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PROFESSOR ANDRIES NENTJES MEMORIAL ISSUE

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Professor Andries Nentjes Memorial Issue

Johannes (Joost) PLATJE

The ISINI 2020 conference was organized in the honour of Professor Andries Nentjes (www.isini.info). ISINI, the International Society of Intercommunication of New Ideas, is much indebted to Professor Nentjes, who passed away in March 2019, at the age of 80. During the conference, the organizers tried to honor Professor Nentjes by doing exactly what he always loved: the academic debate in a critical, friendly and supportive manner. In the September issue of CEREM we published an article on „The Legacy of Andries Nentjes" (Woerdman et al. 2020). This issue contains six articles of the ISINI conference from sessions dedicated to Andries Nentjes. As written on the ISINI website:

„Andries Nentjes was Professor of Economics and Public Finance at the University of Groningen, the Netherlands during more than thirty years. His celebrated academic work encompasses history of economic thought, macroeconomics, post-Keynesian theories and his favourite subject: environmental economics. He is considered a founding father of the environmental economics in the Netherlands. His paper with Simon Kuipers (1973) that elaborated the relation between increasing costs of pollution and limits to economic growth triggered new research. This innovative paper on sustainable growth showed that specific conditions need to be fulfilled regarding technical progress in order to prevent

economic stagnation. As an environmental voluntarist in front of the European Parliament and Dutch government and as supporter of social entrepreneurs Andries fostered environmental organizations, business and policy making. Andries also helped to revive ISINI. His dedication to science, his warm personality and his sense of humor will never be forgotten."

Andries Nentjes
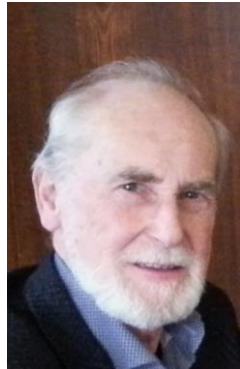
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Acknowledgement

Linking the EU ETS with California's Cap-and-Trade Program: A law and economics assessment

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Abstract:

Aim: This paper aims to evaluate the legal barriers and policy obstacles to linking the European Union Emissions Trading System (EU ETS) with California's Cap-and-Trade Program in the United States, and to identify potential legal solutions to overcome them, by taking a law and economics perspective.

Design / research methods: A qualitative law and economics analysis is performed by combining the legal-dogmatic method with insights from economic theory. Primary sources are the respective legal frameworks, ETS regulations, past linking agreements and relevant case law. Secondary sources include the relevant legal and economic literature, as well as policy documents, reports and press releases.

Conclusions / findings: An EU-California linkage of emissions trading systems (ETSs) is legally feasible on the basis of an informal agreement, through reciprocal amendments to the respective ETS-regulations. Potential barriers could emerge, in particular from misaligned provisions regarding price containment measures and offsets. A gradual implementation of certain mutually beneficial ETS reforms, possibly in conjunction with initially restricted linkage, can provide momentum for transcending these barriers.

Originality / value of the article: To date, no linking has taken place between emissions trading systems from different continents. This paper contributes to the legal-economic literature on linking the EU ETS with California's Cap-and-Trade Program by performing an up-to-date analysis of its associated barriers and by providing concrete legal suggestions to possibly overcome them. Such a transatlantic linkage could enhance the cost-effectiveness of climate policy and contribute to the bottom-up expansion of carbon markets worldwide.

Keywords: EU ETS, California's Cap-and-Trade Program, Linking, Emissions Trading, Climate Change, Law and Economics.

JEL: K32, Q54, Q48

1. Introduction

In 2020, one out of six people in the world live in a jurisdiction that operates a cap-and-trade program to curb climate change (ICAP 2020a: 26). This means that carbon pricing has been expanding since the launch of the European Union (EU) Emissions Trading System (ETS) in 2005, the first multi-country cap-and-trade program for greenhouse gases (GHGs). On the other side of the Atlantic, attempts were made in the United States (US) to implement a federal ETS through the American Clean Energy and Security Act of 2009 (the Waxman-Markey Bill), but this legislative proposal was eventually withdrawn due to a lack of political support. In the same year, however, ten states in the Northeast of the US succeeded in implementing the Regional Greenhouse Gas Initiative (RGGI), an ETS covering power plant emissions (Schmalensee, Stavins 2019). Subsequently, California – the largest economy of the US, located in the West – became the first state in America to launch its own Cap-and-Trade Program in 2012 (Hsia-Kiung et al. 2014: vi).

A cap-and-trade program is a market-based legal instrument that requires participating entities to cover their emissions with a corresponding number of emission allowances (Woerdman et al. 2015). These allowances may be allocated for free or auctioned. By progressively reducing the number of allowances issued each year while cancelling the surrendered ones, the competent authority can impose an annually declining cap on total covered emissions. Because allowances are freely tradable, emissions can be abated cost-effectively. Covered entities will seek the option with the lowest compliance cost: buying allowances (allowance cost), selling/banking allowances (abatement cost), or using allowances (opportunity cost) (Beuermann et al. 2017: 8). In this way, an ETS internalizes the externality of GHGs at a price determined by supply and demand in the market.

A direct linkage is established between cap-and-trade programs when the competent authorities accept each other's allowances as compliance instruments. Linking creates a larger allowance market, which offers a wider spectrum of emissions abatement opportunities so as to meet the overall emissions target at a lower cost. Furthermore, a larger volume of trade increases liquidity and renders the linked market less vulnerable to sudden price fluctuations (Haites 2016: 248). In

addition, linking may help to stimulate a bottom-up expansion of climate policy at an international level (Jaffe et al. 2009: 804).

In 2018, the Governor of California and the EU Climate Action and Energy Commissioner expressed their mutual political will to deepen their collaboration on emissions trading and align their carbon markets (European Commission 2018). Both jurisdictions have acquired experience with linking, since they have implemented and are currently operating linkages with Switzerland and Québec respectively. Linking the EU ETS with California's Cap-and-Trade Program would not only open up cost-effective abatement opportunities in both jurisdictions, but would also resonate a significant message of international climate cooperation, as it could mark the first intercontinental ETS linkage in history.

Zetterberg (2012) examined this prospect in light of the design differences between the two programs, but in the meantime both have undergone significant reforms. An even earlier paper by Mehling (2007) studied the procedural aspects of linking the EU ETS with regional ETSs in the US, while Santikarn (2014) and Unger (2016) focused on the governance and policy aspects of an EU-California linkage. Our paper contributes to the literature (a) by examining the options and barriers to linking the EU ETS with California's Cap-and-Trade Program from a law and economics perspective, (b) by exploring possible legal solutions to the identified impediments, (c) by incorporating both programs' main design features for the coming 2021-2030 period and (d) by including the latest developments, such as the EU-Switzerland linkage and the recent litigation against California's linkage with Québec by the US government.

This paper is organized as follows. Section 2 compares the EU ETS and California's Cap-and-Trade Program by concentrating on their legal design. Section 3 examines potential legal barriers to their transatlantic linkage at three levels: domestic ETS legislation, existing linking agreements and constitutional constraints. Section 4 focuses on the policy barriers that could emerge from misaligned design features between the two programs. Section 5 explores legal solutions to alleviate these differences. Finally, section 6 concludes.

2. Legal comparison of ETS design features

The EU ETS is currently the largest operating cap-and-trade program in the world in terms of absolute emissions coverage, regulating 45% of the EU's GHG emissions (ICAP 2020a: 37). It commenced its operation in 2005 pursuant to Directive 2003/87/EC (the ETS Directive, recently amended by Directive [EU] 2018/410) as a prominent instrument of EU climate policy. The EU aims to reduce GHG emissions by 40% below 1990 levels in 2030 (European Council 2014) or even by 55% as recently proposed by the European Commission (2020a). On 1 January 2020 the EU ETS was linked to the Swiss ETS, marking its first completed linkage with another cap-and-trade program (ICAP 2020a: 46). Earlier linking negotiations between the EU and Australia were well advanced, until the latter's ETS was repealed in 2014 after a change in government (Haites 2014: 24).

California's 2030 emissions reduction target of 40% below 1990 levels is currently aligned with the EU's, in terms of target year, base year and reduction percentage (California Health and Safety Code [CHSC], s. 38566). Its cap-and-trade program functions on the basis of the California Code of Regulations (CCR) (ss. 95801-96022) and covers 80% of the state's emissions (ICAP 2020a: 59). One year after it became fully operational, in 2014, the program was internationally linked with Québec's ETS in Canada. They were designed collaboratively under the Western Climate Initiative, a forum of cooperation that currently provides administrative services to the linkage (WCI 2020). In 2017, Ontario concluded a linking agreement with California and Québec, but six months after it came into force, its new government fulfilled their election promise and repealed Ontario's ETS (CBC 2018).

Both the EU and the US State of California are advanced economies with effective institutions to adequately monitor emissions and enforce non-compliance measures, which is a prerequisite for the proper functioning of (also linked) cap-and-trade systems (Woerdman, Zeng 2020; WJP Rule of Law Index 2020). However, the options and barriers for an EU-California ETS linkage cannot be assessed without a prior overview of their climate goals and their programs' main design features for the 2021-2030 period. The comparative tables 1 and 2 below provide this necessary

context. The relevant legal provisions of the respective regulations are also included, with the aim to facilitate the work of future researchers and practitioners. Subsequently, observations are formulated on the similarities and differences between the two emissions trading systems.

Table 1. Comparison of climate targets and economies of the EU and California

	European Union	**California**
GHG reduction targets	<u>2030</u>: 40% below 1990 levels New target proposal: at least 55% by 2030 (European Commission 2020) <u>2050</u>: Net-zero (European Commission 2019)	<u>2030</u>: 40% below 1990 levels <u>2045</u>: Net-zero electricity production (California Public Utilities Code, s. 454.53) <u>2050</u>: 80% below 1990 levels (California Executive Order S-3-05 2005)
Population	513.5 million (Eurostat 2019)	40 million (US Census 2019)
GDP	18.29 trillion USD (IMF 2019)	3.13 trillion USD (State of California 2019)

The tables 1 and 2 make clear that the two ETSs are similar in many ways, but also show some differences.

On the one hand, the EU and California are two advanced economies that demonstrate equivalently ambitious medium and long-term climate goals. They both operate cap-and-trade schemes with absolute caps, in which each allowance corresponds to one ton of GHG emissions. In both ETSs allowances are distributed to participants with (albeit different) combinations of auctioning and free allocation. In addition, the respective regulations exclude the possibility of using allowances from future allocation years (borrowing), but allow their banking for future use (unlimited in the EU, but under a general limit in California). The two programs also feature comparable Monitoring, Reporting and Verification (MRV) frameworks and registries, while they both ensure high levels of compliance through dissuasive penalties and effective enforcement mechanisms.

Table 2. Comparison of ETS design in the EU and California for 2021-2030

Design Features	EU Emissions Trading System	California's Cap-And-Trade Program
Emissions cap	Absolute cap: 1,816 MtCO2e (2020) ~ 45% of the EU's GHG emissions (ICAP 2020a: 37) Linear reduction factor, 2.2% from 2021 (ETS Directive, art. 9)	Absolute cap: 334.2 MtCO2e (2020) ~ 80% of California's GHG emissions (ICAP 2020a: 59) Non-linear reduction factor, ~ 5% average for 2021-2030 (CCR, s. 95841)
Covered sectors	~ 11,000 participants (ICAP 2020a: 37) Mandatory participation above inclusion thresholds (downstream point of regulation): - Power and heat plants - Energy-intensive industries - Commercial aviation (within EEA) (ETS Directive, art. 2 and Annex I)	~ 500 participants (ICAP 2020a: 59) Mandatory participation above inclusion thresholds (mixed upstream and downstream point of regulation): - Power and heat plants - Industrial installations - Fuel supply (CCR, ss. 95811 and 95812)
Covered GHGs	- Carbon dioxide (CO2) - Methane (CH4) - Nitrous oxide (N2O) - Hydrofluorocarbons (HFCs) - Perfluorocarbons (PFCs) - Sulphur Hexafluoride (SF6) (ETS Directive, Annex II)	- Carbon dioxide (CO2) - Methane (CH4) - Nitrous oxide (N2O) - Hydrofluorocarbons (HFCs) - Perfluorocarbons (PFCs) - Sulfur Hexafluoride (SF6) - Nitrogen trifluoride (NF3) and other fluorinated GHGs (CCR, s. 95810)
Allowance	<u>European Union Allowance (EUA)</u> Allowance to emit one ton of CO2 or equivalent GHGs (ETS Directive, art. 3[a]) Price: €29.69 (December 2020 Auctions) (EEX 2020)	<u>California Carbon Allowance (CCA)</u> Allowance to emit one ton of CO2 or equivalent GHGs (CCR, s. 95802[a]) Price: $16.93 (November 2020 Auction) (CARB 2020)

Table 2. Cont.

Allocation methods	Mix of auctioning and free allocation (ETS Directive, arts. 10-11) Auctioning: ~ 57% Free allocation: ~ 43% (ETS Directive, art. 10[a])	Mix of auctioning and free allocation (CCR, ss. 95890-95910) Auctioning: ~ 45% Free allocation: ~ 55% (CARB n.d.-c; CCR, s. 95841)
Banking	Allowed, unlimited (ETS Directive, art. 13)	Allowed, under general holding limit (CCR, ss. 95922 and 95920)
Borrowing	Not allowed (ETS Directive, arts. 11[2], 12[3])	Not allowed (CCR, ss. 95856[b][2], 95910[c][2])
Offsets	<u>International Offsets</u> No longer allowed from 2021 (Regulation [EU] 2019/1122, preamble, recital 8)	<u>International Offsets</u> Not allowed, but possible in the future CARB can approve sector-based programs in developing countries that reduce emissions from Deforestation and Forest Degradation (REDD) Plans (CCR, ss. 95991-95995). Quantitative usage limit of 2% for 2021-2025 and 3% thereafter (CCR, s. 95854[d]). CARB has not approved any such programs to date (CARB, n.d.-a).
	<u>Domestic (EU) Offsets</u> Not allowed, but possible in the future The Commission can adopt measures for issuing ETS allowances or offset credits from emissions reduction projects not covered by the EU ETS within Member States (ETS Directive, art. 24a). This provision has not been initiated so far by the Member States or the Commission.	<u>Domestic (US) Offsets</u> Allowed under restrictions Qualitative limits: Only from the following offset project types located in the US: 1. Ozone Depleting Substances (ODS), 2. Livestock, 3. Urban Forests, 4. US Forests, 5. Mine Methane Capture (MMC), 6. Rice Cultivation (CCR, s. 95975[e]) Quantitative limits: - Offset use for compliance up to 4% (2021-2025) and 6% thereafter (CCR, s. 95854[b]) - Usage limit of 2% for 2021-2025 and 3% thereafter for offsets that do not provide Direct Environmental Benefits (DEBs) to California (CCR, s. 95854[e]).

Table 2. Cont.

Cost containment and market stability	No price floor or ceiling	Price floor, hard ceiling and soft ceilings
	Market Stability Reserve (MSR) Addresses allowance supply/demand imbalances by automatically withdrawing or releasing fixed percentages of EUAs from/to auction budgets based on the total number of allowances in circulation. From 2023, the amount of allowances in the MSR that exceeds the previous year's total auction volume will be cancelled (Decision (EU) 2015/1814, art. 1[5a], as amended by Directive [EU] 2018/410).	Auction Reserve Price (Price floor) USD 16.68 (2020) Precludes bids below this price from the sale of allowances at auction. (CCR, s. 95911[b])
		Hard Price Ceiling USD 65.00 (from 2021) If the allowance price reaches this ceiling, an unlimited amount of price ceiling units becomes available for sale to participants. (CCR, s. 95915)
	Excessive price fluctuations measure If the EUA price exceeds the two preceding years' average price by more than three times for more than six consecutive months, the Commission can allow Member States to auction part of future auction quantities and up to one fourth of the reserve for new entrants (ETS Directive, art. 29a).	Price Tiers (Soft Price Ceilings) USD 41.40 and USD 53.20 (from 2021) If the allowance price reaches these thresholds, allowances are released from a reserve under the emissions cap. (CCR, s. 95913[h]) The thresholds of the floor, the hard price ceiling and the price tiers increase at an annual rate of 5% plus inflation
Compliance period	Annual (ETS Directive, art. 12[3])	Biennial or triennial (CCR, s. 95840)

Table 2. Cont.

Monitoring, Reporting, Verification (MRV)	Universal annual emissions reporting obligation based on approved monitoring plan (ETS Directive, arts. 6 and 14[3], Regulation [EU] 601/2012 [Monitoring and Reporting Regulation]) Mandatory verification of reports by independent accredited verifiers (ETS Directive, art. 15, Regulation [EU] 2018/2067 and Regulation [EC] 765/2008)	Universal annual emissions reporting obligation based on approved monitoring plan (CCR, ss. 95852[a][1], 95100-95163 [Mandatory Reporting Regulation]) Mandatory verification of reports by independent accredited verifiers (CCR, ss. 95130-95135) Dedicated MRV framework for offsets, which aims to ensure that credits reflect real, additional, quantifiable, permanent, verifiable and enforceable emissions reductions (CCR, ss. 95970-95989)
Registry	Union Registry, supported by the European Union Transaction Log (Regulation [EU] 2019/1122)	Joint registry with Québec, supported by the Compliance Instrument Tracking System Service (WCI 2020)
Penalties and enforcement	- €100 penalty for each ton of GHG emitted without allowance, to increase according to the European index of consumer prices - Obligation to surrender the allowances remains, and the non-compliant entity's name is published (ETS Directive, art. 16) Compliance rate > 99% (European Commission 2020b)	- Obligation to surrender four compliance instruments for each ton of GHG emitted without allowances (CCR, s. 95857[b][2]) - Failure to fulfill the obligation above promptly constitutes a separate violation subject to heavy penalties (civil action, fines and/or imprisonment) (CCR, ss. 95857[c], 96013, 96014; CHSC ss. 41513, 42400-42411) Compliance rate > 99% (CARB 2019)

On the other hand, unlike the EU ETS, California's economy-wide program covers fuel supply (upstream) in addition to direct emitters (downstream), and regulates a slightly broader range of GHGs. Moreover, compliance periods in the two programs are different in duration and, thus, unsynchronized. Another difference emerges in the provisions for offsets. Offsets are credits that result from emissions reductions achieved at uncapped sources, either within the jurisdiction or

elsewhere. The EU has abolished international offsets from its ETS, but has not excluded the possibility for domestic (EU) offsets in the coming years. Conversely, California only accepts domestic (US) offsets under strict limitations, but could, potentially, allow restricted use of certain international credits from developing countries in the future. Lastly, the respective jurisdictions have adopted considerably different regulatory approaches regarding cost containment and market stability. Before scrutinizing these design differences and assessing how they can affect the prospects of linking the two ETSs, it should first be examined whether the linkage is obstructed by potential legal barriers.

3. Legal barriers to ETS linking

This section identifies the provisions in European and Californian legislation that prescribe requirements for ETS linkage, and aims to assess whether these conditions are fulfilled in such a scenario. Subsequently, potential legal constraints are explored within the existing linking agreements concluded by the respective jurisdictions with Switzerland and Québec. Lastly, California's ability to conclude international linking agreements as a sub-national jurisdiction is considered, in light of potential restrictions imposed by the Constitution of the United States of America.

3.1. Linking requirements in European and Californian legislation

The EU ETS can be linked with other programs that meet the criteria set out by the EU ETS Directive. Article 25(1a) explicitly permits the conclusion of linking agreements with sub-federal or regional entities which operate ETSs that are mandatory, feature absolute caps, and are compatible with the EU ETS. California's Cap-and-Trade Program seems to fulfill the first and second criteria, since it is mandatory to the entities included under its scope and it contains their emissions with an absolute cap.

However, the design of California's hard price ceiling may be considered to collide with the EU's absolute emissions cap requirement. It allows California Air

Resources Board (CARB) to sell an unlimited amount of compliance instruments ("price ceiling units") additional to the cap, although the authority is also obliged to spend the revenues on emissions reductions on a "ton-for-ton" basis (CCR, s. 95915[h]). Whether such a design raises a legal barrier to linkage would depend on whether it can actually lead to emissions additional to the cap. Since California's hard price ceiling will come into force in 2021, there is no empirical evidence from its implementation yet. The functioning of this feature is further examined below in the next section.

The third criterion of "compatibility" is not defined in EU legislation. The amending Directive 2009/29/EC, which introduced these requirements to the ETS Directive, notes in recital 42 of the preamble that the candidate ETS must be "compatible with the Community scheme taking into account the level of environmental ambition and the presence of a robust and comparable emissions monitoring, reporting and verification mechanism and compliance system". California's program would likely fulfill these criteria. However, the wording in this provision is not exhaustive, while it should be kept in mind that Directive recitals are not *per se* legally binding in European law (ECJ C-136/04 2005: para. 32).

The absence of binding or exhaustive statutory specifications of "compatibility" suggests that the Commission and the Council have a wide discretion in determining it. Also Mehling (2009: 132) observes that this assessment is "inherently political in nature, not legal". This is confirmed by the Council of the European Union's (2010: para 3[1]) guidelines to the Commission regarding the linking negotiations with Switzerland, which also refrained from specifying absolute criteria about the "compatibility" of the two programs. The ability of assessing this requirement on a case-by-case basis provides EU negotiators with some room for decision-making manoeuvre. Any politically undesirable design misalignment identified by the EU could also be deemed to constitute a legal barrier to linkage, under the justification that it renders the two programs "incompatible".

On the other side of the Atlantic, California's Cap-and-Trade Regulation allows the linkage with an "external ETS" if four requirements are fulfilled, which will be discussed below (CCR, s. 95941; Government Code of California [GOV], s. 12894[f]). The Governor of California is required to make this determination after

considering the advice of the state's Attorney General (GOV, s. 12894[g]). The Governor's findings and the Attorney General's advice prior to California's linkages with Québec (2013) and Ontario (2017) provide valuable insights about the application of the prescribed criteria.

The first requirement is that the candidate linking partner must have established "program requirements for greenhouse gas reductions, including, but not limited to, requirements for offsets, that are equivalent to or stricter" than those in California. Emphasis is put on the overall environmental ambition of the counterparty, as well as the stringency of its MRV framework, registry and offset provisions (Governor 2013: 1-2; 2017: 1-3). The EU features similar levels of climate ambition to California, with comparable MRV mechanisms and registries. In addition, since it currently completely excludes the use of offsets, its offset provisions are stricter than California's. Therefore, the EU ETS would likely satisfy California's first statutory requirement.

The second requirement stipulates that the State of California must be able to enforce its climate legislation "against any entity subject to regulation under those statutes, and against any entity located within the linking jurisdiction to the maximum extent permitted under the United States and California Constitutions". The first part refers to whether covered entities registered in California will remain subject to its full authority and the state's enforcement agencies (Attorney General 2013: 4; 2017: 6-7). A linkage with the EU ETS would not impose any limitations to such authority. The second part refers to whether a linkage will impact California's – constitutionally limited – ability "to extend the reach of its law enforcement beyond its border". This outreach of state jurisdiction is constitutionally permitted only in exceptional cases where an alien entity explicitly consents to the state's jurisdiction or has "certain minimum contacts" within California (such as substantial business activity, or cause of injury) (Attorney General 2013: 4-5; 2017: 7). A linking agreement with the EU does not infringe upon this ability in any manner.

According to the third requirement, the enforcement of laws and regulations by the linking candidate must be "equivalent to or stricter" than in California. In the previous linkages with Québec and Ontario, the state's Governor highlighted the importance of dissuasive penalties for non-compliance and effective enforcement

mechanisms (Governor 2013: 2-3; 2017: 3-4). Since the EU ETS features comparably stringent – if not stricter – penalties and effective enforcement mechanisms, as well as equivalent compliance levels to California's, it meets these conditions.

Lastly, the fourth requirement is that no "significant liability" should be imposed "on the state or any state agency for any failure associated with the linkage." This refers to the risk of legal liability, on the one hand, and security-related liability, on the other (Attorney General 2013: 5-6; 2017: 8-9). The potential of legal liability is unlikely to constitute a barrier to linkage for California. A decision for linkage is a discretionary policy action and, therefore, in case of litigation against any linking decision, the state and its employees are protected by immunities and limitations of liability (Attorney General 2013: 5-6; 2017: 8). The other type of liability is connected with security failures and, particularly, with cybercrime-related risks. The evaluation of the counterparty's security level is based on qualitative observations, without involving a formal liability risk assessment (Governor Brown 2013: 3; 2017: 4). After the lessons learned from fraud and allowance theft in the EU ETS in 2009-2012 (Nield, Pereira 2016), the upgraded, centralized Union Registry of the European program has prevented similar incidents, by offering a high level of protection for data exchange and for transactions (Regulation [EU] 2019/1122). Therefore, the EU ETS is likely to fulfill these liability risk criteria established by California's Regulation.

