETS for changes in carbon emissions and energy efficiencies inside and outside the Union, lies in the methodological approach. Methodologically the paper gives fresh inputs to a well-established research field as it is positioned in between the two most common methods for evaluating the ETS: difference-in-difference designs and computerised general equilibrium modelling (CGEM).

First is calibrated a general Structural Equation Model (SEM) using World Bank Enterprise Survey (ES) data for Türkiye (3rd country) and Italy (1st country). The Italian dataset serves as the counterfactual scenario to Türkiye, where Italy, as a 1st country, is a member of both the EU and ETS. The specific ES datasets are chosen for calibration and validation because of sample sizes and their high internal validity (see also Jensen, 2025). Yet it is important to understand that the result for Italy here only serves to validate the model in its structural set-up. Once validated the SEM can be applied to other 3rd countries, where the same World Bank ES datasets are available. In this paper focus is on the MENA region, a region that is both a major producer and user of fossil fuels, as well as an adjacent and apt EU trading partner, and hence susceptible to both carbon leakage and technology spillovers.

The paper leads to the calibration of a SEM at three levels: institutions (formal, informal and self-management), actions (technology adoption) and outcomes (energy intensity). A main finding is that the variables seeking to capture the influence of the ETS on Turkish firms are best inserted at the lowest level of the SEM (outcome level). This implies that the ETS is modelled in this paper as a pure external economy or spillover effect in the 3rd country context.

The main finding of the paper is that the net impact of the EU's ETS varies across the 5 economies studied in this paper. For Türkiye and Morocco, which are both net-importers of fossil fuels according to Our World in Data (2025), the overall impact on energy intensity is positive (the energy intensity is lower in the ETS regulated industries). This is true both in industries of high and low risk of leakage, where there is found to be a stronger positive impact on high-risk industries (0.12 standard deviations lower) in Turkey relative to low-risk industries (0.08 standard deviations lower). For Morocco the impact is only significant in low-risk industries (0.26 standard deviations lower energy intensity). In the sampled firms from Egypt and Tunisia, the leakage effect oppositely dominates. These countries are also both net-exporters of fossil fuels (implying that they may have a stronger comparative advantage in industries that depend on fossil fuels as well) (see also Our World in Data, 2025). In these two cases, leakages may be the cause of on average higher energy intensities in industries at high risk (energy intensity is higher with 0.1 (0.05) standard deviations in high (low) risk industries in Egypt vs. 0.28 standard deviations in only low-risk industries in Tunisia). For Lebanon there was not found any significant effect for the sampled firms operating in ETS regulated industries. The limitation of the modelling framework is weak causation in a statistical inference perspective, and that only a minor part of the variation in energy intensities of firms is explained by the model.

September 19, 2025

2. Theory

The theoretical framework behind the calibrated SEM takes outset in prior research with the World Bank's ES data (see Jensen, 2025, Jensen, 2021). The idea that latent constructs based on a multitude of survey items can strengthen research reliability and validity, has a long tradition in social science research methods, but has been used less in economics. Here the rich ES data is used to obtain latent constructs to measure variables in the overlapping fields of economics (Pearce and Turner, 1990), institutions (North, 1990) and organisational research (DiMaggio and Powell, 1983). Constructs that, in principle, are non-observable or only poorly observable using individual survey items.

The specific set-up relies on the seminal work by DiMaggio and Powell on institutions and mimetic behaviour in organisations. Here, it is combined with more recent theory on institutions in economic theory (North, 1990, Robinson and Acemoglu, 2012), institutional substitutions (Wisman and Rozansky, 1991) and institutional translations (Røvik, 2016) to render a complete and paradigmatically coherent modelling framework.

For example, DiMaggio and Powell's (1983, 2000, r.o. 2012, 2023) work has been used to understand the specific substitution or translation that happens between organisations (running through informal institutions and resulting in mimetic isomorphism i.e. the reason why organisations become more similar over time just by observing and imitating one another). It was the observed mimetic behaviour across firms within well-defined organisational fields (DiMaggio and Powell, 1983, Page 148) that led to the formulation of the hypothesis of isomorphism. The original aim was to use institutional theory to explain the phenomena of mimetic behaviour and demonstrate that it need not be rooted in any other external source, rational behaviour, pattern, organisation or regulation. The sheer belief of one organisation in the superiority of the observed behaviour of another organisation in terms of rendering better (economic) outcomes could generate such a pattern.

Extending the argument, DiMaggio and Powell also argue that professional bodies and other organisations, external to the industrial value chains, can further such patterns of mimetics. Government, private standardisation bodies, and consultancies, are examples of such organisations, external to the firm and the industrial value chains, that can facilitate institutional translations. The translation happens through a formal or informal procedure, formulae, abstract idea or patented process that becomes part of the embedded beliefs and norms adopted and adapted into existing organisational culture. In this way, the framework offered by DiMaggio and Powell also suggests other avenues for institutional translations to be possible, besides those of mimetics or pure belief spillovers across organisations.

The final conceptualisation of institutions in this paper rests on the traditional classification (or delineation) of institutions in sociology, politics, and economics (first introduced by North in 1990): formal and informal institutions. Formal institutions are associated with rules, procedures, and regulations that are written down and presented as the legal framework of society. In contrast, informal institutions are cultural codes: the unwritten rules of the game or what is referred to also as norms of conduct and beliefs. According to the definition by Voss (2001), an informal institution includes conventions and self-enforcing rules that regulate social dilemmas (problems that go beyond individual concern).

Finally, self-management techniques are conceptualised and measured apart in this paper, because they became a focal point of the theory behind the model, as the calibration exercise developed. Self-management concerns the metrics and norms about how we observe ourselves (see also Castaneda, Kolenko and Aldag, R. J. (1999)). Self-management is applied in everyday life in a multitude of ways and more of an individual rather than social concern (or a translation from the social to the individual or vice versa depending on the context). For example, in education, self-management could be about keeping a diary, note-taking and recording one's own progress over time.