Since the findings are solely based on qualitative assessments and are not subject to judicial review (GOV, s. 12894[g]), California's Governor has considerable discretion in evaluating whether the linking candidate meets the legal requirements. Like in the EU Directive, California's Regulation refrains from specifying exhaustive sub-criteria or strict methodologies for the findings. In both jurisdictions, the legislation only establishes minimum conditions as safeguards (Governor 2014: 3) and effectively bestows the final judgment to the political and administrative authorities. As a consequence, the answer to whether the respective statutory requirements raise legal barriers to an EU-California ETS linkage is – indeed – more political than legal in nature.

3.2. Existing linking agreements

Besides the mutual recognition and acceptance of allowances, linkages are usually formalized with the conclusion of a linking agreement. Because a new linkage can produce considerable effects across the linked market, a linking agreement may *inter alia* define the conditions under which a linking partner can conclude a linkage with a third jurisdiction.

The 2013 agreement between California and Québec stipulated in article 17 that a linkage with a third party requires the other partner's consent, and that the agreement must be amended to include the new partner. As a result, the 2013 agreement was replaced by the 2017 agreement between California, Québec and Ontario, which is still in force despite Ontario's withdrawal. The third party's ETS must be "harmonized and […] integrated" with both programs (art. 19). If Québec does not consent to an EU-California linkage, both California and Québec have the option to withdraw from the agreement by providing 12 months prior written notice to the other partner (art. 17).

Likewise, the linking agreement between the EU and Switzerland requires a partner to notify their intention to link with a third ETS and to regularly inform their counterparty about the progress of the linking negotiations (art. 18[2]). In a linkage scenario between the EU and California, once notified, Switzerland would reserve the right to temporarily suspend the acceptance of EU allowances (art. 15[1][b]). Before the new linkage is implemented, the Swiss may either accept it and cancel the suspension, or terminate their linkage with the EU (art. 18[3]). The termination takes effect six months after it is notified to the other partner (art. 16[1]).

In sum, both existing linking agreements stipulate that the new linkage must be approved by the current linking partners. Their potential refusal would place the EU or California in the position of choosing between terminating their respective existing linkages, or maintaining them and postponing (or even blocking) the transatlantic linkage. Ideally, though, all jurisdictions should engage in a multilateral dialogue with the aim to address any potential linking concerns. This would increase the chances of establishing a wider ETS linkage, which would magnify the associated economic and political benefits for all jurisdictions involved and provide momentum for further expansion.

3.3. International linking agreements and constitutional constraints

From an international law perspective, linking agreements can be either formal or informal in nature. Formal international agreements, also known as "treaties", can generally provide legal certainty and predictability for the linking relationship. The linking partners are mutually obliged to apply, interpret and enforce them according to international law, under the compliance principle of *pacta sunt servanda* (Shaw 2003: 97). However, treaties often involve a laborious ratification process and burdensome amending procedures, while their conclusion by subnational entities may be subject to constitutional limitations (Mehling 2016: 268-269).

In contrast, informal linking agreements, in the form of memoranda of understanding (MoU) or joint statements at a regulatory-political level, do not generate legal obligations under international law. The agreed terms can be easily implemented (and modified) by mutual reciprocal amendments to the regulatory frameworks of the two jurisdictions. Compared to treaties, these agreements offer more flexibility, albeit with lower legal certainty for the linkage conditions (Mehling 2009: 121-122). Their unilateral termination without sufficient notice does not breach international law, but is deterred by the fact that it can inflict considerable reputational damage to the responsible jurisdiction, while it is also likely to harm the covered entities of its own ETS (Mace et. al 2008: 74-75).

The EU can conclude treaties as an international organization with legal personality, according to the procedure set out in article 218 of the Treaty on the Functioning of the European Union (TFEU). However, California's international personality and treaty-making capacity as a sub-federal state is determined by the US Constitution (Shaw 2003: 196). The Treaty Clause of the Constitution explicitly deprives states from the capacity to conclude international treaties and confers this exclusive power to the President and the Senate (art. I s. 10 cl. 1; art II s. 2 cl. 2). Nevertheless, the Compact Clause allows states to "enter into any Agreement or Compact […] with a foreign Power" with the consent of Congress (art. I s. 10 cl. 3).

The terms "Agreement" and "Compact" are used here interchangeably, as they are legally identical within the meaning of the Compact Clause (Glennon, Sloane 2016: 278, 284). What matters is not the nomenclature, but that congressional consent is required only for state agreements that "may encroach upon or interfere

with the just supremacy of the United States" (Virginia v. Tennessee 1893: 519; Henkin 1996: 155). Congressional approval effectively transforms the compact into federal law (New Jersey v. New York 1998: 811), which can render it legally binding (depending on the provisions therein) both to the state and to the United States under international law (Glennon, Sloane 2016: 278). Congress reserves the right to withdraw its consent at any time, while the President retains the ability to veto the approval (Mace et al. 2008: 102).

Interestingly, the linking agreement between California and Québec has not been submitted for congressional approval, as it stipulates in the preamble that it does not "restrict […] each Party's sovereign right and authority to adopt, maintain, modify or repeal any of their respective program regulations". Nevertheless, the agreement was recently challenged in court. In 2019 the US government filed a civil complaint against California before the federal district court, seeking its permanent injunction (USA v. California 2020). The plaintiff contended *inter alia* that, in absence of congressional consent, the agreement violates the Treaty and Compact Clauses of the Constitution, and that it preempts federal power.

The Court ruled in favor of the defendants that the state did not "delegate any sovereign power" and that the non-binding agreement is neither a (categorically prohibited) treaty nor a compact that requires congressional approval (Memorandum and Order March 2020: 24, 33). The Court finally rejected the United States' remaining claim about federal preemption, noting that "the United States has failed to identify a clear and express foreign policy that directly conflicts with California's cap-and-trade program" (Memorandum and Order July 2020: 18), and entered judgment in favor of the defendants. On 14 September 2020, however, the United States appealed to the U.S. Court of Appeals for the Ninth Circuit.

Thus far, this litigation suggests that an informal, non-legally binding linking agreement between the EU and California would probably be the most successful recourse. A formal international linking treaty would be prohibited altogether by the US Constitution. A linking agreement of less formal nature, but with binding characteristics such as mandatory language and compliance or accountability provisions (Bodansky et al. 2017: 18-19), would be susceptible to legal challenges if not approved by Congress. Lawsuits could be brought against it by the US

government, Congress or any other public or private entity with legitimate interest (Glennon, Sloane 2016: 284-285). Compared to an explicitly non-binding agreement, a compact that imposes legal obligations to California would provide potential plaintiffs with ampler grounds to contest that it "encroaches upon federal sovereignty" (Memorandum and Order March 2020: 20, 24). Yet, even if such compact received congressional approval, it would still be subject to the risks of presidential veto and Congress withdrawing its consent. Therefore, a non-binding linking agreement, such as a memorandum of understanding (MoU), would not only provide more flexibility to the parties, but would also be a legally safer option compared to a binding compact.

An informal linking agreement can be implemented through the adoption of reciprocal provisions by both parties. For the EU, this means amending the EU ETS Directive with the ordinary legislative procedure (TFEU, art. 294) on the basis of article 192(1) TFEU on environmental EU legislation (Mehling 2009: 132). This requires a proposal from the European Commission and a qualified majority vote by the Council, in co-decision with the Parliament. In California, the linkage must be proposed by CARB to the Governor, who must issue the findings regarding the statutory requirements within 45 days and submit them to the state's Legislature (GOV, s. 12894 [g]). Subsequently, the Cap-and-Trade Regulation can be amended by CARB and the link may become operational at any time (CCR, s. 95942).

4. Policy barriers from ETS design differences

Besides the legal requirements for ETS linkage agreements, a linkage may be obstructed by ETS design differences, which – in certain cases – may produce undesirable policy effects of environmental, economic or political nature. The first can undermine the achievement of a jurisdiction's (or the aggregate) emissions reduction targets. Economic barriers can arise from negative economic effects to the linked market, such as price instability, increased mitigation costs or competitive distortions. Other implications can render the linkage politically unacceptable, and

are connected with the levels of public and stakeholder support to the linkage (Beuermann et al. 2017: 17-19).

As a solution for dealing with undesirable ETS design differences, the literature on linking has employed the concept of harmonization, which is the process of aligning legal rules (Mace et al. 2008; ICAP 2018). Nevertheless, harmonization also comes at the cost of annulling any advantages of differentiation (Faure 1998: 171). Domestic regulation tends to create efficiencies when it is tailor-made both to the preferences of voters and to the special needs of the regulated entities (Tiebout 1956; Van Den Bergh 2000). Harmonization also potentially involves considerable switching costs, as well as transaction costs related to the negotiation process between the respective authorities prior to its implementation (Carbonara, Parisi 2007: 33).

Therefore, a careful analysis should be made to what ETS design features should be harmonized and how alignment can be achieved. The application of (preferably formal) cost-benefit analyses would be particularly useful in such an endeavor (Sinden 2015). With that in mind, a closer look is taken hereafter at the design differences between the EU ETS and California's Cap-and-Trade Program.

4.1. Market size

Due to their differences in size, the EU ETS features a larger emissions cap and more market participants than California's program. Harmonization of these differences is infeasible if not impossible, while market size differences have not proven to be an impediment in other linkages. An example can be found in the linkages between the ETSs of California and Québec (with cap sizes of 334.2 and 54.7 MtCO2e respectively), and between the EU ETS and the Swiss ETS (1,816 and 4.9 MtCO2e respectively) (ICAP 2020a: 64, 43). Smaller jurisdictions are incentivized to link with bigger ETSs, as they are likely to reap greater benefits from the creation of a larger linked market (Umweltbundesamt 2018: 155). The relative ETS sizes are nevertheless influencing factors for a linkage, since the design features of the larger program economically (and politically) affect the smaller ETS to a greater degree than *vice versa* (Beuermann et al. 2017: 26).

4.2. Cap stringency

Linking two ETSs with emissions caps of significantly different stringency would lead to a transfer of financial flows to the jurisdiction with the comparatively lenient cap. This can raise equity concerns and render the linkage politically unacceptable (Mace et al. 2008: 60). The fact that the EU and California aim for equivalently ambitious emissions reductions does not necessarily mean that the caps of their programs are comparably stringent. The absolute levels and reduction rates of the emissions caps are not sufficient for evaluating cap stringency. Additional factors must be taken into account as well, which include the respective magnitudes of population size and economic growth, the interaction of the ETS with companion (climate and energy) policies in each jurisdiction, and the respective emissions abatement opportunities (Burtraw et al. 2013: 18-19; Zetterberg 2012: 32).

An economic method for approximating comparative cap stringency is to determine the marginal abatement costs (MAC) for achieving the required reductions in each ETS (Burtraw et al. 2013: 18). Assuming that there is adequate scarcity of allowances, the respective allowance prices can be utilized as "proxies" for assessing the MAC curves and, thus, for evaluating comparative cap stringency (Zetterberg 2012: 32; Umweltbundesamt 2018: 27). The allowance price in the EU ETS is currently higher, but California's emissions cap is declining at a rate twice as fast. California's ETS also features a progressively increasing auction price floor, which could distort the relationship between price and cost.

A large pre-link price difference between the two allowance markets would trigger wealth transfers after linkage from the one with the higher price (allowance importer) to the other (allowance exporter), until prices would eventually converge (Tuerk et al. 2009: 343). Convergence would probably occur at a point closer to the EUA price, since the EU ETS is a larger market (Haites 2014: 7). While these foreseen effects can face political opposition, especially by those participants who will be worse-off after a linkage (e.g. net allowance buyers in the ETS with the lower pre-link price, and *vice versa*), a larger difference between the pre-link prices also brings greater overall post-linkage economic gains (Zetterberg 2012: 23). Additional quantitative analysis will be essential for determining the comparative

cap stringency between the EU ETS and California's program with more precision (Umweltbundesamt 2018: 16, 108).

4.3. Sectoral and GHG coverage

California's broader coverage of economic sectors offers a greater range and diversity of emissions mitigation opportunities under the linked ETS, which can further reduce overall compliance costs (ICAP 2015: 5). Also a broader scope of covered GHGs can improve cost-effectiveness in the linked ETS. These differences can give rise to competitive distortions, which would however be present regardless of the linkage (Umweltbundesamt 2018: 150-151). In any case, regulatory choices about sectoral and GHG coverage are often connected with the particular circumstances within each jurisdiction. Their harmonization may be cumbersome and collide with the legitimate expectations of stakeholders (ICAP 2018: 50).

Efforts should be made to avoid double-counting of emissions, as a side-effect of mixed points of regulation. For instance, it has to be prevented that an industry in Europe surrenders allowances for burning LNG produced in California, which has also been covered with allowances under California's program. Carefully coordinated MRV provisions can prevent miscalculation, for instance by exempting imported Californian fuels from compliance obligations in the EU, or by accompanying the hydrocarbon exports with an equivalent quantity of special compliance credits (Mace et al. 2008: 71).

4.4. Compliance periods

Synchronization of compliance periods between ETSs is not a necessary precondition for linking (ICAP 2018: 57). Conversely, it has been argued that misaligned compliance periods are actually beneficial for the liquidity of the linked market (Tuerk et al. 2009: 347). Temporary allowance shortages may occur at the end of an ETS's compliance period, when its covered entities must surrender their allowances. These shortages can be mitigated through trading with the participants in the linked jurisdiction, whose divergent compliance period will be at a different stage.

4.5. Offsets

Offsets can reduce compliance costs by allowing participants to make use of cheaper emissions mitigation opportunities at uncapped sources. Nevertheless, if offsets do not reflect real, permanent and additional emissions reductions, they can compromise a program's environmental integrity (Mace et al. 2008: 62). Offsets in one ETS indirectly propagate throughout the linked market, as the allowances that remain unused (due to the use of cheaper credits) become available for purchase to all participants. An increased supply of "freed-up" allowances may postpone decarbonization efforts and can, arguably, reduce the converged allowance price to an undesirably low level (Umweltbundesamt 2018: 145).

International offsets have been phased out from the EU ETS and are not currently envisaged for the future. The use of cheap credits from the Kyoto Protocol's Clean Development Mechanism (CDM) proved to be among the major drivers for the accumulation of a substantial allowance surplus in the EU ETS (European Commission 2012: 9), while a flawed MRV framework for international projects eroded confidence in their environmental integrity (Öko-Institut 2016: 11). On the other hand, California's Regulation currently allows participants to use offsets exclusively from domestic projects under various qualitative and quantitative limitations, without ruling out the future possibility of CARB approving a restricted use of international credits from Deforestation and Forest Degradation (REDD) projects in developing countries. The vast majority of Californian offsets so far come from US Forests projects, while no credits from Urban Forests and Rice Cultivation have been issued yet (CARB n.d.-b).

California has established a stringent MRV framework with the aim to ensure that all credits reflect genuine emissions reductions. Nonetheless, a recent study shows that there is methodological uncertainty in determining baseline emissions and additionality of GHG reductions in Mine Methane Capture (MMC) and Rice Cultivation projects (Haya et al. 2020). These projects may even provide perverse economic incentives for the perpetuation of coal mining and for switching from crop to rice production, which could lead to increased GHG emissions in the long run. Moreover, evidence suggests that the current design of MRV methodologies for

California's forest carbon offsets cannot sufficiently prevent over-crediting (Marino et al. 2019).

Such environmental considerations may be regarded as an impediment by EU linking negotiators, who have refused to acknowledge certain offset credits in the past, such as credits generated from land use, land use change and forestry (LULUCF) projects due to concerns about the permanency of their emissions reductions (Beuermann et al. 2017: 34). By linking with California's program, which could potentially include a limited use of international sector-based credits in the future, European policymakers may also perceive that their political decision to abolish international offsets from the EU ETS would be circumvented (Zetterberg 2012: 23). As a result, misaligned offset provisions can potentially raise barriers to linking the two ETSs.

4.6. Banking

Both programs allow banking of allowances, as it can strengthen the price signal and contribute to price stability. Banking enables the regulated entities to manage the risk of excessive future compliance costs, while it can even accelerate emissions reductions by incentivizing mitigation early on (ICAP 2015: 8). Unlimited banking in the EU ETS could perpetuate its historical allowance surplus (Umweltbundesamt 2018: 142), but the Market Stability Reserve (MSR) that began operating in 2019 aims to reduce this surplus without trading-off the benefits of banking. California also does not significantly constrain banking, as the holding limit is currently set at a high threshold (Inman 2018), while participants are also allowed to exempt the allowances they need for compliance from their holding limit (CCR, s. 95920[d][2]).

Even with a tighter limit, the EU's comparatively generous banking provisions would effectively spread throughout the linked market by means of proxy arrangements between participants in the respective ETSs (Mace et al. 2008: 61). This means that Californian firms could transfer their excess allowances to their European counterparts, who could bank them on their behalf at an agreed price. Harmonization of banking provisions can eliminate transaction costs and equity concerns associated with such arrangements, but their misalignment has limited implications for the performance of the linked market (Burtraw et al. 2013: 23).

4.7. Cost containment measures

4.7.1. California's price floor

California's program precludes bids below an Auction Reserve Price from the sale of allowances at auction (CCR, s. 95911[b]). This price floor can mitigate price drops and provide incentives for low-carbon investments by contributing to a minimum allowance price in the secondary market (Wood, Jotzo 2011: 1747). In a linkage with the EU ETS, which does not contain such a minimum price, California's price floor may be rendered ineffective if a large supply of cheaper European allowances is available to California's entities (Tiche et al. 2016: 16). Not only would this lead to a (politically contentious) transfer of funds to the EU, but it could even annul the benefits of the Auction Reserve Price for California. A converged price below the floor would also reduce California's expected auction revenues and frustrate the legitimate expectations of investors in low-carbon technologies, who made their investment decisions based on the premise that the carbon price trajectory would remain above certain levels. Therefore, the lack of a price floor in the EU ETS may constitute a barrier to linkage for California.

4.7.2. California's hard price ceiling

A hard price ceiling was introduced in California's program by the latest 2017 reform and will take effect from 2021 (CCR, s. 95915). If the allowance price reaches this ceiling (set at $65 for 2021), an unlimited amount of "price ceiling units" becomes available for sale to California's ETS participants. These compliance instruments are non-transferable and non-bankable, and cannot be purchased by participants of a linked jurisdiction. The eligible entities can buy only as many as they need to surrender in the following compliance deadline, after demonstrating an insufficient quantity of allowances in their holding and compliance accounts. Revenues from price ceiling sales will be earmarked and will be expended for real, permanent and additional emissions reductions on a "ton-for-ton" basis.

In a linkage scenario, California's hard price ceiling may find opposition by the EU negotiators, who had maintained the position in the past that price ceilings are unacceptable, as they can lead to emissions additional to the aggregate emissions cap (Flachsland et al. 2008: 16). Such a possibility would also conflict with the EU's

statutory requirement for an absolute emissions limit. CARB tries to avoid that by securing that ceiling auction money is translated into emissions abatement on a "ton-for-ton" basis. However, the lack of a general limit to the issuance of price ceiling units can lead to an unpredictable amount of excess emissions – and of corresponding funds. If the abatement cost to offset these excess emissions would be higher than the ceiling price, would CARB have to use additional funds from a different budget? The Regulation also does not specify the time when these emissions reductions should be performed. It remains to be seen how California's authorities will address these issues.

Moreover, the fact that the price ceiling units are available exclusively to California's entities may be perceived as inequitable by European participants and raise competitiveness concerns, which would nonetheless exist independently of the linkage. The ceiling could, however, affect the converged allowance price, since the demand by California's entities for allowances above the ceiling price would be zero. Although the potential economic implications of this particular ceiling design to a linked market require further research, the environmental uncertainty introduced by California's hard price ceiling may potentially constitute a barrier to linkage for the EU.

4.7.3. The EU's MSR and California's price tiers

The Market Stability Reserve (MSR), in operation since 2019, is a supply-based mechanism that aims to mitigate the historical allowance surplus and induce price stability in the EU ETS. It operates based on non-discretionary, predetermined parameters. Its existence could be perceived as beneficial to linkage, in the sense that it mitigates EUA price volatility, which would be exported to the linked jurisdiction (ICAP 2018: 29) and which has deterred California's officials to consider linking their program with the EU ETS in the past (Ranson, Stavins 2016: 293). Nonetheless, the MSR's effect on the supply of EUAs and, therefore, the converged price should be considered prior to linking (Galdi et al. 2020: 22).

California's two price tiers (soft price ceilings) have been established below the hard price ceiling with the purpose of functioning as "speed bumps" for the allowance price (CCR, s. 95913[h]; ICAP 2018: 59). The sale of allowances at the

tier prices (again, exclusively) to California's participants introduces elasticity into the allowance supply and can temporarily mitigate price spikes (Perkis et al. 2016: 705). These allowances come from the Allowance Price Containment Reserve (APCR), which has been withdrawing fixed percentages of allowances from all budget years since the program was launched (CCR, s. 95870[a]). California's tiers do not pose environmental concerns, since their allowances come from within the cap, while their economic implications in a linkage are limited as well as more predictable compared to the hard price ceiling (Zetterberg 2012: 42).

There has been little research and experience from past linkages with regard to how price-based mechanisms, such as the tiers, and supply-based mechanisms, such as the MSR, interact with each other (Beuermann et al. 2017: 30). The price mitigation capacity of California's tiers would likely be compromised due to the increased size of the linked market. Both authorities should consider harmonizing the triggers and parameters of the MSR with the price tiers, in order to avoid negative implications from their interplay (Vivid Economics 2020: 9). For instance, if allowances are simultaneously released by California's reserve and withdrawn by the MSR, both mechanisms' effectiveness would be compromised. Nonetheless, as demonstrated in the linkage with Switzerland, the MSR can apply exclusively to EUAs without affecting the quotas of a linking partner's allowances (ICAP 2020a: 40).

5. Can ETS design differences be overcome?

The analysis above indicates that California's offset provisions and hard price ceiling on the one hand, and the absence of a price floor in the EU ETS on the other, can potentially raise barriers to a linkage between the two programs. This section aims to evaluate the gravity of these impediments and provides some suggestions for alleviating them.

5.1. Offsets

California's policymakers are probably not willing to abolish the use of offsets from their program any time soon. While no international sector-based offset programs have been approved by CARB so far, California's domestic offset framework was extended throughout the 2021-2030 period as an "important cost-containment element" within the ETS. Also, the incentive for the use of offsets with Direct Environmental Benefits to California is expected to encourage investments within the state and improve local air and water quality (CARB n.d.-b).

The potential economic impact of domestic or international offsets on the EU ETS is significantly restrained by California's strict quantitative usage limits (Burtraw et al. 2013: 24-25), while the size difference of the two programs further limits the degree by which freed-up CCAs can affect the converged price (Beuermann et. al 2017: 26). Moreover, although not perfect, California's MRV procedures for offsets were developed based on the European experience and the lessons learned from the implementation of Kyoto Protocol's Clean Development Mechanism (CDM) (Narassimhan et al. 2018: 984; Haya et al. 2020: 1113). These Californian parameters, in combination with the MSR's demonstrated potential to address EU allowance oversupply, may encourage European policymakers to alleviate their potential concerns about California's offsets.

To that end, certain improvements to California's MRV framework for offsets can enhance its acceptability by the EU and, simultaneously, augment its environmental stringency. For instance, CARB has been advised to update and strengthen the methodology for calculating emissions reductions from forest offset programs (Marino et al. 2019). The Californian authorities should also assess and mitigate the risk of perverse incentives within eligible project types, as well as consider reinforcing the assessment of project additionality, narrowing down project eligibility criteria and conducting systematic analyses to diminish the risk of over-crediting (Haya et al. 2020).

Moreover, the introduction of innovative monitoring methods, such as technologies that apply artificial intelligence (AI) to analyze satellite images, could help to mitigate uncertainty about the environmental integrity of forestry project credits (Temple 2019). Technical cooperation between the EU and California in this

area could accelerate developments through the exchange of knowledge and adoption of best practices. Our observations above suggest that barriers to linkage due to different offset provisions between the two jurisdictions are not insurmountable.

5.2. Price floor

It is doubtful that California would proceed to link with the EU ETS without a safeguard against harmful allowance price drops, especially in times of increasing economic uncertainty, for instance due to the Covid-19 pandemic. This protection could be provided by the establishment of an Auction Reserve Price in the EU ETS. Allowances that would remain unsold at auction could then be transferred into the MSR with the potential of eventually being cancelled. A price floor can signal the EU's commitment to incentivize long-term green investment plans, by increasing certainty about the future price pathway (Edenhofer et al. 2017: 11).

The introduction of a price floor to the EU ETS has been advocated by a number of academics and is supported by several EU Member States to stimulate investments in climate-friendly technologies (e.g. Flachsland et al. 2020: 140). Imposing a price floor also has economic drawbacks, because a low allowance price under a declining emissions cap is a signal that technical progress succeeds in keeping marginal abatement costs low (e.g. Woerdman 2019). Nevertheless, politically speaking, potential linking negotiations with California could provide the momentum required for its implementation, which can be achieved through the ordinary legislative procedure (TFEU, art. 194[3]; Flachsland et al. 2020: 139). Before linkage, the EU ETS's Auction Reserve Price should be placed at a level equal to – or higher than – California's price floor, in order not to undermine the latter's effectiveness (Vivid Economics 2020: 9). The harmonization of price floors should be evaluated in conjunction with potential options regarding California's hard price ceiling, which will be discussed hereafter.

5.3. Hard price ceiling

The hard price ceiling, which will become effective from 2021 onwards, is a recent addition to California's ETS. When the program was still being developed,

the state's Market Advisory Committee strongly advised against the implementation of a hard price ceiling (CARB 2007: 67-68). In the experts' view, such a design could jeopardize the program's environmental legitimacy and diminish the prospects of linkage with other ETSs. Nonetheless, California's industry had been pressing for reforms that would provide absolute certainty regarding the maximum carbon price (CARB 2018: 149). In order to ensure political support for the extension of the program through 2030, the hard price ceiling was finally included in the 2017 legislative proposal (Busch 2017; Roberts 2018). The bill (AB-398) was passed with supermajority and bipartisan support in both houses. This indicates that the price ceiling is the outcome of a broad political compromise and is not expected to be abolished soon by California's legislature.

The hard price ceiling is currently set at a high level compared to both past and present EUA and CCA prices. However, the unpredictable scale of its potential impact on the environmental integrity of the linked ETS and the fact that it may contradict with the EU's requirement of an absolute emissions cap are likely to impede the prospects of a linkage. While the diametrically opposed policy choices of the EU and California on this feature cannot be easily bridged, middle ground could be pursued in reciprocal reforms.

On the one hand, the EU can consider introducing both a price floor and a soft price ceiling ("price collar") to the EU ETS. A price floor could help to stimulate investments in low-carbon technologies, but could also raise the allowance price above marginal abatement costs. To implement a soft price ceiling, the MSR could undertake a function similar to California's Allowance Price Containment Reserve (APCR) by making (a portion of) the allowances that remained unsold at auction available for sale at the level of the soft ceiling. Some have argued that such a "symmetric safety valve" can bring significant welfare gains and may enhance the program's functioning, while increasing confidence to make low-carbon investments (Burtraw et al. 2010: 4931). In addition, the price collar can attenuate the risk of excessive future compliance costs and perhaps it could help to increase the acceptability of more ambitious reforms to the industry (such as more stringent annual targets), while maintaining an absolute cap on emissions (ICAP 2020b: 16).

On the other hand, California could apply a maximum limit to its price ceiling units. The exact threshold can be determined on the basis of comprehensive economic analysis and stakeholder input. The operation of soft price collars in both linked ETSs could enhance the allocative efficiency of the common market by increasing the responsiveness of allowance supply to changes in demand (Galdi et al. 2020: 6). The coordination between the respective price collars and reserves, in combination with the benefits of a larger linked market, could strengthen price stability without sacrificing the absolute aggregate emissions cap. This prospect could potentially satisfy the policy objectives of both jurisdictions, while providing a predictable price trajectory for the industry.

The materialization of such bold reciprocal adjustments would require mutual compromises and extensive cooperation between the respective authorities prior to a linkage. Incremental steps, such as the implementation of stricter eligibility criteria for projects in California's offset framework and the introduction of an Auction Reserve Price to the EU ETS, could strengthen confidence between the jurisdictions (Burtraw et al. 2013). On these grounds, the EU and California could first attempt a restricted linkage, with a limitation on the number of imported allowances accepted for compliance. This "safe option" would constrain any significant (positive or negative) effect to the respective ETSs (Haites 2014: 15). A nascent linking relationship can then provide momentum for further reforms, while the restriction can be gradually lifted once California imposes a clear limit to the availability of price ceiling units.

6. Conclusion

The EU and the US State of California share a common vision for a decarbonized future and each has developed an Emissions Trading System (ETS) to help achieve it. Both jurisdictions have effective institutions to adequately monitor emissions and enforce non-compliance measures, which is a prerequisite for successfully linking carbon markets. A legal linkage between both programs is therefore not just a theoretical thought experiment, but a tangible prospect that can

provide a range of economic and political benefits to both advanced jurisdictions. It can be established on the basis of an informal agreement, due to constitutional constraints for California, and can take effect through reciprocal amendments of the regulatory frameworks of each ETS. This requires a majority approval via the ordinary legislative procedure in the EU and the approval of the Governor in California. The consent of their current linking partners, Switzerland and Québec respectively, is also needed.

Potential barriers can emerge from different design choices regarding offset provisions and, especially, price containment measures. Strengthening California's MRV framework for offsets, potentially accompanied by the cooperative application of advanced monitoring technologies, can help alleviate this obstacle. The misalignment of price containment measures may present a greater challenge. California's hard price ceiling may be considered to contradict with the EU's political desire and legal requirement for an absolute emissions cap, as it can potentially lead to excess emissions. The absence of a minimum auction price in the EU ETS, on the other hand, could undermine the functioning of California's allowance price floor.

Reforms in each ETS can be considered, which come at a cost but will also generate benefits, including the prospect of a linked and thus larger ETS market with more abatement opportunities. Such reforms may include the introduction of a price collar in the EU ETS and the application of a maximum limit to California's hard price ceiling. Their gradual implementation, possibly in conjunction with the initial establishment of a restricted linkage, could provide the required impetus for transcending these barriers. Its prospect largely depends on the political determination of both jurisdictions to accrue the expected advantages of a linkage by aligning their ETS design differences. If successful, this achievement would constitute an example for future linking endeavors and would help to inspire the bottom-up expansion of climate policy through carbon markets worldwide.

More economic research is needed to quantitatively assess the comparative emissions cap stringency of the respective programs through the 2021-2030 period. Future research should also investigate the interaction between supply-based mechanisms, such as the EU's MSR, and price-based measures, such as California's

price tiers. Finally, further legal considerations could be explored, for instance by comparing the two ETSs with regard to additional design features and by including the Swiss and Québécois programs in a comparative assessment.

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The limits of economic theories and models

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Abstract:

Aim: This article was written out of a felt need to reflect on the relationship between economic theories and models on the one hand and the empirical world as we experience it on the other. The question is in particular whether it is possible for economic models and theories to say anything definitive about the world we live in.

Design/Research methods: The article relies on professional publications, both within the field of economics and outside of it.

Conclusions/findings: There is much reason for humility, economic models and theories have hardly anything definitive to say about the empirical world, and there is a need for a more varied menu of theories and models and for a listening ear for the needs and fears of the population at large. The best we can do is discussing competing and conflicting views in a polite way. However, this requires a Sprachethik that looks more and more like an endangered species.

Originality/value of the article: Recent developments concerning the reach of economic models and theories are related to earlier discussions and a way forward is sketched.

Keywords: Economic methodology, The role of economists, Teaching of economics, Paradigms / Worldviews

JEL: A11, A20, B41

1. Introduction

This paper is born out of the realization that epistemological questions are easily neglected by economists, save for a bunch of specialists (the price of the extreme specialization of the field). As academics we work with theories and models, and with the help of these theories and models we try to say relevant things about the world we live in. Even if we are not epistemology experts and lack the language to analyse the subject matter in any depth we have to ask ourselves how our theories and models relate to the empirical world, and, as builders and/or users of those theories and models, also how we ourselves relate to the empirical world, how we see the empirical world, what our worldview is. The paper is an attempt to come to grips with such fundamental problems of scholarly activity.

For economists the question has assumed special urgency because there is a widespread feeling that they have let the world down recently. They generally did not see the 2008 financial crisis coming and in the wake of the crisis all kinds of unorthodox policies had to be applied to prevent the world economic system falling apart. These look like having been reasonably successful, but how much the perceived effects were due to the measures taken is far from clear. The covid-19 crisis again demands immediate action that leaves little time for reflection, we just have to act before large sections of the population are reduced to poverty and too many business firms have gone to the wall and we have no clear answer to the question how we should deal with the resulting rise in government debt, and how far we should go in letting it rise.

All this confronts us with the question: how relevant are our economic theories and our models for the problems the world wrestles with, and how relevant can they be? What are the limits of economic theories and models? In order to find an answer, I first clarify what I mean by the terms 'theory' and 'model'. Next, in Section 3 I take issue with the popular idea that economic models provide a simplified picture of the 'real' world. Section 4 then argues that models nonetheless can be useful if we accept an 'as if' methodology and pragmatism, while Section 5 sketches the limitations of formal models. Section 6 explores the relevance of one's paradigm, worldview or 'vision'. Section 7 returns to the question what we still can expect from our models and theories, given the limitations that have been discussed.

Section 8 goes into the way any discourse among economists and between economists and the wider public could, or should, ideally be held, given the limitations of our professional activities; it is followed by some concluding remarks.

2. What do we mean if we talk about theories and models?

Economists work with models and develop theories. These terms are used in different senses, with none necessarily the only correct one (Goldfarb, Ratner 2008). It may be confusing, but there is nothing basically wrong with any given definition of the terms, if only a definition is given. I find it useful to define a *model* as a consistent set of variables and relationships between those variables that is used to study a class of phenomena (e.g., labour market dynamics, GDP fluctuations or balance-of-payments dynamics). These relationships can be expressed verbally, in mathematical form, i.e., in a set of equations, and often also in diagrammatic form.

Models in my use of the term are not synonymous with theories. Theories are attempts at explaining phenomena (say, unemployment, a financial crisis or a persistent balance-of-payments surplus). They may make use of models, but a model in itself does not explain real-world phenomena. What a model does, however, is provide a framework for theories. If we choose a model, we choose a set of variables assumed to be important and the kind of relationships that we expect to have good explanatory value. By choosing a model we may restrict the degrees of freedom for our theories. We choose a model that fits the kind of problems that we find important and the way we think those problems should be analysed. A model does not, however, per se determine our theory. Consider, for instance, a very simple, one-equation, model, the *equation of exchange*:

$$MV \equiv Py$$

where M = the money supply, V = the (income) velocity of money, P = the price level and y = real income.

This is an identity. It doesn't say anything about causality. It can be seen as a model, not as a theory. It will only become a theory if we add causality, for instance: if we increase M, P will increase more or less proportionally (the *quantity theory*). Or: if we increase P, M will increase (endogenous money). A case can be made that both theories can be true, but not at the same time. It may depend on institutional arrangements or on policy choices. Those different theories, which purport to explain real-world phenomena, can be accommodated by this simple one-equation model. Note, however, that potentially interesting problems associated with changes in the price level or the money supply, in particular distributional effects, will slip below the radar if we rely exclusively on the equation of exchange. Formal models may function as blinkers.

3. Are models a simplified image of the 'real' world?

Economists will usually tell you that their models offer a simplified representation of the real world. That looks like a lazy man's methodology. Consider a basic Keynesian fix-price model for a closed economy:

$Y = Z(Y, i, T) + G$ (*IS*-curve)
$Ms = Md(Y, i)$ (*LM*-curve)

where Y = national income, i = rate of interest, T = amount of taxes, G = government expenditure, Ms = money supply, Md = money demand, Z = aggregate demand

Does this look like a simplified version of the 'real' world? If so, the 'real' world should look like a more complicated version of the model. Does it? Just look out of the window. To start with, in the world that we observe we do not discern the variables that figure in our models, such as consumption goods and investment goods. Instead, we may see a lady taking delivery of a large fridge for her delicatessen shop and a small one for her apartment one floor higher. The first one is denoted as an investment good, the second one as a consumption good. Far from

giving a simplified image of the 'real' world, the model makes us categorise our empirical observations using categories that *precede* observation. Our model structures our look at the world and what we see there (for an exhaustive study of the role of models in economics see Morgan, Knuuttila 2008). If by 'real' world we mean something more profound, some reality beyond the empirical world as we see it, we put ourselves in the role of Plato's philosophers, who have escaped from the cave where the common people live as prisoners and have seen the real world in full sunlight, whereas the prisoners only see shadows on a screen (Plato 1968: 278ff, part VII, book VII). But if we pretend to have seen the light, how can we possibly be sure that what we find there we have not first put there ourselves?

The tension between the empirical, observable world and the world of economic models becomes even more glaring in Don Patinkin's once-famous *Money, Interest, and Prices* (Patinkin 1969). It is a work of great beauty and elegance which impresses with its meticulous analysis of general-equilibrium models with money – that is, until it is realized that money in a timeless general-equilibrium model with perfect markets (or a sequence economy without learning or missing markets) is *inessential*, a term Frank Hahn used to denote the situation that no monetary variable need enter into the description, or determination, of that economy's equilibrium (Hahn 1973: 230). Money has no useful role in such worlds, they could perfectly function without money and modelers will have to use tricks such as a cash-in-advance requirement to justify the use of money. The futility of models where money is inessential is made clear by Patinkin's (1969: 75) attempt to "conceive of a barter economy as the limiting position of a money economy whose nominal quantity of money is made smaller and smaller." Patinkin had to admit that a fall in the nominal quantity of money will reduce the price level and thus leave the *real* quantity of money unaffected in equilibrium. Still, "This drawback notwithstanding, there does not seem to be any other meaningful way of comparing the respective equilibrium positions of a barter and money economy." Such an approach is of no use in studying real-world problems. Only this should not be read as a call to dump general-equilibrium models. Patinkin also made it clear that the real side of the economy and the monetary side cannot exist independently alongside each other. Neutrality of money in a comparative-statics analysis (meaning that the real side of

the economy is not affected by changes in the money supply, which only affects the price level but not price ratios) still requires a real-balance effect and/or an interest-rate effect for changes in the monetary sector to affect prices. That means that excess-demand functions need to contain monetary arguments. Building on this model it has been spelled out what far-reaching assumptions have to be made to retain neutrality of money in a comparative-statics sense (Aschheim, Hsieh 1969; Visser 1971). This means that monetary policy will have distribution effects, and that is of practical importance. What we need thus is more diversity of models and approaches, not a farewell to the 'hard' tradition.

4. 'As if' methodology and pragmatism

Economic models and theories do not give a simplified representation of the 'real' world. In order to do that, we should first know what the 'real' world looks like, and that is beyond our faculties. Our observations are limited and different people see different things. What we see is essentially chaotic: we see people going from their homes to schools, hospitals, offices and factories and back, we see trucks transporting goods, ships from all continents calling at our harbours and so forth and so on. How to make sense of it all? What we do in formulating economic models and theories is not represent the 'real' world in a simplified picture, but attempt to get a *mental grip on the world* . It is the construction of a mental picture of how the world, or at least that part or aspect of the real world that forms our research object, might function. In the words of McCloskey "We humans must deal in fictions of our own making. Whether or not they correspond to God's Own Universe is something we cannot know" (McCloskey 1994a: 195). This does not mean that anything goes: a model must be logically consistent and we are often able to test whether the results we find when manipulating the model are rejected or not in empirical research. The model, or the theory dressed in the garb of the model, thus may be refuted. But we'll see that this is often not sufficient to get a definitive answer to the question whether a theory should be rejected or not. Nevertheless, the exercise can be useful.

To give an example: we could draw up a model of a car driver deciding whether or not to overtake the car before her. We may use mathematical formulas and make the driver in the model make her decisions on the basis of her own speed, the speed of the car before her, the distance between her and oncoming traffic and the speed of oncoming traffic. The model may turn out to be successful in tracking and forecasting drivers' behaviour, but nobody will believe that drivers really perform any numerical calculations. When using the model we do *as if* drivers behave according to the model. This way of using models is accordingly known as *as if methodology*. It owes its formulation to Milton Friedman (1953), who also called it the *methodology of positive economics*. With this 'as if' methodology, it does not come as a surprise that economic models make liberal use of *metaphors*: liquidity, circulation of money (cf blood circulation); in economic models there's a lot flowing around, with various degrees of viscosity.

Friedman's 'methodology of positive economics' is often seen as a form of *instrumentalism* (Frazer, Boland 1983; Webb 1987). Instrumentalism is "the position that scientific theories are calculating devices that facilitate the organization and prediction of statements about observations. It is the statements about observations that are true or false. Theories are merely 'useful' or 'not useful'" (Losee 2001: 257). Not surprisingly, some observers see close links with John Dewey's *pragmatism* (Wible 1987), which Dewey himself dubbed instrumentalism (Wible, Sedgley 1999: 176). Dewey was not interested in the question whether a theory was 'true' in any sense, but in the question whether it could solve a problem, that is, whether it was a useful theory (Dewey 1938; Suhr 2005). Dewey focuses on "the function of consequences as necessary tests of the validity of propositions, *provided* these consequences are operationally instituted and are such as to resolve the specific problem evoking the operations" (Dewey 1938: iv).

Economists and philosophers of science strongly disagree on the value of instrumentalism. One view, exemplified by Webb, states that Friedman's approach may lead to nonsensical views being taken seriously, as long as their implications are not too obviously at odds with the results of empirical research. But perhaps that's the poverty of economics, we may have nothing better to offer, except that if there are competing theories or models we might find parts where they have

diverging implications and we can test which one performs best. Webb is too negative, in my view. And arguably this was a non-issue for Friedman, because he was not so much interested in the truth claims of a theory but in the predictive powers of a theory. The purpose of a theory is "prediction for purposes of testing and evaluating alternative *policies*" (Frazer, Boland 1983: 129). The choice of a theory is decided by its usefulness, that is its success in predicting future effects of a policy. As Frazer and Boland (1983), following Boland (1979), argue, Friedman's position is free of logical error, he was simply focusing on another issue than most philosophers of science. Still, when there are competing theories and one performs better than others, it does not mean that the others can be relegated to the dust bin, as we will see in Section 6. An another question is that models and theories are not only used for policy purposes or for solving real-life problems. We also use them to interpret history or to try to make sense of present-day situations and developments. But let us first focus on some limitations of formal models.

5. Limitations of formal models

Relying predominantly on formal models has its costs. Models, especially mathematical ones, restrict our degrees of freedom. They exclude variables that do not lend themselves easily to mathematical formulation. For instance, on the level of individual agents elements like love and hate can easily be introduced in a formal analysis by adding other people's well-being in our utility function, with a positive coefficient in the case of love and a negative one in the case of hate. However, in general-equilibrium models this hardly possible, and my mathematical-economics colleagues tell me it is simply impossible for negative interrelationships, hate in this case. In macroeconomic models such feelings, and feelings in general (such as attitude to immigration), are left out completely. Other obviously important forces that have an impact on the variables we are usually interested in, such as growth, income and wealth distribution and environmental degradation, find no place in economic models either. Think cultural, institutional and political factors that stimulate or hinder productive activities (trust, social capital), and even the central

figure of the entrepreneur. Perhaps even worse, the impact of growth and the pursuit of growth on a variety of cultural, institutional and political variables finds no place in the models either. Economic theories of course need not restrict themselves exclusively to the use of formal models and the importance of entrepreneurs and institutions is readily accepted in theories of economic growth and development and in research by economic historians. However, economic policy relies heavily on mathematical models and elements that do not fit these models are always in danger of getting neglected. And it is not only the field of economics that suffers from the dominance of 'hard' science which leads to the neglect of important issues. Benjamin Cohen notes that it is no different in the field of political science, in particular International Political Economy. Unexciting but technically competent work focused on narrow individual relationships has driven out "interpretive theory or grand visions of history and society" (Cohen 2010: 888).

Another point is that the study of societies, of human behaviour, differs from the study of, say, astronomy or cosmology in the sense that our activities as observers may change the systems we observe. Human society is not a given system outside us, we are part of it, which adds to the difficulty, or is another cause of the impossibility, of constructing a 'true' model. When economic surveys or forecasts are published, people will react and change the system, especially if their reaction functions change over time, that is, are unpredictable. Furthermore, we live in a world of fundamental uncertainty, we cannot have any idea of how various variables will develop in the future and what variables will become important that are now not, and the other way round. This fundamental uncertainty was already recognized by Frank Knight (Knight 1921) and by John Maynard Keynes in his *Treatise on Probability* (1921) and in the *General Theory* (Keynes 1936). "Fundamental uncertainty would imply that no matter how hard we try, no economic model would ever come close enough to the true underlying fabric of the economy, simply because no such true fabric exists." (Müller-Kademann 2018: 59, see also Dosi, Roventini 2019).

Now these latest limitations to models also apply to the theories that make use of the models, though they need not impair the value of the theory. They only limit the value of forecasts, which at best can be of the 'if, then' variety. However,

the use of models and theories is not restricted to making forecasts. They are also used to interpret the past, and in that use the limitations may be easier to live with. If the models applied in alternative theories would make conflicting predictions of the results of historical events, Friedman's instrumentalism might be of some use, as in Friedman and Schwartz's *A Monetary History of the United States, 1867-1960* (1963). But not more than some use, as we will see now – and for interpreting present situations and developments it looks like it's of no use whatsoever.

6. Paradigm, vision, worldview

As was observed at the end of Section 3, our model structures our look at the world and what we see, and it is only logical that our choice of model in its turn is closely connected to our worldview, the way we look at the world. This worldview precedes our empirical explorations and includes the aspects we think important and the questions we want to be answered. Different authors use different terms for this view that precedes scholarly inquiry. Worldview does not seem to differ much from what Schumpeter in his *History of Economic Analysis* (it is nigh on impossible to leave out the epithet 'monumental') called 'vision'. Schumpeter argues that "in order to be able to posit to ourselves any problems at all, we should first have to visualize a distinct set of coherent phenomena as a worth-while object of our analytic efforts. In other words, analytic effort is of necessity preceded by a preanalytic cognitive act that supplies the raw material for the analytic effort" (Schumpeter 1967: 41). "Analytic effort starts when we have conceived our vision of the set of phenomena that caught our interest. […] and this vision is ideological almost by definition. It embodies the picture of things as we see them, and wherever there is any possible motive for wishing to see them in a given rather than another light, the way in which we see things can hardly be distinguished from the way in which we wish to see them" (Schumpeter 1967: 42).[1] I would agree if 'the way in

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[1] Interestingly, a similar idea formed the foundation of a peculiar branch of philosophy, the neo-Calvinist philosophy of sphere-sovereignty developed by the Dutch Professor Herman Dooyeweerd (1894-1977) and still extensively studied and discussed in Calvinist academic groups all over the globe:

which we wish to see them' not necessarily points to an outcome we would applaud, but could also be based, for instance, on a sense of impending disaster. As for the term 'paradigm', the *Oxford English Dictionary* defines it as "A conceptual or methodological model underlying the theories and practices of a science or discipline at a particular time; (hence) a generally accepted world view."[2] The term was introduced into the philosophy of science by Thomas Kuhn for ideas maintained for longer periods by scholars in a field without being put to the test. It is similar to the 'hard core' of Imre Lakatos's 'research programmes' (Klant 1994).

In Lakatos's approach, a research programme is made up of methodological rules on the research paths to avoid (negative heuristic) and the research paths to pursue (positive heuristic) (Losee 2001: 203). The negative heuristic isolates a 'hard core' of propositions that are accepted by convention and which are not exposed to falsification. In economics one might perhaps think of the presupposition of a movement to equilibrium after a shock, or the belief that there is such a thing as equilibrium. The positive heuristic is "a strategy for constructing a series of theories in such a manner that shortcomings at any particular stage can be overcome" (Losee 2001: 204). This strategy will result in a 'protective belt' of auxiliary hypotheses around the hard core. Unlike the hard core, the auxiliary hypotheses can be subjected to empirical tests, and thus can be falsified or refuted, which is Karl Popper's criterion of the scientific status of a theory (Popper 1976: 37). Falsification is, however, not a reason to say farewell to a research programme, in Lakatos's view. It may lead to modifications of the protective belt of auxiliary hypotheses, in order to better fit the empirical measurements. This is not so say that any ad-hoc auxiliary hypothesis will do. Lakatos distinguishes between 'progressive problem-shifts' and 'degenerating problem shifts'. If the adjustments in the protective belt results in theories that account for the successes of earlier theories, have a greater empirical content (explain more) than earlier theories and see some of their newly

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"(philosophical) thought is never neutral and always needs to start from an Archimedean or transcendental point to grasp the meaningful totality of reality." (Hengstmengel 2012: 416).

[2] The term 'paradigm' has become popular in the philosophy of science through Thomas Kuhn's book *The Structure of Scientific Revolutions* (University of Chicago Press, Chicago 1970). He created some confusion by using the term in the sense defined above, but also in a more narrow sense, defined by the *Oxford English Dictionary* as "a pattern or model, an exemplar; (also) a typical instance of something, an example" (see Losee 2001: 200-201).

added content corroborated, the problem-shift is progressive (Losee 2001: 204-205). Refutation is not identical with rejection. A paradigm will be replaced by another paradigm if a scientific community decides that the new paradigm is able to explain phenomena that were anomalies within the old paradigm, and the more readily if the new paradigm leads to better quantitative precision (Losee 2001: 200).