In the context of the present study, self-management is concerned with all the recording, audits and measurement that take place in firms related with carbon emissions (see also Peeters, 2006). The institutionalisation of such metrics and methods of self-management, be it through informal institutions or more formalised means (such as the EU's ETS stipulates it must happen, see EC, 2024a), has hardly been explored in the translations that can occur between formal and informal institutions (see also Ahuja, Yadav & Sergio, 2022). Here, it is proposed that such public regulatory imposed self-management techniques could be central as a mechanism for this translation to happen in both a concerted, coercive (imposed by regulators), but still voluntary way (see also Barker, 2005). Therefore, theory is used not only deductively, but, too, aids in the recursive calibration procedure of identifying the theoretically most relevant model. In the development of the research, theory is juxtaposed with different modelling outcomes to arrive at a SEM. This model should be both theoretically consistent and render the best possible statistical fit given theoretical relevance and salience at the same time.

3. Literature review

Common methods for estimating environmental (and trade) policy spillovers from the ETS are econometric policy evaluation methods (with difference-in-difference designs) and CGEM. The two approaches are vastly different. One relies on ex-post studies using empirical data,whereas the other is a calibrated model with outset in theory that is then used to conduct ex-ante scenarios for likely futures and forecasts, once a policy is under consideration for implementation. The latter will inevitably produce more exact results and is therefore also more often oriented to the testing of the strong version of the carbon leakage hypothesis (see above).

No papers were found having used SEM as a method to evaluate the ETS, as survey data has rarely been used or considered in this line of study. Few in-depth case studies have been conducted. Some case studies were identified for experiences during Phases I and II, where the impact on the carbon price has been moderate (see i.e. Rogge, Schneider and Hoffmann, 2011, EC, 2015).

Therefore, this short review focuses on recent important econometric and CGEM contributions that investigate the carbon leakage and/or technology spillover hypothesis.

As the review here shows, there is only a few select papers that consider both aspects of the likely positive and negative impacts of the ETS in 1st countries. No literature has considered the potential positive impact that the ETS could have in a 3rd country context. See also the extensive reviews of the literature offered by Martin, Muûls & Wagner, 2016, Verde, 2020 and Green, 2021.

Under the strong definition of carbon leakage, only the CGEM literature has produced evidence in support of this hypothesis (see for example Beck, Kruse-Andersen and Stewart, 2023, Wang & Kuusi, 2024). Ex-post literature using classic policy evaluation methods, such as difference-in-difference designs and firm-specific datasets (Martin et al, 2014, Koch and Mama, 2019, Dechezleprêtre et al, 2022), has not produced evidence in support of the strong carbon leakage hypothesis.

In this perspective, a more novel policy evaluation approach (also using econometrics) is introduced by Verde, Graf and Jong, 2019. Generally, this new empirical literature using survival models is only now under development, with few concrete results for the impact of the ETS in 1st and 3rd countries having been obtained so far.

The above authors in the literature specialising on the leakage aspect conclude that the EU's system of free allocations, combined with the fact that the impact of the ETS on the carbon price is modest in the early Phases of the ETS, are the main reasons why so few results have been confirming the leakage hypothesis in this line of research (see i.e. Dechezleprêtre et al, 2022).

For the anticipated impact of the ETS on innovation, a limited evaluating literature has been produced (for reviews see also Teixidó, Verde & Nicolli, 2019). Most studies have been conducted for the German electricity sector (Rogge, Schneider & Hoffmann, 2011, Schmidt et al, 2012, Rogge, 2016). When more general data and results are available for the EU's ETS, researchers have reported a small albeit positive effect on the innovatory capabilities of firms (Calel & Dechezleprêtre, 2016, Joltreau and Sommerfeld, 2019, Calel, 2020) and incremental improvements in terms of lowering emissions with around 10% during Phase II in the ETS regulated firms (Dechezleprêtre, Nachtigall and Venmans, 2023). Similar results are also available for ETS systems in China and the US (Ren, Yang, Hu and Chevallier, 2022, Gagelmann and Frondel, 2005).

As already mentioned, no literature was identified that looked for positive spillover impacts on technological change in the 3rd country context. But in extension, recent groundbreaking research from Japan did demonstrate positive spillovers from Japan's ETS in terms of reducing emissions within the same firm (Sadayuki and Arimura, 2021). This included the perspective of Japanese subsidiaries operating in other jurisdictions besides the regulated one (like a 3rd country impact but in a regional perspective).

4. Data

The data is based on the World Bank's Enterprise Survey (ES) data for Türkiye, Italy[1] and the other sampled MENA Countries published via a dedicated website to the surveys. This version of the ES includes a green module recording survey responses about firms' green behaviour. ES data for Türkiye is used as a starting point for calibrating a SEM, using both ordinary variables (survey items) and derived latent constructs from the dataset for Türkiye for 2019 (WB 2019a). The aim with calibrating the model is not only to evaluate it for Türkiye but also applying the same model to other MENA Countries, where very similar datasets are available from the same data provider (limiting the sample to include Egypt, Lebanon, Morrocco and Tunisia)[2].

[1] The ES datasets, in their present form are not complete enough for evaluating the impact of the ETS on firms in 1st countries. For example, a selection bias can be involved as firms are self-selected into the system based on their (prior) energy intensities or emissions rates. To make the data more useful for evaluating the ETS in the 1st and 2nd country context, it would be necessary to add a question about whether the firm is regulated by the ETS or not.

[2] This version of the ES (for Türkiye and other countries in the Middle East, North Africa, Central and Eastern

The final sub-sample for Türkiye (see summary in Table 1, see also summary Table 2 and Appendix Tables A1-A4 for the other MENA country datasets) has 1272 observations with around 20% of the respondent firms dropping out due to incomplete data[3].