How might this hard core – auxiliary hypotheses approach work out in the field of economics. Economic models often have a very high level of abstraction. They start from a number of premises, such as that welfare or utility for a consumer is an increasing function of the number or volume of goods and services they can lay their hands on, but with a negative second derivative, that is, marginal utility is falling; or that work is a disutility. These premises in their turn are based on the postulate of *methodological individualism*, which means that the focus is on the decisions of individual agents. Another hard-core element is, as noted above, the postulate of equilibrium. The models then proceed by developing full-fledged models and theories through deduction. The models and theories are *axiomatic systems* (Klant 1987: 19). One might say that the premises are the hard core in the sense of Lakatos, whereas the results of the deduction are open to empirical refutation, as for instance that the demand for a good is a negative function of its price. If that conclusion is refuted by empirical tests, the protective belt of auxiliary theories becomes active. The hard core itself often receives a protective shield against empirical tests and thus against refutation through the claim that it is immaterial whether the premises are from removed from the empirical world, on the contrary, it is propagated that it should be, as economics makes use of the *as if* methodology: the empirical world is too complicated to start with and we make use of metaphors. You cannot complain if metaphors do not stand empirical tests, that's inherent to metaphors. A theory can thus never be said to be 'true' in an absolute sense, only to be more scientific in the sense of Popper than other theories – and this the more so as the hard core is not subject to the test and thus not 'scientific' in Popper's terminology.

It may be noted that Popper made a sharp distinction between *falsification* and *verification* of a theory. Marxists for instance are able to explain just about everything that happens in the world and see everywhere verifications of Marxist theory (Popper 1976: 34-35). Those who do not see the same way suffer from a

'false consciousness'. Verification provides very weak support for a theory and if any falsifiable proposition based on Marxist theory fails the empirical test, Marxism ranks lower as a scientific theory than theories that are not refuted.

It should be realized that implicit worldviews or visions are quite distinct from ideology-driven use of models that in themselves are free from that ideology. A glaring case is the glorification of GDP growth that can often be found in official publications. High GDP growth suits policymakers because it functions as a measure of their success and lands them high on international league tables. High growth also is a decisive factor in electoral success if it goes hand in hand with low unemployment. However, while there is a positive correlation between GDP and health and other welfare indicators (e.g., Jones, Klenow 2016), it does not follow from standard economic theory that maximizing GDP growth, even under some restrictions (limiting CO_2 emissions, for instance), is optimal. A main element of standard economic theory as taught in the popular textbooks is the concept of opportunity costs: if you want more of A, chances are that you have to give up some of B. If you want more growth, it will usually cost you such things as leisure time, volunteer activities and environmental quality and it will bring more stress. Maximizing GDP growth will probably only be optimal when applying the utility functions of some politicians and planners.

7. What can we expect from our models and theories

Economic models and theories try to pinpoint the main variables that explain the value of other variables, but for conditional forecasts or ex post explanations to be useful it must first be assumed that the relationships between the various variables are more or less stable over time and secondly that the many variables that are assumed to have negligible or only weak influence and are therefore left out of the model more or less offset each other. If then a theory is refuted, that does not mean it is rejected. Additional hypotheses can be developed about for instance structural breaks in the relationships between variables or exogenous shocks, that is, a sudden non-negligible value of a variable outside the model used in the theory. With such

additional hypotheses it is very difficult to definitely reject a theory, and it is quite possible for more than one theory explaining a phenomenon to exist side by side, unless or until falsifiable corollaries of competitive theories can be put to the test, or until a large majority of leading professionals decides which ones provide Lakatosian 'progressive problem-shifts' and which ones 'degenerating problem shifts'.

Seemingly 'scientific' methods, with impressive mathematical methods, thus provide no certainty, and in economics and other social sciences most likely less certainty than in physics, which can rely on a number of constants, such as the speed of light in vacuum and the Planck constant. This has particularly forcefully been argued by Deirdre McCloskey, who claimed for instance that "formal methods of reasoning have little to do with the belief widespread among economist that people engaged in mutually advantageous exchange should be left alone. Yes, you can draw a diagram about it; and if you don't like that you can employ a fixed point theorem about it. But the conviction is mainly political and ethical" (McCloskey 1999: 60-61). In Lakatosian terms, it belongs to the hard core.

McCloskey emphasizes that "all knowledge is rhetorical, an agreement among Us" (McCloskey 1999: 63). She presses home her conviction that science is mostly persuasion rather than demonstration and persuasion includes logic and fact but also metaphor and story, it is rhetoric (McCloskey 1994b). Models are the metaphors that professionals use to look at their field of study. This appears to be widely accepted, we all talk about 'narratives' and no longer about conclusive proofs, but the choice of narrative in economic policy all too often seems to lack logic (as in the case of the primacy of growth) – and textbooks still tell you that their models are a 'simplified representation of the real world'. Is all this talk of a narrative then only a fad? One wonders whether the great majority of economist realize that Kuhn and Lakatos announced what Hoksbergen (1994) calls the *death of foundationalism*. Foundationalism is "the notion that we can come to a true understanding of the world if our theories are logically based on some indubitable foundation"; however, "There are only narratives based on particular perspectives and viewpoints" (Hoksbergen 1994: 670). Whether all this should lead to a postmodern position that truth is completely subjective, is a moot point. The trouble with economics is that

there are few causal relationships which can be as firmly supported by empirical evidence as, say, the causal relationship between smoking and lung cancer. It should be possible, though, to agree that though core models themselves cannot be disproved, at least models and theories derived from these models can be compared and that in some cases one offers a more convincing explanation or prediction than others. That prevents absolute subjectivity, or 'my opinion is as much worth as yours'. But it still requires professional groups that are able and willing to listen to each other and seriously discuss diverging views. This idea has been further elaborated by McCloskey and Klamer.

8. Economic discourse

Klamer and Meehan (1999) argue that knowledge is a variety of processes and each process is generated within a circle of practitioners, with its own rhetoric. McCloskey uses several descriptions of the concept of rhetoric. What she means can, according to Mäki, best be formulated as "Rhetoric is the use of arguments to persuade one's audience (and the study thereof)" (Mäki 1995: 1303). Such a rhetoric consists of metaphors, narratives (described by Klamer and Meehan (1999: 69) as "the employment of events and the characterization of individuals and groups"), and the selection of authority. If we want to convey a message, we need a strategy of persuasion, that is, a rhetoric, which, Klamer and McCloskey say, has four elements: facts, logic, metaphors (models), and stories (Klamer, McCloskey 1989: 140-141). Even if we try to persuade fellow-specialists we do not without stories.

What then if people start from different worldviews, how to prevent talking at cross-purposes? Klamer and McCloskey argue that in discussions with other professionals, who may disagree with us, we should apply the 'Maxim of Presumed Seriousness', that is, presume that others are as serious as we are, unless there is evidence to the contrary (Klamer, McCloskey 1989: 141). We have to follow 'conversational norms of civilisation', or what McCloskey, borrowing from Jürgen

Habermas, calls *Sprachethik*.[3] These norms are nothing special, they simply are: don't lie, pay attention, don't sneer, co-operate, don't shout, let other people talk, be open-minded, explain yourself when asked, don't resort to violence or conspiracy in aid of your ideas. (McCloskey 1985: 24; 1994a: 99).

These rules are fine for discussions among professionals, if they are really willing to listen to each other, but economists also have to deal with other people if they give policy advice or try to explain empirical developments. If they try to communicate with the help of formal models or theories with a high level of abstraction, they may convey the impression of great learning, but over the last few decades people tend to be less and less impressed by such showing-off. Unfortunately, the economic mainstream (measured by the kind of publications in the top-rated journals) has become more and more formal and mathematical and economists are thus more and more in danger of getting remote from the rough and tumble of economic life as people experience it – with honourable exceptions such as Joseph Stiglitz (2013, 2019, 2020) and Thomas Piketty (2014) with their analyses of inequality. How can we as economist communicate with 'ordinary' people. How do we persuade them of the value of, say, theories of international trade that highlight the benefits of specialization, competition and Schumpeterian 'neue Kombinationen' ('new combinations'); and how can they persuade us of their concerns about loss of jobs or their fears of a shift from secure skilled jobs to insecure low-paid unskilled jobs?

McCloskey mentions an image which, she tells, is popular in sociology and brought into economics by Arjo Klamer, amongst others: the street floor, where you have to go if you want to know what it is like to be a member of a crowd, and the eighth floor, where you are better placed to make generalizations about the behaviour of the crowd as a whole (McCloskey 1999). On the street level you miss a wider perspective, but you feel the threats and the stress, and occupants of both levels can only persuade each other of the value of their analyses if they are willing to listen to each other.

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[3] It would be too much of a digression to explore the relationship between McCloskey's use of the term and what Habermas meant. See on this Park, Kayatekin (2000).

Klamer and Meehan distinguish between a circle of academic economist and a circle of 'everyday economists'. The academic economists may presumably be thought to occupy McCloskey's eighth floor, whereas the 'everyday economists' dwell on the street level. They are businessmen making decisions about buying and selling or expansion, and also politicians deciding on a policy. Perhaps we should include everybody else as well, all who have to make decisions about seeking, accepting or rejecting jobs, about spending and saving; and all who are affected by monetary policies, trade policies and migration.

Klamer and Meehan state that everyday economists are most likely to personalize the economy, they think in terms of right and wrong, of victories and defeats and of identities. Between these two circles is a third one, the circle of 'policy entrepreneurs', including academicians who venture too much outside academia to be taken serious on the eighth floor, and economic journalists. These policy entrepreneurs might be able to mediate between the other two circles. A problem Klamer and Meehan notice with academic economists is that they consider policymakers who do not subscribe to their theories and advice stupid. This does not help to bridge the gap between the eighth floor and the street level. Academic economists will have to realize that their rhetoric is impenetrable to others, otherwise they cannot well contribute to a solution of society's ills (note that McCloskey calls herself a pragmatist, McCloskey 1995). Of course, communication is a two- (or multi-)sided process and politicians all too often only 'listen' to academic economists if their studies support the politicians' policies or plans. Anyhow, the politicians communicate with a totally different rhetoric.

For conversations with the street level more is required than a decent 'Sprachethik'. Economists should seriously pay attention to the needs and fears of members of the public, and narratives about what is 'good for the economy' simply will not do if people feel job security and affordable health care and housing are sacrificed in the process. This will require a shift in the institutional setting of the economics profession. As has been forcefully argued by George Akerlof (2020), amongst others, professional advancement is to a great deal dependent on so-called 'hard' research work, heavily mathematical, and this tendency is self-reinforcing because those who rise to the professional top also are editors of the top-ranking

journals and make the important hiring decisions. Akerlof fears that this goes at the cost of a bias against new ideas and results in overspecialization. It leads to a very narrow worldview and may have been a major cause of the fact that the leading economists did not see the financial crisis coming, not taking a rather 'soft' economist such as Hyman Minsky seriously. It was Minsky against DSGE (Dynamic Stochastic General Equilibrium models), and DSGE won. The mainstream had no place for the realization that people do not learn from the past and collectively delude themselves into thinking that 'this time is different' (the title of Carmen Reinhart and Kenneth Rogoff's (2009) seminal study of financial crises. After all, collective forgetfulness jars with the premise of rational expectations, so beloved by economists.

9. Concluding remarks

The time now seems ripe for a more diverse approach to economics, which does not glorify maths at the expense of 'soft' approaches and subjects. An excellent step in the right direction is the text by John Komlos, *Foundations of Real-World Economics* (Komlos 2019). He thinks students are led astray if they are fed a menu of rational economic agents and perfect competition and so on, without warnings of the abstractions made by the textbook models and the limitations of markets, along with the limitations of government. His text goes a long way to make students feel they study a subject that is close to the world and its problems as faced by real people, and not an abstract mathematical universe. At the least for undergraduate studies and policy discussions, it would be beneficial if we opt for relevance over rigour (Salanti 2014).[4] As for reaching out to the street level, the publications by Joseph Stiglitz mentioned above come to mind.

What is needed is reasoning that leaves room for qualitative aspects and relationships that do not lend themselves easily to mathematic modelling. This is of course nothing new, think of Herbert Simon's idea of bounded rationality, with

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[4] "Rigor is a matter of being consistent with theoretical principles, while relevance has to do with the possibility of transferring conclusions or predictions obtained within the model to what actually happens in the external world." (Salanti 2014: 157).

economic agents as 'satisficers' rather than optimisers (Simon 1955), or of Thorstein Veblen's theory of the leisure class and conspicuous consumption (Veblen 1918), which has the character of a scholarly essay rather than a study based on empirical fact-finding or rigorous deduction, just like John Kenneth Galbraith's studies of the power of near-monopolists (Galbraith 1963 [1952]) and of private consumption versus public services (Galbraith 1962 [1958]). They do not impress with advanced mathematics, but provide illuminating insight into the functioning of human society, possibly changing one's worldview (just what Benjamin Cohen is also missing in political science). Such ideas and theories, which tend to be relegated to footnotes or recommended, not required, reading, contribute much more to understanding how our world functions than for instance Don Patinkin's *Money, Interest, and Prices* mentioned above (Patinkin 1969).

An approach to economics that includes 'soft' analysis and research, along with Lakatos's distinction between 'progressive problem-shifts' and 'degenerating problem shifts' and also the pragmatists' focus on problem-solving would do much to improve the quality of conversation and prevent a post-modernist situation where everyone has their own truth. Final answers may not be found, but it should be possible to agree on what can be deemed acceptable theories or explanations and what not. We may for instance never be able to find a definitive answer to the question what exactly triggered the economic successes of the four Asian Tigers (Singapore, Hong Kong, South Korea and Taiwan) or what the relative roles of land reform and export policies in those successes were in the cases of South Korea and Taiwan, but the proposition of some people that these countries simply were lucky and North Korea, North Vietnam and, since the 1976 reunification, Vietnam before the economic liberalization measures starting in 1986 remained poor just because of bad luck (too much or too little rainfall, bad harvests)[5] can be reasonably be rejected as a sore loser's argument. However, no polite exchange of arguments is proof against the strong forces that do not care a cuss for *Sprachethik* and scholarly expertise or are even hostile to it, proof against people who are 100% convinced of their own ironclad truth or are willing victims of complot theories. Perhaps we can soften their stance a bit by paying serious attention to their daily worries, descending

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[5] This I heard some true believers in revolution argue in the early 1980s.

from our lofty eighth floor to the street level. This will certainly not solve the problem that the willingness to listen to each other is a commodity which is in short supply, but we should never give up trying.

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The effect of product diversification on Corporate Social Performance in the non-renewable energy industry. Exploring the moderating effects of host country development and the Sustainable Development Goals

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Abstract:

Aim: Building upon stakeholder and institutional theory, this paper investigates the relationship between product diversification and corporate social performance (CSP), thereby attempting to make essential contributions to the current literature. Based on an extensive literature review, it was expected that related, unrelated and total product diversification are positively related to CSP. Moreover, it was hypothesized that the exposure to weak institutional host country environments negatively affects the relationship between diversification and CSP, and that the Sustainable Development Goals (SDGs) have a positive effect on the relationship.

Design / Research methods: The sample selected for this research is the non-renewable energy industry, since the industry shows great divergence in terms of corporate social responsibility (CSR) performance. In addition, the industry is highly susceptible to regulatory changes, while the Sustainable Development Goals have an enormous focus on the reliability and sustainability of energy, making it a highly relevant industry to study. This study analyzed 40 a 40 non-renewable energy firms over a time frame of seven years, by using OLS regression.

Conclusions / findings: The results reveal that unrelated diversification is positively related to CSP, while the other forms of diversification show insignificant results. Contrary to expectations, the Sustainable Development Goals negatively affect the relationship between product diversification and CSP, while the moderating effect of exposure to weak institutional environments is insignificant.

Originality / value of the article: Research on the relationship between product diversification on corporate financial performance is well-established, but the way in which product diversification influences a firm's behavior towards stakeholder demands and social concerns remains largely unexplored. Accordingly, the results of this study challenge existing theories while adding more context to the existing relationship, and in turn provide promising avenues for future research.

Keywords: stakeholder theory, institutional theory, product diversification, corporate social performance, sustainable development goals, non-renewable energy industry.

JEL: L20, L25, Q40, Q41, Q42

1. Introduction

Diversification is one of the heaviest studied topics in the field of strategy but contrastingly, research on the consequences of diversification has almost been exclusively limited to the impact of diversification on corporate financial performance rather than on Corporate Social Performance (CSP) (Markides, Williamson 1994; Palich et al. 2000; Rumelt 1974, as cited in Kang 2013). In this paper we focus on firms operating in the non-renewable energy sector because in this field energy firms are currently subjected to disruptive change (Steen, Weaver 2017). This changing environment might lead firms to spread their risk by becoming more diversified, which is an important development because diversified firms have a considerable impact on the society as a whole (Kang 2013). Moreover, energy is one of the most important resources in the world, while societal challenges and stakeholder demands are growing. Consequently, much research has been conducted on corporate social responsibility, as it is nowadays a crucial element in firms' strategy (Chan 2014).

Since diversified firms have a more complex and diverse set of stakeholders, one would expect it to be linked to a measurement focused on stakeholder demand: CSP. Additionally, most research conducted in this area limits itself to the relationship between geographical diversification and CSP (Bansal 2005; Brammer et al. 2006; Christmann 2004; Sharfman et al. 2004). At the time of writing, only Kang (2013) and Patrisia and Dastgir (2017) have studied the relationship between product diversification and CSP. However, Kang (2013) used only large firms from the US operating in different industries, while the study of Patrisia and Dastgir is limited to the manufacturing industry in Indonesia. Both Kang (2013) and Patrisia and Dastgir (2017) did not control for country development differences.

The relationship between product diversification and CSP is clearly understudied but there is also an international aspect to it. Research points out that industry characteristics often determine the degree to which firms adopt Corporate Social Responsibility (CSR) practices, while interpretations and other concerns may differ per country (Brammer, Millington 2008; Frynas 2009; Hawn, Kang 2013). The energy industry shows a similar pattern, it seems one of the leading industries in

terms of CSR but practices are adopted very unevenly within the industry (Frynas 2009). Therefore, this study will take both a stakeholder as well as an institutional perspective in order to answer two questions. The first question focuses on the diversification and institutional effects:

"What is the effect of product diversification on the corporate social performance within energy firms and how is this relationship moderated by the strength of the institutional environment of the host country?"

Within this relationship, we distinguished between related, unrelated and total product diversification because it defines the amount and diversity of stakeholders to take into account (Brammer, Millington 2008; Kang 2013).

Moreover, Patrisia and Dastgir (2017) suggest a longitudinal study on the relationship between product diversification and CSP in order to measure the consistency and validity of the relationship. This makes it possible to investigate changes in the relationship in anticipation of the Sustainable Development Goals and following their adoption in 2015. Since the Sustainable Development Goals (SDGs) are exogenous drivers of sustainable performance and achieving the SDGs would fulfill the long-term goals of energy firms, this leads to the second question that focuses on diversification and SDG effects:

"To what extent is the relationship between product diversification and CSP of energy firms moderated by the adoption of the Sustainable Development Goals?"

To answer the two questions, the remaining part of this paper is outlined as follows: literature review, methodology, results, discussion, and finally a brief conclusion.

2. Hypothesis development

2.1. Product diversification and corporate social performance

Several studies point out that industry characteristics often determine the degree to which firms adopt CSR practices (Brammer, Millington 2008; Frynas 2009; Hawn, Kang 2013). CSR standards seem to be highly diverse between industries but are usually shared between countries on an industry level. Even though the key

environmental and social concerns within industries are shared between countries, the interpretation and other concerns may differ per country. The energy industry shows a similar pattern, according to Frynas (2009) it is one of the leading industries in terms of CSR but practices are adopted very unevenly within the industry. This raises the question as to whether the CSP of firms within the energy industry is influenced by the product diversity of the firm due to the wider range of stakeholders.

Within this relationship, there will be distinction between related and unrelated product diversification. Related diversification can be described as the strategy where a firm expands its business related to its current products and services and/or within the same industry (Chen, Yu 2012). Contrastingly, unrelated diversification refers to the expansion of a firm's products and service in a different industry or market (Castañer, Kavadis 2013). The distinction is important for this particular study because industries differ in their interpretation and significance level to diverse societal issues (Brammer, Millington 2008). Therefore, the variety of stakeholder demands and social issues to take into account differs tremendously between related and unrelated diversified firms, where an unrelated diversified firm has to deal with a wide variety of stakeholders and a related diversified firm has a more coherent range of stakeholders (Kang 2013).

Both Kang (2013) and Patrisia and Dastgir (2017) find a positive relationship between unrelated product diversification and CSP and a negative relationship between related product diversification and CSP. Kang (2013) argues that there are three reasons for diversification to affect the CSP of firms. First, diversification provokes risk averse behavior, therefore inducing managers to respond. Moreover, diversification lowers the employment risk of managers which allows them to allocate more attention and firm resources. Finally, diversification gives a stronger incentive for firms to invest in CSP because it creates an economy of scope for CSP related investments. According to the stakeholder theory, diversified firms in general have to deal with a larger amount of salient stakeholders with regards to legitimacy, power and urgency compared to focused firms (Mitchel et al. 1997).

Within the relationship, the level of unrelated diversification is expected to be more positively associated with the CSP of the firms than is the level of related diversification. The argument from both Kang (2013) and Patrisia and Dastgir (2017)

is that unrelated diversification increases the amount of stakeholders and social demands more drastically compared to related diversification. Moreover, unrelated diversification is considered to have a stronger effect on managerial risk aversion compared to related diversification (Hitt et al. 1997) which implies that firms will take decisions more cautiously. However, for the non-renewable energy sector specifically, one would expect that with increasing policies firms would invest in renewable (sustainable) energy (Lund 2009; Steen, Weaver 2017). This form of related diversification would in turn lead to a better corporate social performance and therefore the relationship is expected to be positive. However, the effect is expected to be less strong compared to unrelated diversification. These arguments translate into the following hypothesis:

Hypothesis 1a: Related product diversification is positively related to the corporate social performance of firms operating in the non-renewable energy industry.

Hypothesis 1b: Unrelated product diversification is positively related to the corporate social performance of firms operating in the non-renewable energy industry.

In order to investigate the combined effect of unrelated and related product diversification, which was found to be insignificant in Patrisia and Dastgir's (2017) study, we formulated the following hypothesis:

Hypothesis 1c: Total product diversification is positively related to the corporate social performance of firms operating in the non-renewable energy industry.

2.2. Exposure to weak institutional host country environments

Similarly to expanding a business to product diverse markets, operating a business in different countries increases the amount of stakeholders. Kang (2013) argues that a firm's geographic diversification has a positive effect on its CSP based on the fact that firms expanding their international markets will face a more diverse set of stakeholders.

However, Yang and Rivers (2009) argue that engaging in different institutional environments poses challenges forMultinational Enterprises (MNEs) because the CSR attitudes in different (geographical) markets might differ from the firms' CSR

standards. This relates to the challenge of institutional duality for firms operating internationally (Hillman, Wan 2005; Kostova, Roth 2002). Indeed, several studies have suggested that the management and orientation of CSR differs significantly across different countries (Baughn et al. 2006; Bondy et al. 2004; Welford 2005; Wokutch 1990, as cited in Yang, Rivers 2009). Welford (2005) found that these differences are related to economic development, with developed countries having a predominantly higher occurrence of CSR-related activities. Similarly, Baughn et al. (2016) argue there is a relationship between a company's behavior towards CSR and the economic and social conditions of a country.

Strong institutional contexts can be seen as an imperative for CSR practices (Matten, Moon 2008), where developing countries are predominantly characterized by institutional voids, which increases the opportunities for corporate social irresponsibility (Mair, Marti 2008; Matten, Moon 2008). Even though it can be argued that firms diversify into countries with weak institutional environments to fill institutional voids, it is more likely that firms imitate the lower levels of CSR commitment of the host country competitors to decrease uncertainty and costs (Reimann et al. 2015). This phenomenon can be referred to as isomorphic processes according to institutional theory (Dimaggio, Powell 1983). Following this line of reasoning, we expect that diversification into weak institutional environments weakens the relationship between product diversification and CSP.

Hypothesis 2: Weak institutional host country environments weaken the positive relationship between product diversification and corporate social performance in the non-renewable energy industry.

2.3. Sustainable Development Goals as a moderating variable

Proactive and sustainable organizations increasingly implement sustainability and SDGs alignment in their (CSR) strategy and business models. In doing so, it can help them generate new revenue, ensure investor interest in addition to recruiting and retaining talent (Busco et al. 2018). A survey of the PWC (2015) shows that the SDG awareness among the business community is very high (92%), and that 71% of the organizations are planning on responding to and engaging with the SDGs (Busco et al. 2018). In addition to the financial benefits, focusing on the SDGs will further

strengthen the relationship between organizations and stakeholders. This is because developing and delivering solutions for the achievements of SDGs improves relationships with regulators and stakeholders and lowers the costs of compliance. Hence, when organizations successfully ingrain the SDGs in their strategy, this will enhance legitimacy in the form of improved credibility with the society and reduced future liability for any kind of environmental damage (Busco et al. 2018). In line with this argument, Schrettle et al. (2013) argue that exogenous and endogenous drivers lead firms to more sustainable efforts. Exogenous drivers can be divided into three stakeholder clusters: environmental regulation, societal values and norms, and market drivers. According to Busco et al. (2018), firms are externally driven by the SDGs to set goals regarding their impact in the future.