Table 1: Descriptive statistics for the selected ES variables for Türkiye

Statistic	N	Mean	St. Dev.	Min	Max
AdoptanyEE: Firm adopted energy efficiency enhancing technology	1,272	0.2	0.4	0	1
Customers: Exert environmental standards	1,272	0.1	0.3	0	1
EINT: Energy intensity=Electricity and Fuel Bills over Sales	1,272	0.04	0.1	0.000	0.7
ETS: A dummy for ETS regulated industries	1,272	0.7	0.5	0	1
ETSHR: A dummy for ETS industries deemed at high risk of leakage	1,272	0.5	0.5	0	1
ETSLR: A dummy for ETS industries deemed at low risk of leakage	1,272	0.2	0.4	0	1
Exporter: Dummy for export active firms	1,272	0.2	0.4	0	1
Female: Dummy for female ownership (partially or wholly)	1,272	0.1	0.4	0	1
Foreign: Dummy for foreign owned subsidiary (partially or wholly)	1,272	0.02	0.1	0	1
Istanbul: Dummy for firms located in Istanbul	1,272	0.1	0.3	0	1
Large: Dummy for firms larger than 249 employees	1,272	0.2	0.4	0	1
Machup: Among energy upgrades measured with AdoptanyEE, new machinery was one of them	1,272	0.3	0.4	0	1
Management: Firm has designated manager for environmental and climate policy	1,272	0.03	0.2	0	1
Monitoring: Firm actively monitors its own energy consumption	1,272	0.5	0.5	0	1
Standards: The firm is subject to an energy performance standard	1,272	0.1	0.3	0	1
Strategy: Environment and climate is mentioned in the strategic objectives	1,272	0.1	0.2	0	1
Targeting 1: Firm has targets for own energy consumption	1,272	0.1	0.3	0	1
Targeting 2: Firm has target for own CO2 emissions	1,272	0.03	0.2	0	1
Taxes: The firm is subject to an energy tax	1,272	0.2	0.4	0	1
Source:	Enterprise Survey Data, Turkiye 2019, The World Bank, EIB and EBRD				

The ETS variables are added to the ES dataset by imputation. For a 3rd country such as Türkiye, ETS impacted (but not directly regulated) firms, include firms in all potentially affected industries and sectors (which in Phase 3 includes all ISIC 4-digit codes up to and including 3720). The ETS dummy is inserted accordingly. Among the ETS regulated industries and sectors, a differentiation can be drawn between those with free allocations (classified as at high risk of carbon leakage by the Commission, see EC, 2014 where the Appendix list was used to code the dummies) and those without. The ETS dummy is split as follows into industries classified at high and low risk respectively to capture the impact of the free allocations system: ETS_HR (industries with free allocations because they are deemed at high risk of leakage) and ETS_LR (all other industries).

Table 2 summarises the sampled data cases (firm-level observations) and shows the relative decline in each sample due to variable selection. For the Moroccan dataset sample selection leads to a reduction of more than 80% which reduces the validity of the results for Morocco. Across samples more than half of the sampled firms are operating in industries regulated by the ETS in the EU. Out of these around 30% of the firms are in industries at high risk of leakage in Turkey, whereas this proportion is lower in the other MENA countries studied – see also Table 2, last column.

Europe and Central Asia), was conducted in a collaboration between the World Bank, the EIB, and the EBRD in the period 2018-2020. It is this generation of the ES that includes a green module recording survey items about firms' green behaviour and a wealth of aspects related with institutions and the self- management of emissions practices in firms.

[3] Cronbach Alpha (CA) was calculated to be 0.70 (see also the Technical Appendix) for the ES part of the dataset for Türkiye that was used to generate the latent constructs (institutional variables). For the Italy dataset the CA is 0.83, whereas for the other sampled countries CA is typically lower at around 0.60.

Table 2: Sampled data across MENA region and Italy from ES datasets

COUNTRY	TOTAL CASES (FIRMS)	OBS.*	ETS REG.	ETS HIGH RISK**	HIGH RISK IN % OF ETS REG.
Türkiye	1663	1272	857	255	29.75
Tunisia	615	384	230	30	13.04
Morocco	1096	161	71	10	14.08
Lebanon	532	442	226	42	18.58
Egypt	3075	2772	1815	338	18.62
Italy	760	505	310	104	33.55

Note: *Selected from total cases after deletion of non-missing values, **Industries classified at high risk of carbon lekage according to the European Commission's classification

5. Measurement and methodology

The model is calibrated with the Lavaan Package for R (see for example Gana and Broc, 2019, see also the Appendix for the full results - all code will be included once the paper is published, but to reproduce the results it is necessary to download the raw data from the ES website – see also technical appendix for instructions). The model is developed at three levels, as introduced in the theory section: the structural or institutional, actions for change (adoption of new technologies), and outcomes (energy consumption).

Institutions[4] (1st level) are captured with three interconnected, rules-based aspects of organisations that may instil change: formal institutions (rules, regulations and standards that are enforceable by law), institutions of self-management (techniques to understand our own behaviour and its consequences, these types of rules or norms may be self-imposed and therefore informal or imposed along with regulations such as the ETS system), and, finally, informal institutions (organisational culture and norms).

At the next level of the model (2nd level), is the willingness to initiate change or act, measured directly with the ES survey item, recording the decisions made in individual firms whether to adopt more energy efficient technologies.

Finally, at the last level of the model (3rd level), outcomes are measured as organisational changes achieved. In this study the outcome variable is the overall energy intensity of the firm.

[4] Notice that the measurement of institutions is solely possible using confirmatory factor analysis (part of the SEM approach) to generate the latent constructs based on the underlying survey items from the ES instruments (see also Jensen, 2021 for an application of similar latent constructs in a simple multiple regression).

6. Results

In this section, the main results of the SEM for Türkiye are first presented, followed by a brief section on the validation of the model with the ES data for Italy. Then the full results across the 5 MENA countries are presented with several comparative tables[5].

6.1 Model calibration with ES data for Türkiye

The benchmark model for calibrating the SEM is the ordinary multiple linear regression model with inclusion of factor scores for latent variables that seek to measure institutions (formal and informal, see also Jensen, 2023). Institutions include the additional variable added (also derived as a latent construct, see methodology section) that in this paper is called self-management.

The first step is to include all 3 constructs in a simple, linear model (but here in this paper now estimated with SEM/ML), where each construct contributes individually and non-hierarchically in explaining the likelihood of firms to innovate through adoption of new, more energy efficient technologies. In the first base model (Model 1), there are no interdependencies (see also the theory section on interdependencies or institutional translation mechanisms) across the 3 latent constructs. Besides the latent constructs measuring institutions, several control variables are included, such as firm size, whether the firm exports and whether the owner is a foreign entity or held by Turkish (domestic) owners.

The second step occurs iteratively from the first in terms of improving model fit. An immediate problem in the first model is that the self-management construct dominates the result but appears to be causing multicollinearity or enters a spurious relationship with the other variables and especially the other institutional constructs. This is expected, because theory predicts and prior research suggests, that institutions should be modelled hierarchically (see theory section on institutional translations and Corral, 2003). The advantage of the present modelling framework compared to simple multiple linear regression, is that such interdependencies of institutional translations can be addressed directly by the modeler.

Several iterative steps then occur between the second and third model (Model 3 in Table 2) reported here, where the researcher tries to model possible interdependencies between the latent constructs and result for the decision and outcome variables.

In the final model it is the institutions that drive actionable behaviour (including self-management systems as part of the institutions). Such systems, according to the calibrated model, translate into informal institutions or what is coined as organisational culture. The decisions or actions about implementing technological change in this more hierarchical model then is the immediate precursor or mediating variable between the institutions and outcomes

---

5 All results were first generated using the Nonlinear Minimisation subject to BoxConstraints (NLMINB) optimization method for categorical data, rendering the Maximum Likelihood (ML) or Diagonally Weighted Last Squares (DWLS) estimators. The consistent estimator with categorical data is DWLS (see also Kline, 2023), but for the sake of efficiency (time and energy used estimating each model), results are reported throughout for the ML estimator. Results only differ marginally across the two estimators. (However, it is noteworthy that DWLS always renders a better statistical fit across all estimated models in the paper.)

for the observed energy intensity with each firm. Table 3 demonstrates how the model fit improves somewhat over the course of the calibration exercise. However, the optimisation of the fit only happened once a theoretically consistent model had been identified. After this, the more statistical instrumental approach of using the modification indices (see also Thakkar, 2020 and Kline, 2023) was applied (from Model 3 to Model 3m). After applying modification indices, the final model passes all the statistical criteria for a well fitted SEM when using the DWLS estimator (see also the methodology section about choice of estimators). Note that in Table 2, and throughout the paper, the statistical fit is reported when using the more time and energy efficient ML estimator, rendering a somewhat poorer statistical fit (see also Footnote 5).

Table 3: Calibrating the base model with ES data for Türkiye

MODEL	OBS.	X2	DF	X2/DF*	CFI**	TLI**	RMSEA***
Model 1	1272	1750	70	25.00	0.69	0.61	0.14
Model 2	1272	1778	75	23.71	0.70	0.61	0.13
Model 3	1272	1951	85	22.95	0.68	0.60	0.13
Model 3m	1272	995	84	11.85	0.84	0.80	0.09

Note: *Cut off/critical value <5, **Cut off/critical value>0.90, ***Cut off/critical value<0.05

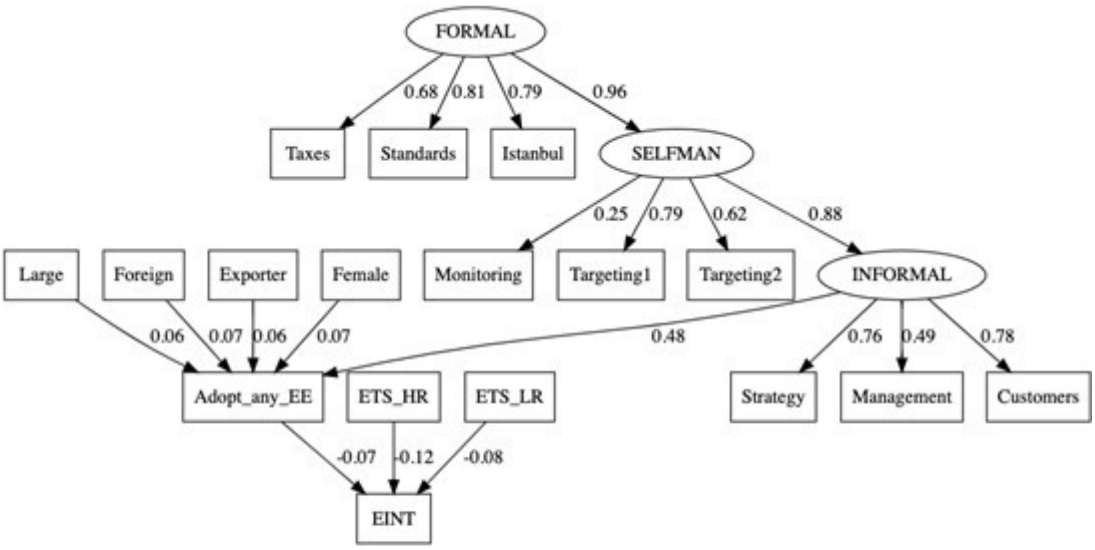
Once the model has been calibrated, it is then possible to use it as the main tool for investigating the influence of the ETS system on firms in Türkiye. In Table 4, three different models are compared. The first (Model 3a in Table 4 – which is a continuation of Model 3m from Table 3 but now with the ETS variables included), assumes that the ETS variables are best inserted in the equations alongside the other FORMAL institutions. In Model 3b, the ETS variables are instead modelled as actionable behaviour. Finally, in Model 3c, the ETS variables are instead inserted as a purely exogenous influence through the outcome variable EINT. All models perform equally well in terms of overall fit statistics, and the general model fit compared to the models without the ETS variables (as presented in Table 2) goes down. This is not surprising as the ETS variables introduce a new source of variance in the variance-covariance matrix. What differs across the models in Table 4 is the local fit. The ETS variables are only significant when inserted into the SEM at the lowest hierarchical level of outcomes. This result therefore vindicates Model 3C for the 3rd country. The result of the calibration exercise is also visualised with Figure 1, where is reported an average positive correlation between the ETS and energy intensities in Turkish firms: where energy intensity is lower with -0.12 or -0.08 depending on whether the industry is classified as at high or low risk of leakage respectively.

Table 4: How to capture the ETS in the context of 3rd country firms?