An example of a successful implementation strategy of the SDGs within the energy industry is the case of Iberdrola. The electric company puts a strong focus on sustainability and links its many successful initiatives directly with the SDGs. Hereby, the company focuses specifically on goal 7 by supplying affordable and clean energy and on goal 13 by combating climate change. In its efforts to play a pivotal role in sustainable development over the long term, Iberdrola invested millions of euros in the "green generation" as well as in accessibility to electricity in developing countries. A study of PWC in 2016 reveals that Iberdrola's efforts to actively participate in achieving the SDGs have been very successful (Busco et al. 2018).

Linking back to the original relationship of investigation, previous research predominantly shows that engaging in socially responsible actions increases firm (financial) performance (Cheng et al. 2016; Hasan et al. 2018; Sweeney, Coughlan 2013). Contrastingly, Victoria-López et al. (2007) find a negative relationship between CSR and corporate performance. However, this effect seems to apply only on the short term, which means firms should look past these short term effects in order to reap the benefits. In this line of argument, Kang (2013) argues that the relationship between corporate diversification and CSP is negatively affected by the focus on short-term profit.

Therefore, the expectation is that when a firm focuses on the SDGs, which are long-term goals and an exogenous driver of sustainable effort (Schrettle et al. 2013),

this focus positively moderates the relationship between product diversification and CSP:

Hypothesis 3: The positive relationship between product diversification and corporate social performance in non-renewable energy industry was strengthened by the adoption of the Sustainable Development Goals in 2015.

3. Methodology

3.1. Data

Quantitative analysis was conducted using secondary data on the firm-level over a time span ranging from 2011-2018, in order to investigate changes in anticipation of the SDGs and following their adoption. The data was accessed through Thomson Reuters' Eikon, Bureau van Dijk's Orbis and Compustat IQ.

3.2. Sample

The selected sample for this study consists of stock-listed, non-renewable energy firms. The energy industry in general has been selected because there seems to be great divergence in terms of CSR adoption in the industry. According to Frynas (2009), negative publication on non-renewable energy firms has put excessive pressure on the industry which in turn makes them pay more attention to CSR. However, even though the energy industry is one of the leading industries in terms of CSR, the practices are adopted very unevenly within the industry. Additionally, Steen and Weaver (2017) argue that the 'greening' process of energy systems implies that many non-renewable energy firms are subjected to (potentially) disruptive change. This implication is confirmed by a report of the Stakeholder Forum (2015) which states that the Sustainable Development Goal related to sustainable energy is indicated as the most important transformational challenge, together with climate change and sustainable consumption and production. These arguments make non-renewable energy firms a highly relevant sample for the sake of this study.

The selected firms are from a range of non-renewable energy industries and are displayed in Table 1. The displayed SIC codes were used to identify the industries

within Compustat and Orbis, while the corresponding NAICS codes were identified in Eikon. After merging the databases, not all industries that were originally selected were matched with firms that published all required data in the sample, this is indicated with a 0. The data presented in the three databases was matched and this resulted in a total of 40 multinational firms that published all required data over a time span of 2011-2018. The average number of employees of the sample firms is 31,274, ranging from 115 to 552,80 employees, meaning smaller and bigger firms are included in the sample. Furthermore, the average firm age is 53 years, ranging from 2 to 131 years. The selected firms represent 15 countries of origin, spread over Europe, Northern America and East Asia, while operating in a total of 170 countries. The resulting sample includes in total 320 observations with available data for all variables, except for the moderating variable, for a total of seven years: 2011-2018.

Table 1. Overview of selected firms and industries within sample

SIC Code	NAICS Code	Description of the industry	Number of firms in selected sample
1221	2121	Bituminous coal and lignite surface mining	0
1222	2121	Bituminous coal underground mining	0
1241	2131, 2389	Coal mining services	0
1311	2111	Crude petroleum and natural gas	14
1321	2111	Natural gas liquids	0
1381	2131	Drilling oil and gas wells	3
1382	2131, 5413	Oil and gas fields exploration services	7
1389	2131, 2371, 2389	Oil and gas fields exploration services, not elsewhere classified	9
2911	3241	Petroleum refining	7
4612	4861	Crude petroleum pipelines	0
4613	4869	Refined petroleum pipelines	0

3.3. Measurements

3.3.1. Dependent variable: Corporate Social Performance

The dependent variable of this study is the *corporate social performance* of non-renewable energy firms. This variable will be measured by means of the combined score of economic, environmental, social and governance (ESG) measures, using the Thomson Reuters' Eikon database. This measure is used by a number of recent prior studies (e.g. Eding, Scholtens 2017; El Ghoul et al. 2017; Ioannou, Serafeim 2012; Maon et al. 2017; Tarmuji et al. 2016) and is considered to be comprehensive and standardized as it is collected through a consistent strategy across national boundaries (Tarmuji et al. 2016). The Eikon ESG score is chosen as measure for CSP for several reasons. First of all, it is a global dataset which covers more than 7000 companies which makes it much more internationally diversified compared to the KLD index, another widely used measure of CSP, which only captures data on US firms (Eding, Scholtens 2017). The second reason is that the data is highly objective, easily accessible and very usable for quantitative analysis (Ioannou, Serafeim 2012). This study utilized the combined ESG score which is a result of overlaying the ESG score with ESG controversies in order to provide a comprehensive evaluation on the impact and conduct of the company's sustainability (Refinitiv Reuters 2019). The value of the combined ESG score ranges from 0-100 with 100 being the highest possible score (Refinitiv Reuters 2019).

3.3.2. Independent variables: product diversification

The independent variables of this study represent *related, unrelated, total product diversification*. Based on extensive literature on diversification (Baysinger, Hoskisson, 1989; Jacquemin, Berry 1979; Palepu 1985; Hitt et al. 1997; Hoskisson, Johnson 1993), the entropy measure of diversification is utilized to measure the independent variables of this study. This measure is chosen because it takes into account the number of segments in which a firm operates as well as the relative importance of each segment in terms of sales (Palepu 1985). The advantages of the entropy measure are the high levels of objectivity, reliability and the ability to

consider the type and level of diversification concurrently (Martin, Sayrak 2003; Patrisia, Dastgir 2017; Sambharya 2000). Moreover, similar studies (Kang 2013; Patrisia, Dastgir 2017) used the same entropy measurement. The data for this variable was derived from the Compustat IQ database. For a detailed description of these three variables see appendix B.

3.3.3. Moderating variables: institutional environments and introduction of SDG's

Sustainable Development Goals. In order to examine how the Sustainable Development Goals, which serves as a moderating variable, affect the relationship between product diversification and CSP, the main relationship will be studied over a time period. The SDGs are adopted in September 2015, and officially came into force on January 1st, 2016 (United Nations 2019), which means that panel data is able to capture the differences over the years. The selected time period is from 2011-2018 in order to be able to investigate the possible differences between the relationship four years before and the three years following from the adoption of the Sustainable Development Goals. This is a similar approach to Jimenez-Parra, Alonso-Martinez and Godos-Diez (2018) who used a time frame of eight years (2006-2013) to investigate the effect of regulation.

Exposure to weak institutional environments. The second moderating variable of this study represents the *exposure to weak institutional environments.* Since the literature does not present a specific measure for this variable, the measurement is an adaptation based of a commonly used measure of internationalization in the context of CSR research. Oftentimes, internationalization is measured as the number of unique countries a firm operates in (Bansal 2005; Keig 2013; Strike et al. 2006), but this measure does not take into account the intensity and depth of exposure to foreign host country environments. Therefore, an additional measure is to count the number of foreign subsidiaries that a firm has formed (Chetty et al. 2006; Strike et al. 2006). Since the aim of the moderating variable is to measure the effect of exposure to weak institutional host country environments, the measure was adapted by specifying the presence of subsidiaries in developed and least developed countries. For a detailed description see appendix B. The development

of countries was defined in line with the United Nations World Economic Situation and Prospects (WESP) country classification (019). For the purpose of measuring the moderating variable in this study, the countries classified within the categories developing and least developed countries were considered as *weak institutional environments.*

Unlike the other variables, the moderating variable will only be tested in the year 2018 since the required subsidiary panel data was not available in the Orbis database.

3.3.4. Control variables: firm and market conditions

In order to rule out alternative explanations, this study includes several control variables that have been proven to impact corporate social performance in prior research. Firm size, firm performance, firm age, and market-to-book ratio have been included as control variables on the firm level, where CSP means have been included on the industry- and country level.

Firm size: The first control variable included is firm size as larger firms generally have a higher CSP due to the fact that they have the resources available to invest in socially responsible behavior (Liang, Renneboog 2017; Perrini et al. 2007; Useem 1988). In addition to larger firms having more opportunities to invest in CSR, larger firms are more visible to the public which means they face higher levels of stakeholder pressure which in turn might lead them to behave more responsibly (Brammer et al. 2006). In line with previous studies, the number of full-time employees was used as a proxy for firm size (Baumann-Pauly et al. 2013; Kang 2013; Perrini et al. 2007), which was logarithmically transformed in order to ensure normality.

Firm age: Firm age is included as a control variable as it has been proven to have a positive effect on CSP (Withisuphakorn, Jiraporn 2017). Firm age has been measured as the logarithm of the number of years since the company was founded from 2011-2018.

Market-to-book ratio: The market-to-book ratio was included to control for the existence of intangible assets such as R&D capability and brand strength since it may affect the CSP of firms (McWilliams, Siegel 2000; Kang 2013). The market-

to-book ratio is able to determine the growth opportunities or the potential to grow (Choi, Moon 2016). The market-to-book ratio was included as a control variable rather than other predicting measures such as R&D data since this data was unavailable for the firms within the sample.

Firm performance: The fourth control variable included represents firm performance as it is expected to have a positive effect on CSR commitment. As CSR might be considered as a costly choice for firms, it is rather sensitive to the existence of slack resources (Jackson, Apostolakou 2010). Thus, firms with a higher amount of slack resources are more likely to invest in CSR (Waddock, Graves 1997) and consequently have a higher CSP score (Jackson, Apostolakou 2010). Following similar studies (Kang 2013; Patrisia, Dastgir 2017), firm performance is measured by calculating the Return on Assets (ROA), which reflects the operating performance of the firm by presenting the asset utilization (Griffin, Mahon 1997; Vitezić et al. 2012). The data was derived from the Compustat database.

Industry level effects: In order to control for industry differences in CSP, the mean CSP scores by industry (two-digit SIC code) are included, following prior related studies (Kang 2013; Patrisia, Dastgir 2017). Controlling for industry level effects is especially important for the energy industry in general since CSR practices seem to be adopted uniquely within the industry (Frynas 2009). The data for this variable was calculated as the mean ESG score per industry, derived from the Thomson Reuters' Eikon database.

Country level effects: Following a similar line of reasoning as industry-level effects, the mean CSP scores by country are included as a control variable. Frynas (2009) argues that the interpretation of CSR differs tremendously per country, meaning that country standards might have an effect on the adoption of CSR. Similarly, this variable was calculated as the mean ESG score per country for every industry, derived from the Thomson Reuters' Eikon database. Moreover, STATA offers the possibility to control for fixed country level effects, using location of the headquarters, which is included in the analysis as well.

3.3.5. Conceptual model

The following conceptual model (Figure 2) illustrates the expected relationships while including the control variables discussed in this chapter and our hypotheses are included as well.

Figure 1. Conceptual model including control variables
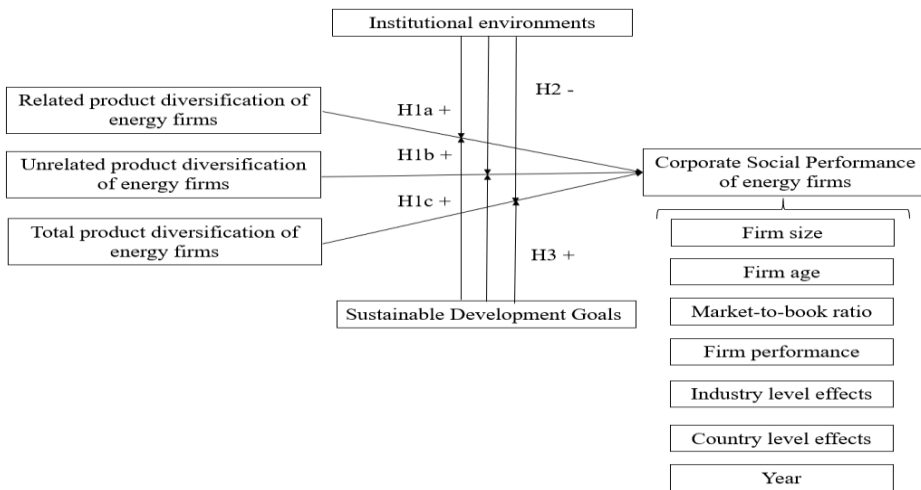
3.3.6. Data analysis

In order to gain insights in the relationship between product diversification and CSP, several regression analyses will be conducted. The regression technique used to analyze the relationship is Ordinary Least Squares (OLS) regression. This technique is a suitable approach when the dependent variable is continuous, which is the case for CSP. The panel data was analyzed using fixed effects. Fixed effects is a suitable approach when the aim is to explore the relationship between independent and dependent variables within an entity (Torres-Reyna 2007). Moreover, considering the relatively large amount of control variables, interaction effects between control variables and independent variables have been disregarded and therefore this study only measures the direct effect of the control variables.

In addition to the regular regression analysis, lagged regression is applied for hypothesis 3. Time lags account for the fact that certain events can take time to have an effect on the dependent variable, which makes them highly useful within panel data. Since CSP is a long-term oriented indicator, lagged regression can anticipate the effect of product diversification towards CSP which did not occur immediately or in the same period (Patrisia, Dastgir 2017). Moreover, lagged analysis makes it possible to analyze the effect of the SDGs in a later period in time, which allows for a delay in the reaction of the firm after the adoption of the goals. Therefore, after running the regular regression analysis for hypothesis 3, the regression was repeated with lagged independent and moderating variables. While the choice of time lags is highly debated (Dormann, Griffin 2015), this paper uses 1-, and 2-year lags as the SDGs were officially enforced in 2016, while the total panel runs until the end of 2018.

4. Results

4.1. Descriptive statistics and preliminary analysis

Table 2 portrays an overview of the descriptive statistics of the variables used in this research. The sample consists of 40 individual firms originating from 15 countries, these firms have been analyzed over a time frame of 7 years which totals to 320 observations for every variable. An exception here is the exposure to weak institutional environments of which the sample consisted of 55 firms which were only analyzed over a 1-year time frame. This will be further explained in the results section. Table 3 presents the descriptive statistics of the variables used for hypothesis 2.

The descriptive statistics in Table 2 show that the minimum and maximum CSP scores differ tremendously with a minimum of 15.46 and a maximum of 89.02 respectively, which means that higher and lower CSP levels are well represented in the sample. The mean CSP score for all firms is similar to the CSP industry and country means, however, the minimum and maximum scores of those variables are much lower and difference between them much smaller. In terms of the independent

variables, a striking difference can be noted between related product diversification and unrelated and total product diversification. All minima are 0 which means that there are firms in the sample who are not diversified at all, however, the means and maxima show that the values of unrelated diversification are much higher than related product diversification, with a mean of 0.212 versus 0.0561 respectively.

Hence, the level of unrelated product diversification is higher than related product diversification. Finally, it is important to notice that the minimum value for exposure to weak institutional environments is 0 (Table 3) and the maximum is 1. Hence, there are firms present in the sample that are not at all exposed to weak institutional environments and firms who are merely operating in weak institutional environments.

Table 4 represents the correlation matrix of all variables used in this study. Using an absolute threshold of 0.7 (Dormann et al. 2013) the correlation matrix shows that total product diversification and related product diversification are strongly correlated with a significant value of 0.921. However, this does not come as a surprise since total product diversification is calculated as the sum of related and unrelated product diversification. Since the independent variables will never be used in the same model, this breach is not expected to distort the results of this study. Furthermore, year and SDGs effective are highly correlated with a significant value of 0.845. This correlation was expected since the adoption of the SDGs was measured as a dummy variable of year. Since the SDGs are a time-dependent variable, both will still be utilized in this study

Before using regression analysis, several tests were conducted for the classical assumptions of OLS regressions, including normality, heteroskedasticity, and correlation. The outcomes of these tests are described in detail in Jongsma (2020).

Table 2. Descriptive statistics hypothesis 1 and 3

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	mean	sd	min	max
Dependent variable					
CSP	320	48.76	15.97	15.46	89.02
Independent variables					
Related Product Diversification	320	0.0561	0.119	0	0.587
Unrelated Product Diversification	320	0.212	0.295	0	1.540
Total Product Diversification	320	0.268	0.300	0	1.578
Moderating variable					
SDGs effective	320	0.693	0.462	0	1
Control variables					
CSP Industry Mean	320	45.06	4.133	40.68	56.73
CSP Country Mean	320	44.00	2.061	39.97	51.96
Firm Age	320	53.17	30.77	2	131
- Log Firm Age	320	3.767	0.712	0.693	4.875
Firm Size	320	31,274	84,181	115	552,8
- Log Firm Size	320	8.779	1.754	4.745	13.22
Market-to-book ratio	320	1.577	1.537	-9.991	9.526
Firm Performance	320	-0.00277	0.238	-3.301	0.566
Company	320	20.50	11.56	1	40
Country	320	10.13	5.320	1	15
Year	320	2,015	2.295	2,011	2,018
CSP Lag 1	280	48.521	16.381	15.46	89.02
CSP Lag 2	240	47.285	16.06	15.46	89.02

Table 3. Descriptive statistics hypothesis 2

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	mean	sd	min	max
Dependent variable					
CSP	55	48.095	13.10	20.32	75.23
Independent variables					
Related Product Diversification	55	0.0390	0.956	0	0.366
Unrelated Product Diversification	55	0.153	0.237	0	1.055
Total Product Diversification	55	0.192	0.242	0	1.055
Moderating variable					
Exposure to Weak Environments	55	0.211	0.257	0	1
Control variables					
CSP Industry Mean	55	44.33	1.581	43.09	47.67
CSP Country Mean	55	43.87	1.383	40.92	47.67
Firm Size	55	21,640	67,035	60	476,223
- Log Firm Size	55	8.256	1.836	4.174	13.07
Company	55	20.50	11.56	1	55
Country	55	10.13	5.601	1	15
Year	55	2018	0	2018	2018

Table 4. Correlation matrix

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1. CSP	1											
2. Related PD[1]	0.0958	1										
3. Unrelated PD	0.0779	-0.166**	1									
4. Total PD	0.115*	0.921***	0.232***	1								
5. SDGs effective	0.138*	-0.0306	-0.0147	-0.0360	1							
6. CSP country mean	-0.0384	-0.0781	-0.0901	-0.113*	0.296***	1						
7. CSP industry mean	0.189***	0.0135	-0.0561	-0.00888	0.0873	0.150**	1					
8. Firm age	0.0487	0.0946	0.0414	0.110*	0.0833	0.194***	0.239***	1				
9. Firm size	0.0469	0.438***	0.0446	0.450***	-0.0624	0.181**	0.194***	0.245***	1			
10. Market-to-book ratio	-0.00395	0.0115	0.143*	0.0679	-0.0867	-0.156**	-0.151**	-0.00930	-0.0345	1		
11. Firm performance	-0.0297	0.0814	-0.00763	0.0773	-0.0266	-0.0734	0.0127	0.0299	0.160**	0.177**	1	
12. Year	0.167**	-0.0312	-0.00508	-0.0328	0.845***	0.317***	0.0940	0.101	-0.0578	-0.151**	-0.128*	1

$^*p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

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[1] PD = Product Diversification.

4.2. Regression results

Tables 5, 6 and 7 present the results of the Ordinary Least Squares regression analysis using fixed effects and robust standard errors. An overview of the variables and scales used in the regression for a better understanding of the unstandardized coefficients can be found in appendix B. As there are three hypotheses tested through regression analysis, each will be discussed individually. In addition, for hypothesis 3, 1-, and 2-year lags were conducted and analyzed which can be found in Table 8.

4.2.1. The relationship between product diversification and CSP

Table 5 presents the results of the first regression analysis, where model 1 only includes the control variables for comparative purposes and in model 2, 3, and 4 the independent variables are included individually. Due to the high correlation between related product diversification and total product diversification, it was not possible to include a model with all the independent variables.

After the inclusion of the independent variable related product diversification in model 2, the control variables CSP country mean and firm size remain highly significant, and the significance level of CSP industry mean decreases to $p<0.05$. The inclusion of related product diversification evokes the *R-squared* to increase from 29.4% to 32%, thus slightly increasing the explanatory power of the model. However, related product diversification itself has a negative, though insignificant effect on CSP (β=-5.258, $p>0.1$), therefore not supporting hypothesis 1a.

Model 3 includes the independent variable unrelated product diversification which increases the *R-squared* to 32.6%. Moreover, unrelated product diversification has a positive and significant effect on CSP (β=7.066, $p<0.1$), which provides support to hypothesis 1b. Hence, if the level of unrelated product diversification increases, firms perform better in terms of CSR.

Finally, model 4 includes the independent variable total product diversification, which results in a *R-squared* of 32.3%. The control variables CSP industry mean, CSP country mean, and firm size remain positive and significant. However, total product diversification has a positive, yet insignificant effect on CSP (β=5.482, $p>0.1$) Therefore, hypothesis 1c was not supported.

Table 5. OLS regression resuls for hypothesis 1

CSP (H1)	(1)	(2)	(3)	(4)
VARIABLES	Model 1	Model 2	Model 3	Model 4
Control variables				
CSP industry mean	0.716***	0.594**	0.630**	0.644**
	(0.242)	(0.257)	(0.254)	(0.254)
CSP country mean	2.212***	2.242***	2.194***	2.169***
	(0.720)	(0.767)	(0.785)	(0.787)
Firm size (log)	2.899***	3.247***	2.967***	2.857***
	(0.736)	(0.744)	(0.727)	(0.732)
Firm age (log)	-1.889	-1.199	-2.400	-2.070
	(1.783)	(1.783)	(1.801)	(1.783)
Market-to-book ratio	-0.0965	-0.097	-0.1906	-0.168
	(0.440)	(0.442)	(0.447)	(0.442)
Firm performance	-1.150	-0.616	-0.958	-0.819
	(2.697)	(2.608)	(2.552)	(2.522)
Country fixed effects	Yes	Yes	Yes	Yes
Independent variables				
Related PD		-5.258		
		(7.700)		
Unrelated PD			7.066*	
			(3.899)	
Total PD				5.482
				(3.883)
Constant	-86.31***	35.39	37.84	36.29
	(31.75)	(34.55)	(35.27)	(35.28)
Observations	320	320	320	320
R-squared	0.294	0.320	0.326	0.323
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1				

4.2.2. The moderating effect of exposure to weak institutional environments

Table 6 presents the results of the second regression analysis which is, unlike the other regressions, only conducted over the year 2018. However, due to missing data, 40 firms are not sufficient to run a regression with all the control variables included, since a proper regression analysis requires a minimum of 10 observations per variable (Tabachnic, Fidell 2007). Therefore, the sample size was increased by 15 firms which provided the necessary data in the year 2018. This brings the total number of observations to 55, which means that 5 variables can be included in the analysis. Since the first regression revealed that only the CSP industry mean, CSP country mean and firm size are significant predictors of CSP, they have been

included in the second regression while the insignificant control variables were left out.

Table 6. OLS Regression results for hypothesis 2

CSP (H2)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Control Variables							
CSP industry mean	-0.848 (1.150)	-0.847 (1.165)	-0.726 (1.224)	-0.721 (1.224)	-0.687 (1.332)	-0.501 (1.300)	-0.416 (1.376)
CSP country mean	-3.164*** (0.906)	-3.149*** (0.931)	-3.809*** (1.031)	-3.680*** (0.992)	-4.322** (1.600)	-5.102*** (1.670)	-5.136*** (1.831)
Firm size (log)	2.957** (1.457)	2.932* (1.496)	2.582* (1.510)	2.441 (1.609)	3.418** (1.663)	3.127 (1.894)	3.029 (2.008)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Independent variables							
Related PD		1.833 (14.79)			4.221 (23.04)		
Unrelated PD			12.65 (10.19)			11.41 (25.34)	
Total PD				11.96 (10.27)			9.953 (21.66)
Interactions							
Weak environments					-9.278 (10.88)	-10.14 (10.17)	-11.30 (11.88)
Related PD × Weak environments					-6.497 (98.25)		
Unrelated PD × Weak environments						4.784 (54.68)	
Total PD × Weak environments							9.204 (48.48)
Constant	220.1*** (69.92)	219.5*** (71.34)	245.1*** (69.97)	240.3*** (70.08)	266.3*** (85.10)	294.5*** (84.77)	293.6*** (88.45)
Observations	55	55	55	55	55	55	55
R-squared	0.374	0.374	0.396	0.395	0.392	0.414	0.416
Robust standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$							

Similar to the first result table, model 1 only includes the control variables and in model 2, 3, and 4 the independent variables are added individually. Additionally, model 5, 6, and 7 present the interaction effect of the exposure to weak institutional environments with the respective independent variables.