MODEL	ETS EXPLAINS	OBS.	X2	DF	X2/DF*	CFI**	TLI**	RMSEA***
Model 3A	Institutions	1272	1182	110	10.75	0.82	0.78	0.09
Model 3B	Actions	1272	1175	110	10.68	0.82	0.78	0.09
Model 3C	Outcomes****	1272	1302	123	10.59	0.82	0.79	0.09

Note: *Cut off/critical value <5, **Cut off/critical value >0.90, ***Cut off/critical value <0.05, **** Local parameter fit <=0.01 level

Figure 1: Final SEM for Türkiye with ETS variables included



Note: Standardised regression paths, showing only paths with p<=.05.

6.2 Model validation with ES data for Italy

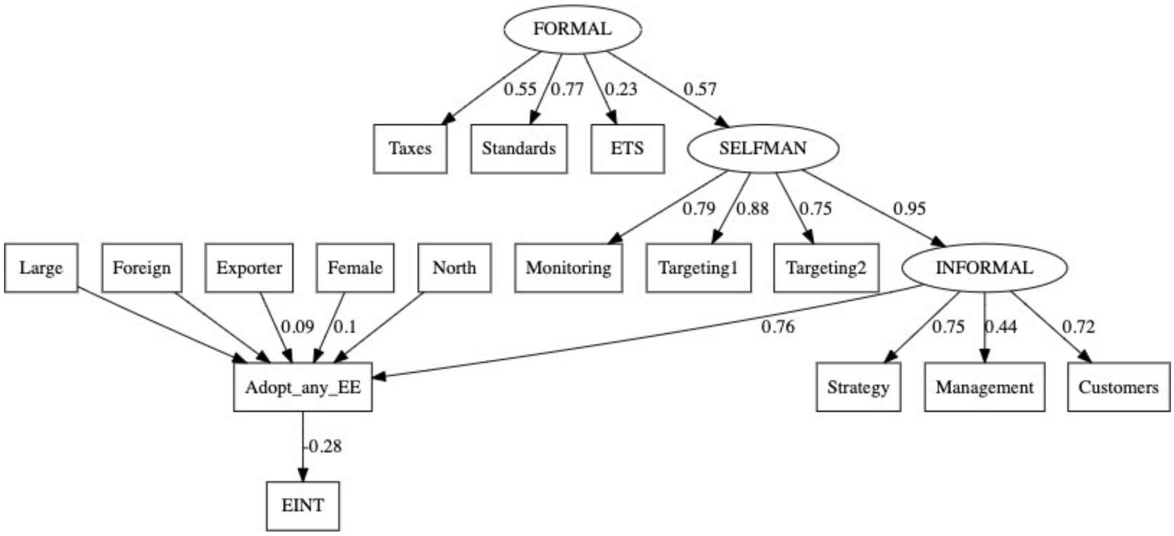
The calibrated model is now ready to be applied to other samples. But first as a validation exercise, the same baseline model was applied to the Italy dataset, checking the above calibration from Table 4 and onwards (i.e. investigating for Italy where the ETS variables have the best fit in the SEM). The assumption is that this would be different for a 1st country relative to a 3rd country. Because in the 1st country, the ETS is part of the formal institutional set-up. The results for Italy (equivalent to the results for Türkiye in Table 4), are shown with Table 5. Again, is there little differentiation in the overall model fit across the models, but the local fit is only significant now when inserting the ETS variables at the highest hierarchical level of the model or what is called the level of institutions (Model 3A).

Table 5: How to capture the ETS in the context of 1st country firms?

MODEL	ETS EXPLAINS	OBS.	X2	DF	X2/DF*	CFI**	TLI**	RMSEA***
Model 3A	Institutions****	509	671	107	6.27	0.79	0.75	0.10
Model 3B	Actions	509	699	107	6.53	0.78	0.74	0.10
Model 3C	Outcomes	509	698	107	6.52	0.78	0.74	0.10
Model 3.0	ETS=Institutions (formal)****	509	764	112	6.82	0.77	0.72	0.11

Note: *Cut off/critical value <5, **Cut off/critical value>0.90, ***Cut off/critical value<0.05, **** Local parameter fit <=0.01 level

Figure 2: Validating the SEM with ES data for Italy



Note: Standardised regression paths, showing only paths with p<=.05.

These results are then compared with the additional option of instead adding the ETS variables as a defining part of the latent construct of formal institutions (Model 3.0 in Table 5, last row). The result is that the best fit for Italy is obtained with the calibrated SEM, when the ETS is modelled alongside the survey items that make up the formal institutions as shown in Table 5 and Figure 2. This result also demonstrated that the ETS is highly correlated with other formal institutions for a 1st country such as Italy. Therefore, the most correct in the context of the calibrated SEM is to juxtapose the ETS with other aspects of formal regulations such as taxes and standards, but now for the 1st country. This is the result that was expected and confirms the overall validity of the modelling framework offered.

6.3 Applying the SEM across all ES data samples available for the MENA region

Table 6 shows the results across the sampled MENA countries. Note that in the tables the ordinary regression coefficients are reported and to be interpreted for the ETS variables when multiplied with 100 (and most of the other variables as well, however, depending on the dependent variable in the SEM) as the percentage point difference in energy intensity of ETS regulated firms relative to non-regulated firms.

COUNTRY	ETS HIGH RISK#	ETS LOW RISK#	OBS.	X2	DF	X2/DF*	CFI**	TLI**	RMSEA***
Türkiye	-0.014 (<0.01)	-0.013 (<0.05)	1272	1171	110	10.65	0.82	0.79	0.09
Tunisia	-0.001 (>0.10)	0.069 (<0.01)	384	489	107	4.57	0.59	0.50	0.10
Morocco	-0.055 (<0.01)	-0.036 (<0.10)	161	331	107	3.09	0.74	0.68	0.11
Lebanon	-0.14 (>0.10)	(0.006) (>0.10)	442	448	107	4.19	0.63	0.55	0.09
Egypt	0.017 (<0.01)	0.011 (<0.05)	2772	2673	107	24.98	0.65	0.57	0.09

Note: #p-values in (), *Cut off/critical value <5, **Cut off/critical value>0.90, ***Cut off/critical value<0.05

In all the results reported in the paper the ETS dummy is portioned out (split dummy) on industries at low and high risk of carbon leakage respectively. For Türkiye the ETS regulated industries have energy intensities that are significantly lower with 1.3-1.4 percentage points in absolute terms. The same tendency is observed for Morocco but only in high-risk industries are energy intensities lowered with 5.5 percentage points in ETS regulated industries, whereas the result for low-risk industries is insignificant.

Economically these numbers may not seem formidable. However, when cast as standardised coefficients in the path diagrams (see Figure 1 above for Turkey and Figures A1-A4) in the Appendix, the coefficient estimates can better be seen in the relative perspective of the other coefficient estimates within the same country (and across the sampled countries – see Footnote 5). That is because the standardised coefficient is cast on the scale of standard deviations and therefore accounts for that the energy intensities of firms may vary quite a lot also across the sampled countries (see also the descriptive statistics tables – i.e. Table 1 and Tables A1-A4).

In the path diagrams the interpretation of the coefficient estimates (now standardised), is the standard deviation increase or decrease in the ETS regulated industries (high or low risk) relative to non-regulated industries. In the SEM as in the multiple regression these interpretations are made when keeping all the other model variables constant[6]. (Note that in the path diagrams the coefficient estimates are only reported for p-values below 0.05.)

The results here translate into 0.12-0.08 standard deviations in high and low risk industries in Turkey, and into 0.26 standard deviations in high-risk industries in Morocco. Note also, that the impact of the regulation is always more important than the impact of self-proclaimed innovation on energy intensities in the 3rd country context. Only in Italy (re. Figure 2) is there an effect of innovation on lowering the energy intensity with firms which exceeds the reported standard deviations for the combined impact of technology spillover and carbon leakage in the MENA countries.

The results for Egypt and Tunisia are quite opposite those for Turkey and Morocco. In these countries the results suggest that the average impact of the regulation is negative (because here the coefficient estimates are positive for the ETS regulated industries implying that on average firms have higher energy intensities when operating out of an industry with the regulation in place in the 1st country). In absolute terms the impact is more moderate in Egypt and there is not much differentiation across high (the energy intensity is higher with 1.7 percentage points) and low risk (higher with 1.1 percentage points) industries. But according to the standardised results which can be read from the path diagrams (i.e. Figure A1 for Egypt), this translates into an 0.1 standard deviation higher energy intensity in Egyptian firms when the industry is at high risk and only 0.05 standard deviation in industries at low risk. For Tunisia, the result also suggests that the leakage effect dominates. Here there is only a significant impact in low-risk industries, where in absolute terms the energy intensity is higher with 6.9 percentage points, whereas in the standardised version (see Figure A4) this translates into an energy intensity that is higher with 0.28 standard deviations in low-risk industries.

7. Discussion, conclusions and limitations of the research

The paper offers a novel approach to modelling the impact of the EU's ETS in a 3rd country perspective. A review of the existing literature on the ETS finds that there is an overweight of research focusing on the potential negative impact of carbon leakage due to the ETS. No research was found that investigated the competing or potentially counteracting impact that the ETS may have on technological change through technology spillovers. To investigate the overall impact of the EU's ETS for 3rd countries on the European rim and here focusing on the MENA region, a unique number of cross-country datasets are available from the ES making it possible to first calibrate a model for Türkiye and then applying it to the other datasets for a cross-country comparison of the results.

[6] Normally the standardised coefficients are not considered to be comparable across samples. However, and given that the energy intensity of the sampled firms overall varies considerably by country (re. Tables 1 and A1-A4), the standardised coefficients can also be useful in a relative comparison if we remember that standard deviation as a measure is particular to its sampling variable (here by country).

It became a central proposition of the research that such self-management systems as the ETS is (carbon pricing aside) may be implemented in organisations partly because of the translations that happen between formal institutions, such as climate policies, and the embedded auditing requirements making it increasingly necessary for firms to observe, self-monitor, and self-regulate their emissions behaviour. The measurement possibilities inherent in the ES datasets lead to the calibration of a SEM that has three levels: the institutional level (encompassing institutions that are formal, informal, and self-management directed), the actionable level (concerned with the organisations' decisions about technology adoption in the realm of energy preserving solutions) and, finally, the outcome level (recorded energy intensity of each firm).

The results obtained suggest that de facto change in Turkish firms' energy intensities (outcomes) is partially driven by technology adoption rates (innovation), and then by the overall drive for a new energy system founded in tradeable CO2 permits (where the inserted ETS dummies capture the regulated industries and sectors at different risk rates of leakage).

The main result of the calibration exercise is that for the 3rd country, this aspect of the energy system is best captured as a pure external economy or spillover effect. For Türkiye, the results also demonstrate that the ETS could have an overall positive impact on carbon emissions even if there is carbon leakage with Turkey. Because the results suggest that in industries where the ETS regulation is in place in the EU, it lowers the energy intensity of Turkish firms. The effect is small but significant. On a standardised scale it translates into a lower energy intensity with between 0.08-0.12 standard deviations depending on whether the industry is deemed at low or high risk of carbon leakage. Results for Morocco are like those for Turkey, but these are less valid also due to the smaller sample. For Egypt and Tunisia the overall impact is estimated to be negative, again for the largest sample (Egypt) the results are similar for high and low risk industries, but now the negative impact (suggesting carbon leakage is strongest in the case of Egypt and Tunisia as well) is again largest in high risk industries (0.1 standard deviation higher energy intensity when a firm operates out of an industry at high risk vs. 0.05 standard deviation at low risk).