Since a relatively low number of individual coefficients in the regression show a significant effect on CSP, this section will not discuss all models separately but focus on the striking details. Though a lower amount of the individual coefficients are significant in the second regression, the *R-squares* are higher compared to the first regression models and increase steadily with the inclusion of the independent variables and interactions. However, none of the independent variables, nor the interactions are significant. The most logical explanation for the increased *R-squares* is that the explanatory power is higher due to the small number of observations, being 55 rather than 320. Due to the low number of observations, the standard errors are also quite high. For these reasons, it should be concluded that hypothesis 2 cannot be confirmed based on the regression results, implying that the exposure to weak institutional environments does not have a moderating effect on the relationship between product diversification and CSP.

4.2.3. The moderating effects of the Sustainable Development Goals and lagged analyses

Table 7 presents the results of the third regression model, including the moderating effect of the enforcement of the Sustainable Development Goals in 2016, as illustrated in model 1, 2, and 3.

Model 1 shows that after the inclusion of the interaction effect between related product diversification and the SDGs, there is a slight increase in the *R-Squared* of 32% to 32.3%. However, related product diversification remains to have a negative, though insignificant effect (β=-10.54, p>0.1), whereas the interaction effect has a positive, insignificant effect on CSP (β=13.91, p>0.1).

Model 2 shows very striking and surprising results for the interaction effect between unrelated product diversification and the SDGs. The individual effect of unrelated product diversification is positive and highly significant (β=11.83, p<0.01), and the effect of the adoption of the SDGs also has a positive and significant effect on CSP (β=8.336, p<0.5). However, when the interaction effect is included, it becomes clear that the SDGs have a strong weakening and significant effect on the relationship between unrelated product diversification and CSP (β =-15.20, p<0.01). As this result was very unexpected, a margins plot, Figure 3, was

created in Stata to graphically show the weakening moderating effect. The red line shows the effect of unrelated product diversification on CSP after the SDGs were adopted, while the blue line represents the relationship before the adoption of the SDGs. From the margins plot it becomes clear that at lower levels of unrelated product diversification, CSP levels are higher once the SDGs are adopted, but the CSP immediately decreases when levels of unrelated product diversification increase. The exact opposite happens before the SDGs were adopted, thus, low levels of unrelated product diversification are favorable after the adoption of the SDGs where high levels of unrelated product diversification were favorable before 2016. The two lines cross each other at a level of 0.5, being a moderate level of diversification.

Model 3 shows similar results as model 2 but the coefficients and significance levels are slightly lower. The *R-Squared* increases from 32.3% to 33.6% with the inclusion of the interaction effect between total product diversification and CSP. The effect of total product diversification is now positive and significant (β=9.387, p<0.5), and the adoption of the SDGs still has a positive and significant effect on CSP (β=8.513, p<0.5). However, similar to model 2, the interaction effect between total product diversification and the SDGs is negative (β=-12.94, p<0.5). This effect was again graphically depicted in a margins plot in Figure 4. As illustrated in the margins plot and the coefficients in model 3, the interaction effect of total product diversification is a little less strong compared to unrelated product diversification but it follows a similar pattern.

Figure 3. Moderating effect of unrelated product diversification x SDGs
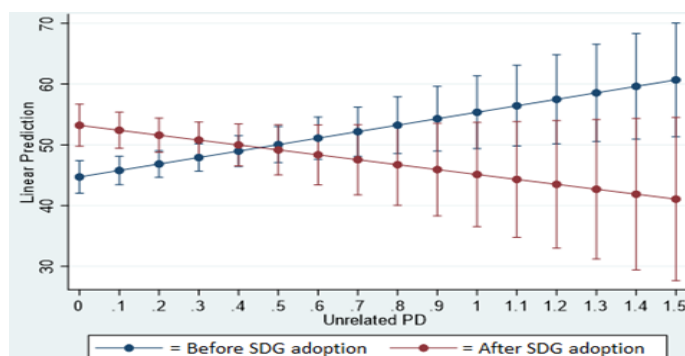
Figure 4. Moderating effect of total product diversification x SDGs
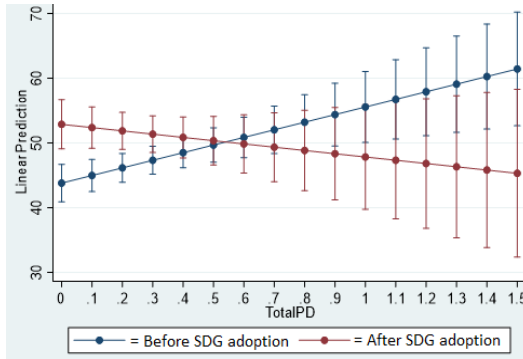
In addition to analyzing the regular moderating effect of the SDGs, 1-, and 2-year analyses were conducted which can be found in Table 8. Model 1, 2, and 3 represent the 1-year lag analysis and model 4, 5, and 6 illustrate the 2-year lag analysis of the interaction effects.

Compared to Table 7, the lagged analysis show similar results in terms of the independent variables and the interaction effects. However, the beta coefficients and significance levels increased significantly, and while the direct effect of the SDGs is not significant anymore, the SDGs provide significant interaction effects throughout all lagged analyses. The lagged analyses resulted in a significant, negative relationship between related product diversification and CSP of which the effect is weakened by the SDGs in the lagged analysis. Contrastingly, unrelated and total product diversification are positively and significantly related to CSP and the adoption of the SDGs weaken this relationship. Since it was hypothesized that the SDGs would strengthen the positive relationship between product diversification and CSP, hypothesis 3 is not confirmed as both the regular as well as the lagged regression results show that the SDGs weaken the positive relationship.

Table 7. OLS regression results for hypothesis 3

CSP (H3) Variables	(1) Model 1	(2) Model 2	(3) Model 3
Control Variables			
CSP industry mean	0.583** (0.259)	0.614** (0.255)	0.637** (0.255)
CSP country mean	-0.596 (0.770)	-0.241 (0.798)	-0.258 (0.808)
Firm size (log)	3.282*** (0.747)	3.012*** (0.718)	2.892*** (0.718)
Firm age (log)	-2.110 (1.815)	-2.439 (1.779)	-2.327 (1.787)
Market-to-book ratio	0.103 (0.437)	0.00826 (0.432)	0.0386 (0.434)
Firm performance	-0.349 (2.547)	-1.046 (2.431)	-1.142 (2.488)
Country fixed effects Year	Yes Yes	Yes Yes	Yes Yes
Independent Variables			
Related PD	-10.54 (9.781)		
Unrelated PD		11.83*** (4.239)	
Total PD			9.387** (4.233)
Interactions			
SDGs effective	5.132 (3.404)	8.336** (3.327)	8.513** (3.391)
Related PD x SDGs effective	13.91 (12.81)		
Unrelated PD x SDGs effective		-15.20*** (4.812)	
Total PD x SDGs effective			-12.94** (5.078)
Constant	38.21 (34.73)	21.89 (35.73)	20.17 (36.09)
Observations	320	320	320
R-squared	0.323	0.343	0.336
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1			

Table 8. OLS regression results for lagged analysis of hypothesis

CSP	1-Year Lag	1-Year Lag 1	1-Year Lag	2-Year Lag	2-Year Lag	2-Year Lag
VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Control variables						
CSP industry mean	0.403 (0.263)	0.470* (0.253)	0.484* (0.254)	0.372 (0.274)	0.428 (0.261)	0.449* (0.267)
CSP country mean	0.328 (0.780)	0.274 (0.854)	0.251 (0.851)	0.120 (1.007)	0.146 (1.145)	0.141 (1.138)
Firm size (log)	3.219*** (0.771)	2.572*** (0.701)	2.518*** (0.730)	3.559*** (0.831)	2.702*** (0.772)	2.640*** (0.818)
Firm age (log)	-2.578 (1.826)	-2.896 (1.798)	-2.656 (1.823)	-3.101* (1.801)	-3.394* (1.755)	-3.095* (1.801)
Market-to-book ratio	-0.594 (0.512)	-0.679 (0.485)	-0.633 (0.489)	-0.364 (0.470)	-0.578 (0.418)	-0.542 (0.431)
Firm performance	-3.498 (4.568)	-2.959 (4.364)	-2.899 (4.450)	-1.609 (3.355)	-1.018 (3.318)	-0.925 (3.381)
Country fixed effects	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
Independent variables						
Related PD	-24.62** (9.708)			-36.18** (9.986)		
Unrelated PD		13.45*** (4.625)			18.76*** (5.082)	
Total PD			7.901 (4.868)			11.44** (5.615)
Interactions						
SDGs effective	-5.111 (3.852)	-1.136 (3.893)	-1.357 (3.924)	-2.968 (3.726)	3.479 (3.564)	2.869 (3.726)
Related PD × SDGs effective	22.00* (12.17)			33.70*** (12.17)		
Unrelated PD × SDGs effective		-12.79*** (4.747)			-18.98*** (4.829)	
Total PD × SDGs effective			-9.209* (5.336)			-13.51** (5.472)
Constant	23.99 (35.69)	22.10 (38.68)	20.51 (38.53)	32.95 (44.03)	26.70 (50.14)	23.89 (49.84)
Observations	280	280	280	240	240	240
R-squared	0.334	0.344	0.329	0.333	0.350	0.326
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1						

5. Discussion

5.1. Overview of the results

This study was designed to investigate the relationship between product diversification and corporate social performance of non-renewable energy firms, and how the exposure to weak institutional environments and the Sustainable Development Goals influence this relationship. Table 9 presents an overview of the results from the regression analyses, which will be discussed in more detail in the remaining part of this section.

Table 9. Hypothesis results

Hypothesis	Results
Hypothesis 1a: Related product diversification is positively related to CSP	Not confirmed
Hypothesis 1b: Unrelated product diversification is positively related to CSP	Confirmed
Hypothesis 1c: Total product diversification is positively related to CSP	Not confirmed
Hypothesis 2: Exposure to weak institutional environments weakens the positive relationship between product diversification and CSP	Not confirmed
Hypothesis 3: The SDGs strengthen the positive relationship between product diversification and CSP	Contradictory

5.2. Discussion of the results

5.2.1. The relationship between unrelated product diversification and CSP

Based on an extensive literature review and building upon stakeholder theory, the first hypothesis stated that all forms of product diversification were positively related to the CSP of firms operating in the energy industry. The positive and significant effect of unrelated product diversification was expected for several reasons, all linking back to the perspective of the stakeholder view, which states that firms create value by taking into account all groups related to them (Freeman 1984). Linking the importance of stakeholder demands to product diversification, it is important to notice that CSR standards are usually shared on a specific industry level (Frynas 2009), but the interpretation and significance level to diverse societal

issues differs tremendously between industries. Therefore, since expanding into unrelated product markets means firms need to deal with a broader and more diverse amount of stakeholders in order to gain legitimacy, it does not come as a surprise that our results pointed out that unrelated product diversification is positively related to CSP. This outcome is in line with similar studies of Kang (2013) and Patrisia and Dastgir (2017), who also found a positive relationship, though the sample and setting of their studies was very different.

5.2.2. The relationship between related product diversification and CSP

Kang (2013) and Patrisia and Dastgir (2017) both found a negative and significant effect between related product diversification and CSP. This paper did not follow their results and contrastingly hypothesized that related product diversification was positively related to CSP for several reasons. As mentioned before, Kang (2013) and Patrisia and Dastgir (2017) used a different sample in their study, where the first focused on US-based firms operating in different industries and the latter on manufacturing firms from Indonesia. Since this paper focuses on the energy industry, which is highly susceptible to regulatory changes, we expected that firms who diversified into related areas would still have a positive effect on CSP. Connecting the 'greening' process theory of Steen and Weaver (2017) with the increased stringency of regulations in the energy industry, we expected that incumbents would invest more in renewable energy (Lund 2009) which would in turn increase their CSP. However, there are also numerous arguments against the positive relationship (McCarthy 2018; Li et al. 2016), while having a number of downsides in terms of coordination costs (Patrisia, Dastgir 2017). However, all of these arguments are reasoned from a cost perspective in terms of corporate financial performance rather than corporate social performance which provides value in a different way. Moreover, from a stakeholder perspective it could be argued that relatedly diversified firms still must deal with more stakeholders than focused firms. Since the area is highly understudied and provides insignificant results in this current study, we recommend future research on the topic to obtain more conclusive results.

5.2.3. The relationship between total product diversification and CSP

Finally, hypothesis 1c stated that total diversification would be positively related to CSP. This hypothesis was included in order to investigate the combined effect of related and unrelated product diversification and was therefore expected to be positive. However, the results reveal a positive, insignificant effect of total product diversification on CSP. Patrisia and Dastgir (2017) expected a positive relationship as well but did not find a significant effect. This could be due to the fact that the signs of related and unrelated product diversification were different in the first place. Another possible explanation of the insignificant effects of both related and total product diversification could be that the two variables turned out to be highly correlated (0.921, $p<0.001$). However, this does not explain the difference in sign while both types of diversification were expected to be positive based on the literature. This could be due to the fact that unrelated diversification proportionally added more to total diversification compared to related product diversification due to the higher values as presented in the descriptive statistics (Table 2). Nevertheless, due to the insignificance of the results, no conclusions can be drawn which in turn provides avenues for future research in the field of both related and total product diversification.

5.2.4. The moderating effect of exposure to weak institutional host country environments

Hypothesis 2 was based on a combination of institutional theory and stakeholder theory and stated that the exposure to weak institutional environments would weaken the relationship between product diversification and CSP. The model of Barrena-Martinez et al. (2015) explains how institutional theory and stakeholder theory function as the two solid pillars in the macro- and micro-context explaining the pressure that lead firms to engage in CSR, as operating in different institutional environments complicates gaining internal as well as external legitimacy (Hillman, Wan 2005; Kostova, Roth 2002). Since weaker institutional environments increase opportunities for corporate social irresponsibility (Mair, Marti 2008; Matten, Moon 2008), we expected that isomorphic pressures would lead firms to imitate the lower levels of CSP of their host country competitors (Reimann et al. 2015). However,

Table 6 shows that both the direct effect of exposure to weak institutional environments and its interaction with product diversification are insignificant. Thus, the empirical analysis does not support the moderating effect of weak institutional environments.

The first and most pertinent possible explanation of the insignificant results would be the low number of observations, as this hypothesis was only tested over a 1-year time frame with 55 firms. Another possible explanation of the insignificant effect could be that most firms in the sample were large firms who are more likely to publish sustainability reports and are thus more likely to be included in the sample. These firms generally commit more to CSP due to their visibility and the availability of resources and data (Brammer et al. 2009; Drempetic et al. 2017; Perrini et al. 2007), which is confirmed by the positive significant effect of firm size on CSP in most regression models. This suggests that regardless of the level of internationalization or exposure to weak environments, larger firms generally have a higher level of CSP. Moreover, looking at the other control variables, it can be concluded that the CSP country mean has a highly significant, but negative effect on CSP on the firm level throughout all regression models. This outcome confirms Matten and Moon's (2008) argument that CSR is embedded in the institutional system of a country. This suggests that the average CSP score in the home country is a strong predictor of the CSP score of firms, meaning that they may be less susceptible to social demands and expectations in the host country. This argument is strengthened by the fact that the measurement of CSP in this study is an aggregation of CSP attributes of the firm in general. Thus, negative activities in weaker institutional environments might be overshadowed by positive practices in developed countries which could be another possible explanation for the insignificant effects.

5.2.5. The moderating effect of the adoption of the Sustainable Development Goals

Finally, hypothesis 3 expected that the adoption of the SDGs would strengthen the positive relationship between product diversification and CSP. This interaction effect was expected since firms are externally driven by the SDGs to set goals

regarding their impact on the future (Busco et al. 2018). Moreover, long-term orientation has been found to have a positive effect on the relationship between product diversification and CSP (Kang 2013). Hence, since the SDGs are long-term goals and function as an exogenous driver of sustainable effort (Schrettle et al. 2013), we argued that SDGs would positively moderate the main relationship. To our surprise, the regression results as displayed in Table 7 prove an opposite interaction effect with unrelated and total product diversification. The direct effect of the SDGs show a positive effect on CSP, which can be explained by the arguments above as well as by increased legitimacy due to improved stakeholder relations (Busco et al. 2018). However, when interacted with unrelated and total product diversification the SDGs prove to have a strong weakening, significant effect on the relationship. The direct and interaction effect of the SDGs was not present in the model that included related product diversification. Interestingly, in the lagged analyses, related product diversification has a highly negative, significant direct effect on CSP and a positive interaction effect with the SDGs, while the direct effect of the SDGs is not significant anymore in any of the lagged models. This demonstrates how it might take time for events and regulations to have an effect on certain firm behavior.

Though very unexpected, the results open up new opportunities for the discussion of different views and possible explanations. First of all, it is important to reiterate that SDG goal 7: "*Ensure access to affordable, reliable, sustainable and modern energy for all"* (United Nations 2019) is one of the most important goals (Stakeholder Forum 2015) because energy is central to almost every major challenge in the world today. Access to energy is therefore one of the core components on the agenda, but the production of sustainable, renewable, energy is also pivotal since the current energy production is a source of climate change, accounting for 60% of the greenhouse gas emissions (United Nations 2019). Therefore, it would be fair to assume that in order to reach the goals, policies for non-renewable energy incumbents become more stringent which could lead firms to flight into unrelated markets. McCarthy (2018) argues that traditional energy firm who try to escape the regulations by diversifying into different markets will reduce the value of their current assets, while creating value in new markets is difficult and expensive.

Therefore, we assume that the financial performance of these firms will decrease, leaving them with less resources available to invest in social performance. This assumption also provides an explanation as to why the relationship between related product diversification and CSP is positively affected by the SDGs and unrelated and total product diversification is negatively affected.

"Firms investing in related areas such as renewable energy will continue to gain value and at the same time perform better in CSR, hence, the SDGs offer those firms compelling growth opportunities. Contrastingly, firms who try escape the market into unrelated areas to evade regulations might destroy their value added."

5.3. Theoretical contributions and managerial implications

By combining stakeholder theory with institutional theory, the relationship between product diversification and CSP within the non-renewable energy industry was studied. By doing so, our paper contributes to existing literature in several ways and in turn provides implications for managers.

Theoretical contributions

First of all, while the relationship between product diversification and corporate financial performance is a highly studied topic in existing research (Kang 2013), the relationship between product diversification and CSP remains largely understudied. The lack of research on the topic is interesting since diversified firms face a more complex set of stakeholders, meaning that it would be fair to assume that previous research would link product diversification to a stakeholder demand focused measure. Therefore, our paper responds to the call of Kang (2013) to conduct more boundary spanning research connecting CSP and other corporate phenomena in order to gain a more complete understanding of corporate actions. By putting an emphasis on the relationship within the energy industry specifically, this research also contributes to the question as to whether CSR practices are distributed unevenly within the industry (Frynas 2009). Understanding this discrepancy is of utmost importance since energy is one of the most important resources in the world and firms operating in the industry have a vulnerable position towards their stakeholders.

The importance of research in the energy industry is confirmed by the emphasis the United Nations put on Goal 7 of the SDGs. Therefore, the SDGs were included in this research in order to investigate how they affect the relationship between product diversification and CSP within the energy industry. This was done by conducting a longitudinal study as suggested by Patrisia and Dastgir (2017), where the difference could be measured since the adoption of the goals.

"Despite the unexpected negative interaction effects of the SDGs with unrelated and total product diversification, our results opened up opportunities for new insights and discussion of the impact of the goals and its corresponding regulations have on diversified firms."

Managerial implications

In addition to the theoretical contributions this research delivers to the literature, it also offers several implications for managers of energy firms. First of all, this study helps managers understand how product diversification affects their corporate social performance. In general, in order to increase the CSP of an energy firm, a manager should pay attention to unrelated product diversification. This argument provides a different view on unrelated diversification as previous literature predominantly viewed unrelated diversification as an inefficient and inferior diversification strategy (Berger, Ofek 1995, as cited in Kang 2013). However, if CSP can serve as a long-term predictor of (financial) firm performance and viability (Kacperczyk 2009; Kaplan, Norton 1996; Ogden, Watson 1999), then it could be suggested that unrelated diversification may in fact have a positive effect on firm performance in the long-term (Kang 2013). Moreover, being more unrelatedly diversified means that a firm needs to take into account a higher number of stakeholders. If a firm will take into account those demands, their CSP will likely go up which in terms generate sustainable competitive advantage (Choi, Wang 2009) and better financial performance. However, it could be argued that failing to take into account rising stakeholder demands might turn the relationship into a negative effect (Patrisia, Dastgir 2017). Therefore, we recommend managers to anticipate on

the rising stakeholders demand that result from unrelated diversification in order to reach the desired effect.

However, despite the relationship between unrelated product diversification being positive throughout the years 2011-2018, the SDGs seem to negatively moderate the relationship.

"Hence, in order to continue to capture value from CSP, it is not recommended to invest in unrelated markets from 2016 on, especially not if the aim of diversifying is to escape increasing regulations. Contrastingly, managers are recommended to invest in related markets, such as renewable energy, in order to increase CSP and being able to capture more value."

Finally, although this study does not provide enough empirical evidence to conclude that being exposed to weak institutional host country environments, it is not recommended to diversify into developing countries in order to escape regulations (McCarthy 2016). Hence, in general, it can be concluded that (unrelated) diversification is not necessarily an inferior strategy for firms to increase long-term firm performance as in fact it positively affects CSP.

"However, we argue that it is important to take into account the increased stakeholder demands and it is definitely not recommended to engage into diversification in order to escape regulations, both in terms of diversifying into weak institutional environments as well as in diverse product markets."

Since the adoption of the Sustainable Development Goals it seems more viable for energy firms to invest into related areas such as renewable energy, this way the CSP is likely to go up which in turn positively affects financial performance.

5.4. Limitations

Despite rigorous efforts to ensure the accuracy and validity of this research, there are still some limitations to be discussed which in turn provide avenues and opportunities for future research. These limitations are related to the use of three

different databases and the effects of combining them. This could have had some effects on the results (significance tests) and limitations regarding the measurement of corporate social performance. CSP was measured using the Thomson Reuters Eikon ESG data and while it offered many advantages, such as the international orientation of the database, it also has some limitations.

6. Conclusion

The aim of this research was to provide an answer to the following research questions: *"What is the effect of product diversification on the corporate social performance within energy firms and how is this relationship moderated by the strength of the institutional environment of the host country?"* and *"To what extent is the relationship between product diversification and CSP of energy firms moderated by the adoption of the Sustainable Development Goals since 2015?"*
Multiple regressions analyses revealed that unrelated product diversification is positively related to CSP, while related- and total product diversification provide insignificant results. Moreover, the adoption of the SDGs weaken the positive relationship between unrelated- and total product diversification and CSP, while the goals positively affect the negative relationship between related product diversification, thus finding the contrary of what we expected in hypothesis 3. Unfortunately, the empirical findings were unable to determine whether the exposure to weak institutional environments affects the positive relationship between product diversification and CSP, thus not providing evidence to confirm hypothesis 2. Nevertheless, the findings of our paper contribute to theory and provide managerial implications in different ways. This makes them worth being considered by managers in the energy industry, especially in this time where policies affecting energy firms become more stringent. Hence, while providing new insights extending current literature, this paper also emphasizes the need for future research which could deepen understanding on the topic.

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Appendices
Appendix A. List of definitions

CSR in a broad sense can be described as *"actions that appear to further some social good, beyond the interests of the firm and that which is required by law"* (McWilliams, Siegel 2001: 117). This definition covers all relevant components as well as it captures an MNEs' CSR activities in host countries (Campbell et al. 2012).

CSP -CSR and CSP are interrelated concepts and CSP can be seen as a natural consequence of CSR. This study follows the definition of Wood (1991: 693): *"a business organization's configuration of principles of social responsibility, processes of social responsiveness, policies, programs, and observable outcomes as they relate to firm's societal relationships."* Thus, this definition places CSR into a broader context and constitutes the social performance as the outcome of CSR activities undertaken by a firm (Ioannou, Serafeim 2012).

Related PD - Related product diversification is operationalized as the strategy where a firm expands its business related to its current products and services and/or within the same industry (Chen, Yu 2012).
Unrelated PD - Unrelated product diversification refers to the expansion of a firm's products and services in a different industry or market (Castañer, Kavadis 2013).