Somewhat surprisingly the results for high and low risk industries run counter to the risk scenarios anticipated by the EU Commission in some of the country cases. (Where classification of high risk depends both on the emissions and trade intensity of the activity in question). However, considering that the free allocations are in place to counter any potential carbon leakage, the results are perhaps less surprising. Because if the technology spillover dominates with more in high-risk industries in countries more amenable to technology spillovers relative to carbon leakage (as would seem to be the case for Turkey), it would be consistent with a scenario of countering the tendency towards leakage and furthering the cause for abatement and innovation in the 1st country. But unless it is possible to more accurately assess the two impacts individually within the same research design, it is difficult to draw stronger conclusions about for example how large a problem carbon leakage really is. And this observation is true not only for the present research results, but for most of the research that has been conducted so far. Other approaches, such as in particular survival modelling offers possibilities to better understand the balance between the impacts of the ETS on innovation and carbon leakage in European firms. These are then also primary effects that can then spill over to the 3rd country. As this research also shows the size of such impacts are in absolute and relative terms currently probably quite modest. But for the 3rd country context documentation is now seizing more importance, also to render supporting factual research for the upcoming CBAM. Where the CBAM is an add-on policy to the EU's ETS that has large potential for initiating real change both in European firms and through their subsidiaries and wider spillover impacts onto world markets.

The weakness of the calibrated SEM in this paper is that such a small variation in energy intensity is explained by the model. Also, cast as a structural model with cross-section data and despite a considerable number of control variables available for the analysis, the argument for causation is weak from a statistical inference perspective. Other unobserved factors may play a role and the time series order among the final dependent or outcome variable and some of the model constructs (explanatory variables) is not perfect. For example, energy intensity as observed with the surveys refer to the latest financial year, whereas the firms are asked whether they have introduced an innovation within a timeframe of 3 years etc.

Yet from a theoretical viewpoint, there is a good basis to argue for causation with the calibrated model. This is thanks to the work of DiMaggio and Powell (1983, 2000, r.o. 2012, 2023). While extant literature does not connect isomorphism to later concepts related with self-management and institutional translations, this paper does. It is argued that such processes underlie the mechanisms in the works by DiMaggio and Powell, and that this can lead to outcomes such as isomorphism. Here, the theoretical interest is more with the translation that happens from national or EU level regulations. These regulations translate themselves into self-management systems that then become part of the organisational culture. In a public policy perspective, the focal point of interest or question is how such systems can drive or direct change in organisations towards closing the emissions gap?

References

Ahuja, J., Yadav, M., & Sergio, R. P. (2023). Green leadership and pro-environmental behaviour: a moderated mediation model with rewards, self-efficacy and training. International Journal of Ethics and Systems, *39*(2), 481-501.

Antoci, A., Borghesi, S., Iannucci, G., & Sodini, M. (2021). Should I stay or should I go? Carbon leakage and ETS in an evolutionary model. Energy Economics, 103, 105561.

Barker, J. R. (2005). Tightening the iron cage: Concertive control in self-managing teams. Critical Management Studies, Oxford University Press, Oxford, 209-243.

Beck, U. R., Kruse-Andersen, P. K., & Stewart, L. B. (2023). Carbon leakage in a small open economy: The importance of international climate policies. Energy Economics, 117, 106447.

Calel, R. (2020). Adopt or innovate: Understanding technological responses to cap-and-trade. American Economic Journal: Economic Policy, 12(3), 170-201.

Calel, R., & Dechezleprêtre, A. (2016). Environmental policy and directed technological change: evidence from the European carbon market. Review of economics and statistics, 98(1), 173-191.

Castaneda, M., Kolenko, T. A., & Aldag, R. J. (1999). Self-management perceptions and practices: a structural equations analysis. Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior, 20(1), 101-120.

Corral, C. M. (2003). Sustainable production and consumption systems—cooperation for change: assessing and simulating the willingness of the firm to adopt/develop cleaner technologies. The case of the In-Bond industry in northern Mexico. Journal of cleaner production, 11(4), 411-426.

Dechezleprêtre, A., Gennaioli, C., Martin, R., Muûls, M., & Stoerk, T. (2022). Searching for carbon leaks in multinational companies. Journal of Environmental Economics and Management, 112, 102601.

Dechezleprêtre, A., Nachtigall, D., & Venmans, F. (2023). The joint impact of the European Union emissions

trading system on carbon emissions and economic performance. Journal of Environmental Economics and Management, 118, 102758.
DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. American sociological review, 48(2), 147-160.
DiMaggio, P. J., & Powell, W. W. (2000). The iron cage revisited institutional isomorphism and collective rationality in organizational fields. In Economics meets sociology in strategic management (pp. 143-166). Emerald Group Publishing Limited.
DiMaggio, P., & Powell, W. W. (2003). The iron cage revisited. The Sociology of Organizations, University of Wisconsin, Madison, SAGE Publications, 243-253.
DCC (2024). The 2024-2030 Climate Change Mitigation Strategy and Action Plan. Turkish Directorate for Climate Change, Ministry of Environment, Urbanisation and Climate Change, Ankara, Turkey.
EC (2014). COMMISSION DECISION of 27 October 2014 determining, pursuant to Directive 2003/87/EC of the European Parliament and of the Council, a list of sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage, for the period 2015 to 2019. Official Journal of the European Union. L 308/114. 29.10.2014. Bruxelles, Belgium.
EC (2015). Study on the Impacts on Low Carbon Actions and Investments of the Installations Falling Under the EU Emissions Trading System (EU ETS). Final Report. The European Commission, Brussels, Directorate-General for Climate Action. Available at: https://climate.ec.europa.eu/document/download/61ca7f6c-0044-4044-b2f1-dcb0b6974030_en?filename=report_low_carbon_actions20150623_en.pdf
EC (2021). Regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism. The European Commission. Brussels 14.7.2021. COM (2021), 564 final.
EC (2023). Guidance on Interpretation of Annex I of the EU ETS Directive. The European Commission, 19.12.2023. Bruxelles, Belgium.
EC (2024a). Climate Action. Development of EU ETS (2005-2020). The European Commission. Available at: https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/development-eu-ets-2005-2020_en#documentation [Accessed on 29 Jan, 2024].
EC (2024b). Climate Action - Carbon Leakage. The European Commission. Available at: https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/free-allocation/carbon-leakage_en [Accessed on 29 Jan, 2024].
Eskeland, G. S., & Harrison, A. E. (2003). Moving to greener pastures? Multinationals and the pollution haven hypothesis. *Journal of development economics*, *70*(1), 1-23.
Gagelmann, F., & Frondel, M. (2005). The impact of emission trading on innovation–science fiction or reality? European Environment, 15(4), 203-211.
Gana, K. and G. Broc. (2019). Structural Equation Modeling with Lavaan. Wiley.
Gerlagh, R., & Kuik, O. (2014). Spill or leak? Carbon leakage with international technology spillovers: A CGE analysis. Energy Economics, 45, 381-388.
Green, J. F. (2021). Does carbon pricing reduce emissions? A review of ex-post analyses. Environmental Research Letters, 16(4), 043004.
Jensen, C. (2021). Soft and hard aspects of green behaviour: A firm-level study of the pollution haven hypothesis in the Mediterranean Basin. Heliyon, 7(4).
Jensen, C. (2025). Does gender matter for green behaviour? An empirical investigation with cross-country data from the Enterprise Surveys. Forthcoming in *SAGE Open*.
Joltreau, E., & Sommerfeld, K. (2019). Why does emissions trading under the EU Emissions Trading System (ETS) not affect firms' competitiveness? Empirical findings from the literature. Climate policy, 19(4), 453-471.
Kline, Rex B. (2023). Principles and Practice of Structural Equation Modelling. Fifth edition, Guilford Publications.
Koch, N., & Mama, H. B. (2019). Does the EU Emissions Trading System induce investment leakage? Evidence from German multinational firms. Energy Economics, 81, 479-492.
Kruse, T., Dechezleprêtre, A., Saffar, R., & Robert, L. (2022). Measuring environmental policy stringency in OECD countries: An update of the OECD composite EPS indicator. *OECD Economic Department Working Papers*, (1703), 0_1-56.
Martin, R., Muûls, M., De Preux, L. B., & Wagner, U. J. (2014). Industry compensation under relocation risk: A firm-level analysis of the EU emissions trading scheme. American Economic Review, 104(8), 2482-2508.
Martin, R., Muûls, M., & Wagner, U. J. (2016). The impact of the European Union Emissions Trading Scheme on regulated firms: what is the evidence after ten years? Review of environmental economics and policy.