Appendix B. Description of variables

Variable	Measure	Value	Item Source
Dependent variable *Corporate social performance*	ESG Score – Aggregated measure derived directly from database	Continuous variable that ranges from 0 (low) to 100 (high)	Thomson Reuters' Eikon
Independent variables *Related product diversification*	Entropy measure of related product diversification: $$DR_j = \sum_{i \varepsilon j}^{n} P_i^j \ln \frac{1}{P_i^j}$$ $$DR = \sum_{j=1}^{m} DR_j \times p_j$$	Entropy measure values range from 0 (low) to 1 (high).	Compustat IQ
Unrelated product diversification	Entropy measure of unrelated product diversification: $$DU = \sum_{i=1}^{m} P_i \times \ln \frac{1}{P_i}$$	Entropy measure values range from 0 (low) to 1 (high). Note: this dataset contains values above 1, but it means the same: a very high level of diversification.	Compustat IQ
Total product diversification	Sum of related and unrelated product diversification: $$DT = DU + DR$$	Entropy measure ranges from 0 (low) to 1 (high). Note: this dataset contains values above 1, but it means the same: a very high level of diversification.	Compustat IQ

Appendix B. Cont. …

Moderating variables *Sustainable Development Goals*	Official enforcement of SDGs on January 1st 2016	Dummy variable where 0 equals the years 2011-2015 and 1 equals 2016-2018 after the enforcement	Not applicable
Exposure to weak institutional environments	The extent to which a firm is exposed to weak environments: $$\frac{\textit{Number of subsidiaries in weak institutional environments}}{\textit{Total number of foreign subsidiaries}}$$	Ratio value ranges from 0 (low) to 1 (high)	Orbis (Country Classification: World Economic Prospects Handbook, 2019)
Control variables *Firm size*	The number of employees of a firm in a given year	Continuous variable that can take on every value from 0 onwards	Thomson Reuters Eikon
Firm age	The number of years a firm exists in a given year	Continuous variable that can take on every value from 0 onwards	Orbis Annual Reports
Market-to-book ratio	Market-to-book ratio is calculated as: $$\frac{\textit{Market capitalization}}{\textit{Net Book Value of total assets}}$$	Continuous variable that ranges from –100% to + 100%	Thomson Reuters Eikon Compustat IQ
Firm performance	Return on Assets, calculated as follows: $$\frac{\textit{Net Income}}{\textit{Total Assets}}$$	Continuous variable that ranges from –100% to + 100%	Compustat IQ
Industry level effects	Mean ESG score per industry firm operates in – derived directly from database	Continuous variable that ranges from 0 (low) to 100 (high)	Thomson Reuters' Eikon

Appendix B. Cont. …

Country level effects	- Mean ESG score for country firm located its HQ – derived directly from database	Continuous variable that ranges from 0 (low) to 100 (high) Not applicable	Thomson Reuters' Eikon
	- Country level fixed effects in STATA		Not applicable

Optimism in a time of uncertainty. Spinoza, Kant and the eternal peace

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Abstract:

Aim: This article describes ideas of Enlightenment thinkers about the building of a democratic state with responsible and rationally thinking citizens. The article starts with the ideas of Spinoza, formulated in the seventeenth century, and will end in our time, where democracy is under threat.

Design/Research method: The article relies on professional publications, both within the fields of philosophy and political sociology.

Conclusions/findings: The study concludes that the optimistic expectations about the increase of democracy and the stability of democratic institutions in the world are no longer valid.

Originality/Value of the article: Recent developments in the political field in the western world make this optimism questionable.

Keywords: Philosophy, political sociology, democracy

JEL: Z18

1. Introduction

This paper is born out of the conviction that democracy is too much seen as a thing that is self-evident and no longer as something that has developed over the last four centuries or so and which has constantly been discussed and fought over.

In this paper I will give a bird's eye view of the building up of democratic institutions and especially the role of the individual as a citizen of a state. The first part of the article leans on publications of philosophical thinkers, the second part is based on more recent studies in the field of the social studies in order to get some grip on the state of democracy in Europe and the United States.

I will start with Enlightenment thinkers such as Spinoza and Kant, who believe that you can, and should, build up a state in which the rights of the individual and the rights of states can be underpinned by the rule of law. Thinkers who also emphasize the responsibilities of the individual as a citizen. Here I will also discuss the ideas of Agnes Heller, who follows the ideas of Kant about morality. Heller highlights the responsibility of the individual as a citizen.

Recent developments in the political field in the western world make the idea of progress questionable. In the last part of the paper attention is paid to more pessimistic publications in the sociological field which point to the idea that democracy is a precious good that is under pressure in our days. In this part I try to get some grip on the causes of the decay of democratic values in our western societies.

The ideas of the Enlightenment thinkers about the future are based on an optimistic view of humanity. These thinkers, starting by Spinoza, see a bright future for mankind by building democratic states with responsible citizens who use rational thinking. However, the dilemma is that the human being is also an emotional being.

I will start with the ideas of Spinoza about emotion and reason. Spinoza, an early Enlightenment thinker, spoke about a state in which the individual as a citizen has the natural right of free reason and judgment: "no man's mind can possibly lie wholly at the disposition of another, for no one can willingly transfer his natural right of free reason and judgment, or to compelled to do so", he said (Spinoza 2004: 257). But Spinoza also knew the emotions of the individual and was afraid that too

much freedom could be a danger for the peace of the state and the power of the rulers. How far can this freedom be allowed. Spinoza wrote his books in the seventeenth century, in a time when two great wars, the 80 year war and the 30 year war, had finished.

In the 18th century Kant wrote his pamphlet *Zum ewigen Frieden* (Kant 1984). In this pamphlet he made it clear that war did not end by a cease-fire but that you could prevent a war by concluding a peace agreement. For Kant the foundation of peace between nation states had to be an peace agreement that was underpinned by the rule of law. *Zum ewigen Frieden* of Kant was published in 1795. The immediate cause was the peace between Prussia and France. After Kant there would be two World Wars in Europe.

Agnes Heller, a Hungarian philosopher, who lived from 1929 till 2019, started in her book *A philosophy of morals* (Heller 1990) with the ideas of Kant about morality. She formulated the question "how can a human being be a responsible citizen".

In the nineteenth and twentieth centuries the scientific, rational methods and explanations become more and more important. After the second World War we have built international institutions to enhance peace and to fight against hunger, sickness and war. In the world wide environmental crisis and in the world wide health crisis of Covid-19 we see that in the most part of the Western world governments make use of scientific methods to fight against the damaging influence of these crises.

According to modern thinkers such as Fukuyama and Pinker the world is better off with the ideas of reason, science and humanism. Pinker gives in his book *Enlightenment now* (2018) a lot of charts to show the progress of humankind in the fields of medicine, hunger, education, equality and so on. But will people agree with him and will the reason win of the emotion?

2. Reason and emotion by Spinoza

The time when people started to think about a brighter future of mankind was the time that Jonathan Israel (2001, 2019) calls the Radical Enlightenment. Jonathan Israel situates that time after 1650. The influence of the church was diminishing and science, particularly the natural sciences, flourished. A process of rationalization and secularization had set in.

A highly important thinker of that time is, according to Jonathan Israel, Benedictus Spinoza, who was born in Amsterdam in 1634. Spinoza described the human being as a part of Nature gifted with reason and emotions.

The Ethics, written by Spinoza and published after his death in 1677, has as a subtitle: written in a geometrician style. Spinoza uses definitions, axioma's and propositions to make clear what he will postulate. Spinoza is a rationalist, a builder of a system who uses the deductive method. Spinoza believed that "only deduction from axiomatic principles delivered moral, political, religious and social truths, and that a desirable society was possible only if designed and enforced by reasoning individuals", as we read in Gullan Whur (2000: 133). Out of these general laws of nature Spinoza deduced, as he says: "those natural laws wherewith we conceive every individual to be conditioned by Nature, so as to live and act in a given way" (Spinoza 2004: 200).

That Spinoza chooses this method is not at all strange when we look at the fact that in the middle of the seventeenth century there was great progress in science, especially in mathematics and physics. We also know that Spinoza was acquainted with figures as Christiaan Huygens and other persons of the circle at Leyden University.

With his stance that Man is a part of Nature, Spinoza has definitely broken with the ideas of the Middle Ages of a transcendent and sovereign acting God and an individual that has to seek after salvation of his soul. For Spinoza there was neither a sovereign acting God nor a goal in Nature. As Spinoza states in *The Ethics*: "this eternal and infinite Being which we call God or Nature, acts by the same necessity as that whereby it exists" (Spinoza 2001).

The human being, as part of nature, is gifted with passions but also with reason. In the introduction of part IV of *The Ethics*, Spinoza describes, what he names "the bondage" of the human being: "for when a man is a prey to his emotions, he is not his own master, but lies at the mercy of fortune: so much so, that he is often compelled, while seeing that which is better for him, to follow that which is worse" (Spinoza 2001).

Spinoza discusses his ideas about reason in part V of *The Ethic*s. In the introduction he says: "I shall therefore treat therein of the power of the reason, showing how far the reason can control the emotions, and what is the nature of Mental Freedom or Blessedness; we shall then be able to see, how much more powerful the wise man is than the ignorant" (Spinoza 2001).

According to Spinoza when we have a better understanding of our passions we will have more power to handle these passions.

That Spinoza sees the human passions also as a danger for the state can we read in the passages where he describes his view on the human being as follows: "But men are more led by blind desire, than by reason: and therefore the natural power or right of human beings should be limited not by reason, but by every appetite [instinctive desires necessary to keep up organic life – IR], whereby they are determined to action, or seek their own preservation" (Spinoza 2004: 292). For Spinoza, it was the natural right of every human being "to preserve themselves". And that means that "the natural right of the individual man is thus determined, not by sound reason, but by desire and power" (Spinoza 2004: 201). But when we live according to our passions we live amidst enmity, deceit and anger, so according to Spinoza, it is better to live according to the dictates of our human reason.

Therefore Spinoza had to handle in his political theory with a human being that was gifted with a capacity of reason on the one hand and on the other hand was driven by his passions; an individual that has the natural right to be free and has the right to preserve himself. How can this individual become a citizen?

When we look at the description that Spinoza gives of the best form of government it is good to know that Spinoza lived in the Dutch Republic. He grew up in Amsterdam, a city with trade as its main source of income. He was born in a family of Portuguese Jews. His family were also merchants and Spinoza himself was

well acquainted with that part of life. He lived after the revolt of the Provinces of the Dutch Republic against Spain, a war that is known in history as the 80 year war. This war was for an important part a war of religion. During and after this revolt and the victory of the provinces, the state had the form of a republic with as representative a stadholder. The key concept of citizenship In this Republic was that the citizens should participate in the political process and had the moral obligation to pay taxes. Citizens thus bore a clear responsibility (van Zanden, Prak 2006).

In chapter XVI of the TTP (Tractatus Theologico-Politicus – A Theological-Political Treatise) Spinoza speaks about the foundations of the state and the role of the citizens. According to Spinoza, men need each other and must come to an agreement to live together. But, for men to do that, desire cannot be their guide but they must be guided by reason and "will restrain any desire which is injurious to a man's fellows, that they will do to all as they would be done by, and that they will defend their neighbor's rights as their own" (Spinoza 2004: 203). Spinoza discusses in the TP (Tractatus Politico – A Political Treatise) the idea of a democracy; the idea that an individual hands over power to a political body and citizens "have a right to vote in the supreme council and to fill public offices" (Spinoza 2004: 385). For "in fact, the true aim of government is liberty" (Spinoza 2004: 259).

However, Spinoza makes two statements: first the idea that an individual can abdicate the right of free action to the state but not the right to free reason and judgment. Spinoza pleaded for freedom of philosophical speculation and of religious belief. He saw this freedom as "absolutely necessary for progress in science and the liberal arts" (Spinoza 2004: 261). About this freedom Spinoza poses the question: "how far such freedom can and ought to be conceded without danger to the peace of the state, or the power of the rulers" (Spinoza 2004: 258)

The second idea is that action in obedience to orders of the state does not make a man a slave. This is the case when the object of the action is the good of the state. Spinoza has to reconcile obedience to the orders of the state and the natural right of an individual to be "a free man".

Spinoza had trust in a democracy and he stated: "In a democracy, irrational commands are still less to be feared: for it is almost impossible that the majority of a

people, especially if it be a large one, should agree to an irrational design" (Spinoza 2004: 206).

In the TTP and TP Spinoza describes his ideas about the state and the role of the citizens. Important in this description is the role of the citizen as a free man gifted with reason. This free man is not fit for citizenship. But, as Spinoza formulated: "For men are not born fit for citizenship, but must be made so" (Spinoza 2004: 313).

And although the human being was a part of Nature and was not in the possession of a free will, man could be free of the power of church and religion. For the future science and reason had to be the leading principles of mankind.

3. Kant and the eternal peace

Immanuel Kant wrote in 1784 *An answer to the question: What is Enlightenment?* (Kant 1784a). According to Kant is "The Enlightenment the human-being's emergence from his self-incurred minority". In this article Kant argues that the public use of one's reason must always be free. That public use of reason alone can bring about enlightenment among human beings. An enlightenment that can be reached only slowly. It is clear that Kant not strives for a revolution. A revolution will not bring a true reform in one's way of thinking, according to Kant. Jonathan Israel poses: "Kant defends and justifies Enlightenment as a continuing program of moral advancement and general amelioration while deferring to the princes and simultaneously endorsing the general principles of the American and French revolutions" (Israel 2019: 597). Kant pleaded for a republican form of the state.

An important point for Kant was the involvement of an much wider circle of citizens by the government. Every man should not only have the possibility but have the duty to give his opinion. As he states "It is because of laziness and cowardice that so great a part of humankind, after nature has long since emancipated them from other people's direction nevertheless gladly remains minor for life, and that it becomes so easy for others to set themselves up as their guardians". The motto of Kant is "Dare to be wise" (Kant 1784a).

The idea of the "public opinion" originated in the eighteenth century. The word "public opinion" we find for the first time in *the Oxford Dictionary* in 1781. The expression was used by Edmund Burke in his speech to the electorate (voters) in Bristol. In France the expression "public opinion" we found already in the middle of the eighteen century. In Germany it was Kant who introduced the idea of the public opinion as an important factor in politics, as Jürgen Habermas describes in his book *Strukturwandel der Offentlichkeit* (Habermas 1962). Kant argued that publicity was a means to bridge the gap between politics and morality. The public opinion has the possibility to bring morality in politics. Morality has here the notation of reason, the power of judgment. The citizen who was enlightened and could give his opinion was the citizen that reads books and was present at discussions in salons. For Kant these cultural traits were not the only ones that were necessary. To be an enlightened citizen you also need a social position and have an earning; so children, women and wage laborers could not been enlightened persons.

Kant himself gave his opinion about the relation between politics and morality in his pamphlet *Zum ewigen Frieden*. In the epilogue of this pamphlet, written by Rudolf Malter, we can read: "Gewährung und Wahrung des Friedens ist Sache der Politik; Politik jedoch, die sich allein auf ihre pragmatischen Mittel verläst, verfehlt den Frieden; sie geht auf ihn zu, wenn sie sich unter Grundsätze stellt, die aus reiner praktischer Vernunft, aus der »ursprünglichen moralischen Anlage in uns« stammen: Immanuel Kants berühmter Entwurf »Zum ewigen Frieden« setzt auf die Politik, die dadurch, dass sie sich der Idee des Rechts unterordnet, den Frieden unter Menschen ermöglicht" (Kant 1984: 69).[1]

"The conditions needed for mankind to reach the common goal of »perpetual peace« were the politicization of all nations, leading to fraternity of all republicans, autonomy of every state, and isonomia (political equality) of all states. Until then war between states remains inevitable" (Israel 2019: 609). These are, according to

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[1] "To start and maintain peace is a task of politics; politics, however, that is only grounded in pragmatism, fails peace; peace will only been reached when the peace is based on »praktische Vernunft«, on the origin of morality in ourselves". Immanuel Kant's well known pamphlet *Zum Ewigen Frieden* refers to politics that is based on the idea that only politics that is bound by the law brings peace among people" [translation – IR].

Kant, the most important conditions for eternal peace. Coercion cannot longer been exercised by the person of a ruler but it is only the ratio that has power; "das einzig Vernunft Gewalt hat" ("*that only reason has power*").

Eternal peace could be very difficult to reach but Kant was optimistic about the future.

In *Idea for a Universal History from a Cosmopolitan Point of View*, a pamphlet that Kant wrote in 1784, he says: "Whatever concept one may hold, from a metaphysical point of view, concerning the freedom of the will, certainly its appearances, which are human actions, like every other natural event, are determined by universal laws. However obscure their causes, history, which is concerned with narrating these appearances, permits us to hope that if we attend to the play of freedom of the human will in the large, we may be able to discern a regular movement in it, and that what seems complex and chaotic in the single individual may be seen from the standpoint of the human race as a whole to be a steady and progressive though slow evolution of its original endowment" (Kant 1784b).

4. Agnes Heller

When Agnes Heller, a Hungarian philosopher speaks about Kant, she describes him as a thinker of morality. Heller also speaks about morality. She doesn't speak about a universal law that determined human actions, but she focusses in a more practical way on the responsibility of the person. Especially the modern person who lives in a contingent world, a world without clear roles and clear destinies. In her book *A Philosophy of Morals* she speaks about "the modern age which has invented the great narratives of our own (historical) determination and self-determination" (Heller 1990: 125). Besides these great narratives there is also the obligation for a person to be responsible. To be responsible means in this context to be not only responsible for your personal life but also for the common good.

Heller herself, born in 1929 and died in 2019, lived under a totalitarian communist regime. Later on she departed to New York; there she held the Hannah

Arendt chair for 25 years. One of her topics is what it means to live as an individual in a totalitarian state. She asks how it is possible to make an connection between the institutions of the state and the ideas of morally engaged common people (Heller 1990: 125). She seeks the answer in the fact that contingency fill us with anxiety but only as long as we fail to meet our true historical condition.

Agnes Heller shows us that there is not only a story to tell, a story of a brighter future, but that there is also a personal obligation. The obligation to be a responsible person. In a situation of contingency responsible persons can make a difference. As Heller says: "Although everything that is could have happened otherwise, it is more than mere chance, for there are people who have transformed certain possibilities into realities while other people have failed to do so" (Heller 1990: 129).

5. Science and optimism

In the nineteenth century we see a drive by the elite in the Netherlands to make higher education affordable also for the middle class. It was van Vloten[2] who worked for higher education that should be affordable for a greater part of the population, including the children of middle class people. It was also the time that in many countries in Europa compulsory education was introduced. It was not only reading and writing that had to be learnt also behavior and the cultural norms were involved, such as the norms of purity (cleanliness) and regularity. Ali de Regt (1984, 2015), a sociologist, speaks in her book about a civilization offensive. She describes the changes in the situation of the labor class and the beginning of social legislation. The sociologist Norbert Elias (1982) points to the increasing interdependence of men and the changes in the society. Auke de Woud (2015) speaks about the old and the new civilization and the many technical inventions. It was a time in which the old fashioned civilization changed in a great speed. There were people who were optimistic about the new world in which welfare should rise in a spectacular way. But there was also a part of people who saw in a book as Oswald Spengler's (2017,

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[2] For bibliographic material on Johannes van Vloten, see
https://www.dbnl.org/auteurs/auteur.php?id=vlot002.

first published in 1918), *Untergang des Abendlandes*, their pessimistic view on the changes confirmed.

At the end of the century we see also the beginning of secularization in the Netherland and in other countries in Europe. Van Vloten propagated the ideas of Spinoza in the Netherlands and emphasized the autonomy of the human being. More and more new groups came on stage; first the males, later on, in the beginning of the twentieth century also females get the right to vote and to be represented in politics. Besides the awakening of groups to stand for their rights and to be responsible for their own community and their own fate, another process became more and more important: the influence of science on society.

Also at the end of the nineteenth century we see the blossoming of the scientific methods, not only in the natural sciences but also in the social sciences. The sociologist Max Weber (1864-1920) speaks about the "Entzauberung" of the world because of a process of intellectualization and rationalization. He saw rationalization in the realm of religion where the magical aspect was displaced by a more rational relation between man and the divine. Also in the sphere of law Weber documented "a course from the personalized dispensing of justice by wise leaders and elders, to the codified, rationalized, and impersonal justice of the modern world" (Coser 1971: 233). He was afraid that mankind in the future would live in an iron cage of his own making (Coser 1971: 233). But Weber also saw that rationalization and bureaucratization of the world was inescapable and gave man an unprecedented domination over the world of nature.

After the second World War the number of young people that started academic education surged. The trust in science was huge and a career as an academic was a dream of a lot of young people. Scientific methods and rationalization of all sort of processes became not only common in the natural sciences but also in the social sciences.

6. Disconnection and discontent

After the second World War there were a lot of initiatives to make the world more stable by building global institutions. The idea was that these global institutions with voting rights for the states which participate in these institutions, would provide a basis for peace and development. The greatest player in these institutions is the United States of America. The United Nations, that has its headquarter in New York City, is an intergovernmental organization that aims to maintain international peace and security, took effect on 24 October 1945. The United Nations had fifty member states at its founding. Nowadays there are 193 member states. As early as 10 December 1948 the "Universal Declaration of Human Rights" was accepted. Thereafter more and more international institutions, affiliated to the United Nations, were erected as, the WHO, the WTO, IMF, the World Bank, the International Court of Justice and the IPCC (Intergovernmental Panel on Climate Change). The United Nations is the successor of the League of Nations that formally came into being on 10 January 1920.

After the Second World War more unity in Europa also started when, in the 1950s, six core states, Belgium, France, Italy, Luxembourg, the Netherlands and Germany, founded the European Communities as a predecessor of the European Union, which nowadays consists of 27 countries. A candidate of this Union has to meet the Copenhagen criteria, which require a candidate to have a democratic, free-market government together with the corresponding freedoms and institutions, and respect the rule of law.

In the first decades after the end of the Second World War an optimistic idea began to spread: the idea that freedom and prosperity for all could be reached in the globalized world of the nearby future. The question is: is this a correct view on the history of man?

In the late 90s of the twentieth century there were writers (Castells, Putnam, Fukuyama) who pointed already to a decline of these feelings of progress and noted a change in the mood of people. Castells, a Spanish born sociologist, saw in the sixties and seventies of the twentieth century the beginning of a transformation in the society. He points to the following processes the information technology

revolution, the economic crisis of both capitalism and statism (concentration of economic controls and planning in the hands of a highly centralized government often extending to government ownership of industry) and the blooming of cultural social movements such as libertarianism, human rights, feminism, and environmentalism. Castells painted the development of a global and capitalist economy and an increase of social inequality and polarization. In his conclusion at the end of volume III of his trilogy *End of Millennium* (2000: 390) says: "The dream of the Enlightenment, that reason and science would solve the problems of humankind, is within reach. Yet there is an extraordinary gap between our technological overdevelopment and our social underdevelopment".

Especially American scholars have a pessimistic view on the future at the moment. But also in Europe democratic institutions are under threat as publications of Freedom House show. Freedom House, a think tank that is founded on the core conviction that freedom flourishes in democratic nations where governments are accountable to their people, as we can read on the website, sees nowadays dangers for the core values of democracy. The think tank "sees attacks by elected leaders on democratic institutions, as there are – the press, independent judiciary, and anti-corruption agencies – and on the rights of minorities and migrants". Freedom House has published a report, titled *A Decade of Democratic Deficits*. According to Freedom House net declines in Democracy scores in Europe and Eurasia have consistently outweighed net gains in the last ten years.

Fukuyama points in his book *Political Order and Political Decay* to the decay of the political institutions in the United States and the judicialization of the system. "The United States has returned to being a state of »courts and parties«" (Fukuyama 2014: 470). But it is not only the political institutions that fail. In his book he also describes the decline of the American government. "The federal government has become a destination of last resort for (young people wanting to make) a difference" (Fukuyama 2014: 460). Twenty two years earlier Fukuyama was a lot more optimistic about liberal democracy and only to the progress of humankind. In his book *The End of History and the Last Man* he points not the fall of the Berlin Wall, but also to the collapsing of authoritarian states in Southern Europe and the forming of democratic states in Latin America. But in his book *Political order and political*

decay he says: "There is no automatic historical mechanism that makes progress inevitable, or that prevents decay and backsliding. Democracies exist and survive only because people want and are willing to fight for them" (Fukuyama 2014: 548).

About the political institutions in the United States recently an article was posted on the site of Huffington Post: "The GOP is very much Trump's Party, Poll shows" by Ariel Edwards-Levy (2020). More Trump voters said they were loyal to President Donald Trump than they were to the Republican Party. 49% of Republican and Republican leaning independents who voted for Trump in 2016 said they consider themselves more supporters of Trump than of the Republican Party. Just 19% said they were more supporters of the party, with another 28% saying they were supporters of both. The poll consisted of 1000 completed interviews conducted from August 24 to August 26 among U.S adults.