Michalek, G., & Schwarze, R. (2015). Carbon leakage: pollution, trade or politics? Environment, Development and Sustainability, 17, 1471-1492.
Narassimhan, E., Gallagher, K. S., Koester, S., & Alejo, J. R. (2018). Carbon pricing in practice: A review of existing emissions trading systems. Climate Policy, 18(8), 967-991.
North, D. C. (1990). *Institutions, institutional change and economic performance*. Cambridge University Press.
Olçum, G. A., & Yeldan, E. (2013). Economic impact assessment of Turkey's post-Kyoto vision on emission trading. Energy Policy, 60, 764-774.
Pearce, D. W., & Turner, R. K. (1990). Economics of natural resources and the environment. Johns Hopkins University Press.
Peeters, M. (2006). Inspection and market-based regulation through emissions trading. The striking reliance on self-monitoring, self-reporting and verification. Utrecht Law Review, 177-195.
Peters, G. P., & Hertwich, E. G. (2008). CO2 embodied in international trade with implications for global climate policy.
Powell, W. W., & DiMaggio, P. J. (Eds.). (2012). The new institutionalism in organizational analysis. University of Chicago press.
Powell, W. W., & DiMaggio, P. J. (2023). The iron cage redux: Looking back and forward. Organization Theory, 4(4), 26317877231221550.
Ren, S., Yang, X., Hu, Y., & Chevallier, J. (2022). Emission trading induced innovation and firm performance. Energy Economics, 112, 106157.
Robinson, J. A., & Acemoglu, D. (2012). *Why nations fail: The origins of power, prosperity and poverty* (pp. 45-47). London: Profile.
Rogge, K. S., Schneider, M., & Hoffmann, V. H. (2011). The innovation impact of the EU Emission Trading System—Findings of company case studies in the German power sector. Ecological Economics, 70(3), 513-523.
Rogge, K. S. (2016). Reviewing the evidence on the innovation impact of the EU emission trading system (pp. 161-194). Edward Elgar Publishing.
Røvik, K. A. (2016). Knowledge transfer as translation: Review and elements of an instrumental theory. *International Journal of Management Reviews*, *18*(3), 290-310.
Sadayuki, T., & Arimura, T. H. (2021). Do regional emission trading schemes lead to carbon leakage within firms? Evidence from Japan. Energy Economics, 104, 105664.
Schmidt, T. S., Schneider, M., Rogge, K. S., Schuetz, M. J., & Hoffmann, V. H. (2012). The effects of climate policy on the rate and direction of innovation: A survey of the EU ETS and the electricity sector. Environmental Innovation and Societal Transitions, 2, 23-48.
Thakkar, J.J. (2020). Structural Equation Modelling. Application for Research and Practice (with AMOS and R). Springer Studies in Systems, Decision and Control, no. 285. Springer, Berlin.
Teixidó, J., Verde, S. F., & Nicolli, F. (2019). The impact of the EU Emissions Trading System on low-carbon technological change: The empirical evidence. Ecological Economics, 164, 106347.
Verde, S. F., Graf, C., & Jong, T. (2019). Installation entries and exits in the EU ETS: patterns and the delay effect of closure provisions. Energy economics, 78, 508-524.
Verde, S. F. (2020). The impact of the EU emissions trading system on competitiveness and carbon leakage: the econometric evidence. Journal of Economic Surveys, 34(2), 320-343.
Voss, T.R. (2001). Institutions. in International Encyclopaedia of the Social & Behavioral Sciences, (eds. Smelser, N.J. and P. B. Baltes), Pergamon Press, Oxford.
Wang, M., & Kuusi, T. (2024). Trade flows, carbon leakage, and the EU Emissions Trading System. Energy Economics, 134, 107556.
WB (2019a). The Italy 2019 Enterprise Surveys Data Set. Implementation Report. The World Bank, Washington D.C.
WB (2019b). The Turkey 2019 Enterprise Surveys Data Set. Implementation Report. The World Bank, Washington D.C.
Wisman, J. D., & Rozansky, J. (1991). The methodology of institutionalism revisited. Journal of Economic Issues, 25(3), 709-737.