Another way to look at the changing tide is to look at society and the ties between people. Putnam investigates in his book *Bowling alone* (2000) trust and reciprocity as a trait of the American way of life in the second half of the twentieth century. He looks at the social trust in the American society. Putman asked questions as "How often do you read a newspaper?", "Are you interested in politics?" and "Do you think most people can be trusted or that you can't be too careful?". Putman found, moving along the line of the oldest generation toward the younger generations, "that each generation that had reached adulthood since the 1950s has been less engaged in community affairs than its immediate predecessor" (Putnam 2000: 254). Moreover the older generations are steadily replaced by younger generations. Putman sees this "as the single most important explanation for the collapse of civic engagement over the last several decades" (Putnam 2000: 255). Putman published his book in 2000.

Steven Pinker is more optimistic about the future of the enlightenment ideas. Pinker points in his book *Enlightenment now* (2018: 340) to the findings of an exit poll that the most consistent predictor of Trump support was pessimism about the direction of the country, the workings of the federal government and the lives of the next generation of Americans. Pinker refers also to research by the political scientist Ronald Inglehart (2016), who found similar patterns, based on their analysis of 268 political parties in thirty-one European countries. The support for populist parties is

strongest not from manual workers but from "petty bourgeoisie". Populist voters are older, more religious, more rural, less educated and more likely to be male and members of the ethnic majority (Pinker 2018: 340). The same pattern we can find among Brexit-voters. Inglehart concluded that supporters of authoritarian populism are the losers not so much of economic competition as well as cultural competition. Populism is an old man's movement, as Pinker says. Pinker mentions also another factor in the rising of authoritarian populism namely the fact that many people, also younger people, stay home on election day, as we have seen in the voting over the Brexit.

Also in the European Union the voter turnout in the elections for the European Parliament decreased each time after 1979 the first time you could vote for this Parliament. In 2019 the voters turnout increased by 8% and went above 50% for the first time since 1994, as statistics point out (European Parliament 2020).

When we see voting as a civic plight and you remember all the years of struggle to get voting rights for everyone, it is not a rational act to abandon that right.

Is the election of Trump as president of the United States and his idea of "America First" the end of the spreading of democratic ideals in the world and the building of international institutions.

Are the ideas of Kant, the belief and trust in global political institutions and the importance of a democratic state as painted by Spinoza foregone?

The other prominent idea of the Enlightenment was the use of science and scientific methods to make the world a better place to live in. When Spinoza gave a voice to these ideas he was fighting against superstition. Superstition was for him related with emotions. Science was the fruit of reason.

Popper (1977) who published his book *The open society and its enemies* in 1945 argued that the conflict between rationalism and irrationalism has become the most important intellectual, and may be the most important moral issue as well, of our time. Popper describes rationalism as an attitude of listening to critical arguments and learning from experience.

Popper also says that equality for the law is not a fact, but a politic decision and that "the choice for rationalism is a moral decision. Rationalism is tightly connected

with the belief in the unity of mankind" (1977: 232). For Popper morality is inherent in his choice of modern science (1977: 240).

When we look at the world of our time we see a lot of problems but no or not enough political will to solve the many problems. Are we responsible persons at the moment that the scale of the problems is not our own nation or the nations around us but the problem is at a global scale. Are we the responsible person in the sense as Heller defines them?

Is men a rational being as Enlightenment thinkers believe that trust science and will handle according to the facts of scientific enquiry?

7. Conclusion

The ideas of the Enlightenment have a history of centuries. The Enlightenment thinkers saw in the reason the key for a brighter future. When we start by the Early Enlightenment in the 17th century, we see that Spinoza saw a bright future for mankind when it was led by reason. For Spinoza it was reason that gives guidance to freedom and makes the building of state possible. Spinoza trusted in the possibility to make men fit for citizenship.

One century later it was Kant who described enlightenment as the human-beings emergence from his self-incurred minority. Also Kant saw a steady and progressive evolution toward a better future. Kant based his optimism also on a public use of reason. The Enlightenment is according to him a continuing program of moral advancement.

Heller does not speak like Kant about a steady and progressive revolution but about the responsibility of every person. Persons have the moral obligation to be responsible for the state they live in.

In the 19th century we see a blossoming of scientific methods in natural and social sciences. In politics we see that not only the better off citizens but also the labor class males and the females get the right to vote. There was optimism about the future. After two World Wars there was a new elan to make the world stable and

a better place to live in. Global institutions were erected. In Europa the European Union was founded. The dream of a better and a more peaceful world was not dead.

In our days there is a lot of uncertainty about the future of stable democracies. Scientists as Castells, Putnam and Fukuyama are concerned about the future of democratic institutions in the United States and other places in the world. Also there are signs of a steady diminishing in civic engagement and social trust in the societies where we live in.

At this moment we see many big crises in the world, a health crisis, a climate crisis and the coming of illiberal democracies as in Hungary, Poland and Latin America. There are sparks of hope with women in Belarus who fight for fair elections and women in Pakistan who fight for their rights to go freely on the streets. Also we saw young people fighting for measures to stop climate change.

When we look at the role of the citizen in the historical process, we see that in democratic states more and more people, not only men but also women, not only rich and well educated people but all people have at least get voting rights. Responsibility as a citizen refers not only to voting rights but also to morality, to make the choice to be a responsible person, as Heller argued. Every person should have the possibility to say what his opinion is, according to Spinoza that is the right of the free person, with Kant it is more or less an obligation.

A democratic state is not something that is and shall always be there. This state is the end of a long historical process of progress and decline. But decline is not inevitable.

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COVID-19 and consumer financial vulnerability

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Abstract:

Aim: This paper provides an overview of the impact of COVID-19 on consumer (household) financial vulnerability in the Netherlands in the context of socio-economic developments for households in the period 2008-2016.

Design/ research methods: After a discussion of the socio-economic developments for household in the period 2008-2016, financial vulnerability analytics is used to discuss the implications of the published results of two surveys on the impact of COVID-19 on the financial situation of households in the Netherlands (AFM/CPB, NIBUD).

Findings: It appears that problems are to be expected in households with uncertain incomes (e.g., flex workers and self-employed), in households with inflexible budgets (with fixed and necessary expenses higher than disposable income), in households that are fragile because of lack of buffers, and in households with a low income for a longer period of time. Some households such as the ones of singles and the young are less able to cope with the financial risks than others. There are lifecycle effects to be noted: the young will have difficulty in finding and keeping jobs, and therefore in making ends meet.

Value of research: The analytics and results are of interest and relevant for cross-cultural research in other Western Countries.

Keywords: Corona, COVID-19, financial vulnerability, income decline; unemployment

JEL: D11, D14

1. Introduction

Since the beginning of 2020, due to the COVID-19 virus many people died. On a global scale, lockdowns of economic activities, especially in recreation, culture, sports and tourism, were applied. For many working from home became the rule, whereas others were confronted with the closure of restaurants, schools and universities. Contrary to the Great Recession (2008-2016), austerity is not applied in economic policy now. In the Netherlands various kinds of government support exist to prevent a total collapse of the economy.

The lockdown applied as a consequence of the first wave of COVID-19 led to a decline in GDP ranging from -9 to -20 per cent in OECD countries in the second quarter of 2020. In the last part of 2020 and beginning of 2021 many bankruptcies are expected to occur across the western world as a result of the second wave. However, as we can read in OECD (2020a), for the first time since the pandemic began, there is now hope for a brighter future thanks to the development of vaccines, with the global economic growth to be expected to vary between 5 per cent (optimistic scenario) and 2.75 per cent in 2021 (pessimistic scenario). Nevertheless, the outlook continues to be exceptionally uncertain, with both upside and downside scenarios (OECD 2020a).

The lockdown implies rising unemployment rates and decline of real income for many households. The population with paid work will be more affected by COVID-19 in the decline in income (unemployment) than the population without a paid job. This growing consumer and household insecurity leads to more financial vulnerability.

The topic of this paper is the impact of COVID-19 on financial vulnerability of consumers or households. Financial vulnerability refers to consumer situations that may lead to the endangerment of income security or level of living of the household in the longer run. We will restrict the empirical part to data on the Netherlands, a country with generous programs of government support to households and firms in the first wave of COVID-19.

In section two we will give background information on the economic setting of household in the Netherlands. We will be setting the scene by showing that in the

period 2008-2016 consumer vulnerability increased, e.g., due to the elimination of buffers and automatic stabilizers. In section three we will develop a theoretical framework that will be used to analyse the data of two studies among the population with paid work in section four. The last section contains the conclusion and discussion.

2. Economic setting of households in the Netherlands

Table 1 provides socio-demographic information on households in the Netherlands. In about 5.2 million on a total of 7.9 million households at least one person has paid work. About 30 per cent of the workers belong to the flexible workforce. There are about 3.5 million singles and there about 4.5 million couples, about half of them with children.

Table 1. Socio-demographic information on households in the Netherlands – s**ome statistics on households**

Some statistics on households
- 7.9 million households.
- 5.2 million household with at least a working breadwinner.
- About 2 million households with a retirement pension.
- 3.5 million one person households (singles).
- About 558,000 one parent households.
- About 2.1 million couples with children.
- About 2.2 million couples without children.
- The average household net adjusted disposable income per capita is USD 29,333 a year, lower than the OECD average of USD 33,604.
- The average household net wealth is estimated at USD 157, 824, lower than the OECD average of USD 408,376.
- Dutch people earn USD 52, 877 per year on average, more than the OECD average of USD 43,241.
-30 per cent of workforce are flexible workers (flex workers and self- employed).

Source: data collected by author from CBS Statline (2020); international income figures from OECD (2020b).

In 2008 and 2009, the first years of the Great Recession, expansionary policies, i.e., spending more, taxing less, printing money, were used to combat the crisis. In short, the text book solution. But since 2010 the so-called Austerians reigned: fiscal

austerity instead of fighting unemployment. Debt, both private and public, is seen as the main problem. The Austerian desire is according to Krugman (2012) deeply destructive, as it pays little or no attention to the spread and dangers of unemployment. In the Keynesian approach, the budget deficit is in the first place less important than the unemployment level and, consequently, full employment or higher unemployment is expected to diminish the budget deficit of the government. Modern monetary theory learns that the quest for a small government budget is not necessary from a monetary point of view and, furthermore, hinders societal progress in many ways (Kelton 2020).

Unemployment in the Eurozone was higher than in the EU28. In the Eurozone, a low inflation rate is more important than the unemployment rate. This is a consequence of the 3 per cent (government budget deficit) and 60 per cent (government debt) rules in the Eurozone. One of the observations is that Austerity leads to higher unemployment rates than is the case with Keynesian policy (Stiglitz 2016). During the Great Recession, the North-West of Europe suffered less than the south of the Eurozone in terms of unemployment (Eurostat 2018).

An international comparison with seven other Western countries – Canada, Denmark, Finland, France, Germany, UK and USA in the period 2002-2016 – shows that the Netherlands scores the lowest on per capita private consumption, real individual private consumption, real income growth, real house prices, share of labour income, and has the highest tax burden as a percentage of net disposable income (Keus, Verbruggen 2017).

In the period 2008-2018, the following picture arose. High and rising taxes for less public consumption. High taxes on purchase of cars, use of cars, electricity (38 per cent). Automatic stabilizers such as unemployment benefits and some care expenditures were reduced in power. Collective expenditures went up from 38.4 per cent of GDP in 2011 to about 39 per cent in 2013/2014 and about 40 per cent in 2020 (CBS 2020).

Capital income – a source of income for the very rich (top 1 per cent) – is hardly taxed in most Western countries. For example, capital gains in the Netherlands had a flat tax of effectively 1.2 per cent until 1-1-2017 (CBS 2020, own calculations based on tax rules). The effective tax on capital income is about 10 per cent, much lower

than the 35-40 per cent on labour income. Tax burden has shifted from capital to labour income. In contrast to the low Gini coefficient for income inequality of about 0.30, the one for net wealth inequality is high, 0.8 to 0.9 (CBS 2020). Wealth tax records show a substantial decline in wealth inequality up to the 1970s and a gradual rise thereafter (van Bavel, Frankema 2018; van Bavel 2016). This has also to do with the fact that the return on shares is high as a consequence of low interest rates. Some people speak of the profit shares bubbles. Consequently, the share of capital income in GDP is rising.

Private wealth inequality is already high and becoming more severe in the Western World. Piketty demonstrates this with the following picture: 50 per cent of households owns almost no wealth; 40 per cent owns a house; 10 per cent owns a house and other forms of wealth; and 1 per cent is very wealthy. Moreover, he demonstrates that the private wealth distribution nowadays is as unequal as in 1914 (Piketty 2014).

In the Netherlands, progressive taxation has been virtually abolished (40 per cent and 49 per cent income tax bracket and a VAT tariff of 9 and 21 per cent). According to Piketty (2019), the middle class pays the most of the taxes. The Panama papers in 2015 pointed at tax avoidance and tax evasion by the top 1 per cent, which is facilitated by tax legislation in the West, especially in the Netherlands (Obermaier, Obermayer 2017).

The Great Recession was a very severe recession even in the Netherlands. Austerity led to many deficiencies for households such as a shortage of houses (2011-2014 were very bad years for the construction industry). The pressure on incomes and increased vulnerability put a lot of strain on households in times of COVID-19. Just as in the USA a secular stagnation of household incomes is observed, together with financial insecurity. Many households are problematically indebted. In 2000, 20 per cent of Dutch households encountered difficulties in making ends meet. This percentage increased to 30 per cent in 2015 and somewhat more in 2020 (NIBUD 2019, 2020) This trend has led to concerns about the endangered middle class (Engbersen et al. 2017).

3. Theoretical background on households and financial vulnerability

Every household may be confronted with financial risks. In welfare states there are some collective regulations to mitigate those risks and to provide some social protection. On top of this many households have their own arrangements such as a savings buffer. Some households are better able to cope with financial risks than other and will not be confronted with financial difficulty very rapidly. However, this does not hold for financially vulnerable households. The higher the vulnerability measured on a continuum, the higher the risk of getting into financial trouble.

Financial vulnerability refers to situations that may lead to the endangerment of consumer income security or level of living in the longer run. People do not like this. They want to attain and maintain a certain level of living that is assumed to be normal in society. A loss of the same amount of income (a loss) leads to a greater negative change in welfare than a positive change by an equivalent rise in income (a gain) (see e.g. Knetsch 2016). Table 2 gives an overview of factors that have a positive impact on financial vulnerability of households. Consumer pessimism can be seen as the outcome of financial vulnerability.

Table 2. Factors affecting financial vulnerability of households

Financial vulnerability increases when
- there is less flexibility in the household budget;
- more consumer fragility;
- more uncertainty in income procurement;
- low income for a longer period of time;
- consumer credit problems.

Source: see van Ophem (1988, 1990).

Flexibility in the household budget affects financial vulnerability in several ways. The higher the flexibility or discretionary income, the higher the flexibility in expenditures. This means that expenditures may be postponed (van Raay 2012, 2016). The higher the flexibility or discretionary income, the higher the saving and increase of savings account (savings buffer). A higher share of fixed expenditures in income means less flexibility and higher financial vulnerability. A part of the daily expenditures can be seen as necessary, and thus fixed expenditures, such as food and nutrition, mobility and clothing. It is important to note that the share of fixed and

necessary expenditures in income has grown in the past decades in the Netherlands, whereas this share is higher for low income groups compared to higher income groups. For instance, in 2013 the lowest 20 per cent income group spent 55 per cent of their income on housing, water, energy, food and beverages, whereas 37 per cent is the corresponding figure for the highest 20 per cent income group (CBS 2016a).

The second factor presented in Table 2 is the financial fragility of households. Research in this field was conducted by Lusardi et al. (2011) in the USA by asking people how confident they are that they could come up with 2,000 dollar (about €1,700) if an unexpected need arose within the next month. The following answers were possible: I am certain I could come up with the full 2.000 dollar; I could probably come up with 2.000 dollar; I could probably not come up with the full 2.000 dollar; I am certain I could not come up with 2.000 dollar.

The result for the USA are startling: 28 per cent of the respondents was certainly not able to cope and 22 per cent probably not. The research was also carried out in a cross cultural setting across eight countries. There some striking differences were observed: in the Netherlands about 59 per cent is certainly able to cope, predominantly by drawing on savings (89 per cent of this group). In countries as the USA, UK, Canada, Italy, you get different results. Household in the USA and UK are less able to come up with the amount than household in the Netherlands, a country with one of the highest incidence of savings accounts (Lusardi et al. 2011).

The third factor presented in Table 2 is uncertainty with respect to income procurement. This uncertainty is higher for employees without a labour contract for an indefinite period of time and for self-employed without personnel or staff. Currently, about 30 per cent of the working population in the Netherlands belongs to the flexible workforce (CBS 2020). Both categories need larger buffers (savings) to fill the gap between periods in which the income procurement is low or not existent.

Self-employed are to be found among the low and high income groups. At the bottom of the income distribution uncertainty may lead to precariousness. The precariat is a social class formed by people suffering from precarity which is a condition of existence without predictability or security affecting material or psychological welfare. Table 3 shows some implications inherent to precariousness.

A lower income for a longer period of time has many implications. It leads to a depletion of the stock of durables, less participation in sports activities and a higher incidence of not getting financially by: around 40 of the low income group has problems in getting by, whereas the corresponding figure of the higher income group is 10 per cent (CBS 2016b).

Table 3. Aspects of precariousness

"[T]he spread of greater labour market flexibility, greater job insecurity, a greater fragility in relationships and a weakening in the formal provision of social welfare" (Nettleton, Burrows 2001).
"[T]he concepts of precarious housing and precarious employment make direct reference to the marginal position of many households" (Beer et al. 2016).
"[Precarious] employment…is uncertain, unpredictable, and risky from the point of view of the worker" (Kalleberg 2009).
"Precariousness (in relation to work) refers to all forms of insecure, contingent, flexible work – from illegalised, casualised and temporary employment, to homeworking, piecework and freelancing" (Gill, Pratt 2008).

Source: derived from McKee et al. (2017).

People with low income for a longer period of time are financially vulnerable. Their financial reserves are depleted and, as said before, many durables are on the brink of collapsing. Scarcity leads to a tunnel vision and to a smaller bandwidth, which increases the risk of financial problems (see, e.g., Mullainathan, Shafir 2013).

Another aspect of financial vulnerability of households is credits. Credit by households can be divided into credit for investment, like mortgages and study loans, and credit for consumption purposes, like cars and decoration. Some credits do have a collateral, others not. Nowadays, more than 50 per cent of the households in the Netherlands has a mortgage and consumer credit is taken up by about 25 per cent. Defaults with respect to mortgages are very rare in the Netherlands. However, in some cases consumer credit may lead to problematic debts and financial problems. As already discussed in the previous section, in 2000 20 per cent of Dutch households encountered difficulties in making ends meet, whereas this has risen to 30 per cent in 2015, and 33 per cent in 2020 (NIBUD 2019, 2020). Nowadays, there are more households with difficulties in making ends meet than in the 1980s, both absolutely as relatively, when one compares results in van Ophem (1988) with the ones from NIBUD (2019a).

Financial risk of households is connected to household types and life cycle. Some household types are less vulnerable than others. Dual breadwinner families are financially stronger than households of one breadwinner or singles. Dual breadwinners are less prone to financial risks (de Hoog, van Ophem 2006). Singles are more often found in the lower part of the income distribution, just as single parent families. Couples with children are more often found in the upper part of the income distribution (CBS 2016c). This is partly due to life cycle effects: singles are mostly young or old, couples with children are in the part of their life where income tends to be higher (see, e.g., Bryand, Zick 2006). Wealth is positively correlated not only with income but with age as well. The situation of the young (20-30) with respect to financial vulnerability is more pronounced. Young households are vulnerable to financial shocks (higher mortgage debts, less pension savings, less free savings in saving accounts).

In the next section we will apply the theoretical framework developed here to analyse the data of two studies among the population with paid work.

4. Results from two surveys

Tables 4 and 5 provide information of two surveys on the impact of COVID-19 on the financial situation of households in the Netherlands. They were published by the end of the summer of 2020. The studies are restricted to the population with a paid job, who are directly hit in their income procurement due to the spread of the COVID-19 virus and the actions to combat it. The AFM/CPB[1] study is the most comprehensive one of the two. In none of the studies the Lusardi question (how confident people are that they could come up with 2,000 dollar (about €1,700) if an unexpected need arose within the next month) was asked for.

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[1] AFM = Authority Financial Markets. Agency that monitors the behavior of economic agents on financial markets as well as safeguard workable competition; CPB = Government agency that produces economic analyses and economic forecasts.

The AFM/CPB results are based on applying the micro-simulation model Mimosi (CPB) on CBS[2] data of 100,000 households (2016). The effect of the gross income shock on disposable income is simulated taking into account relevant allowances like TOZO (Temporary income support due to COVD-19 for self-employed based on social assistance), unemployment benefit and social assistance. Information on fixed and necessary expenses is used. Several scenarios are analysed: one for income loss of main breadwinners and one for income loss of partner and supplementary incomes. A share of fixed expenditures in the household budget of 0.5 and higher is seen as an indicator of potential financial stress. Financial stress is very high for households with a share of 0.9 and larger. The so called coping period (uitzingtermijn) is calculated, i.e., the period in which households for which fixed and necessary expenses (like food and nutrition) are higher than disposable income are able to pay the fixed expenses from asset withdrawals. A distinction is made between a short coping period (less than three months to cover the expenditures by asset withdrawal) and a longer coping period (assets withdrawal may take longer than six months). The study provides information about the interplay of factors mentioned in the previous section: share of fixed expenditures, stage in the life cycle, insecurity of earnings (flexible workforce or self-employed) and low income. Table 4 contains key findings from the AFM/CPB study.

Table 4. Key findings from the Stress test households

• It appears that short coping periods are characterized by high fixed expenditures ratios (> 0.5) and 0.9 for the share of fixed expenses including food and nutrition in the household budget.
• Households with a short coping period (< 3 months) possess net wealth of about € 737 to 1,242 for self-employed and about € 170 to 410 for employed. The corresponding figures for households with a longer coping period (> 6 months) are €28,000 and € 30,000 respectively.
• Households with a short coping period have lower disposable incomes, rent more frequently a house, are single or single breadwinner.
• About 100,000 households are not able to pay for their expenses within half a year after loss of work; 73,000 after three months.
• Even with TOZO self-employed are more vulnerable.
• Unexpected outlays may exacerbate the financial stress.

Source: AFM/CPB 2020.

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[2] CBS = Statistics Netherlands.

About 4 per cent of households with a breadwinner with paid work faces very serious financial stress, defined as households that are not able to pay for their expenses for at least three months after loss of work. This is probably an underestimation because of the time that elapses between applying for and receiving of a social benefit (waiting time). Furthermore, government support is not fully used and unexpected expenses may appear. The latter may jeopardize financial planning and may have a great impact on the financial situation of the household, as has been shown in other studies (van Ophem 1988).

Table 5. Key findings NIBUD poll published in July 2020

• 41 per cent of flex workers (average income € 930 per month) and 44 per cent of self-employed (average income €1,214 per month) are confronted with an income decline.
• This decline may lead to immediate financial problems. About a quarter of the respondents say that they do not have a buffer to cover four months of income loss. Furthermore, about half of the respondents reporting an income decline has less than € 7,500 of direct disposable assets.
• 43 per cent of the respondents with an income decline (n=187) are very worried about their financial situation This is much higher than the corresponding e 19 per cent for all respondents. Both categories are equally worried about their health and the health of family and friends, about 58 per cent of all respondents.
• About 33 per cent of the respondents has great difficulties in making ends meet. The corresponding figure for flex workers is 36 per cent, and 24 per cent for employed with an infinite labour contract.
• Respondents who have great difficulties in making ends meet mention reasons such as high fixed expenditures, income loss and low income.
• About 35 per cent of the respondents with great difficulties in making ends meet (n=404) is confronted with payment arrears.
• Cutting on expenditures is practiced by 37 per cent of all respondents, 50 per cent of flex workers and 55 per cent of self-employed.
• NOW (Temporary job retention scheme and income support due to COVID-19 for firms) is used by 20 per cent of the employers and allowance as *TOZO* by 36 per cent of the respondents, 41 per cent of flex workers and 25 per cent of self-employed.

Source : NIBUD 2020.

Some of the factors analysed in the AFM/CPB study are also mentioned and discussed in the NIBUD[3]-study from July 2020. This is a survey among 1,991 respondents with paid work who are 18 years and older. In the employment status a

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[3] Netherland Institute for Budget Extension.

distinction is made between employees with an indefinite and employees with a temporary contract, flex workers and self-employed. Flexibility of the labour contract, fixed expenditures, low income are factors in the analysis of making ends meet. Table 5 contains key findings from the NIBUD poll.

About 33 per cent of the respondents has great difficulties in making ends meet. This is in line with previous NIBUD research (2019). Respondents who have great difficulties in making ends meet mention reasons such as high fixed expenditures, income loss and low income. The lack of financial buffers was mentioned by about 25 per cent of the households. An income decline leads to more worries about the financial situation and to cutting on expenditures.

The NIBUD research also shows the relevance of the factors affecting financial vulnerability of households mentioned in Table 2. Flex workers and self-employed are more hit by an income decline than employees.

5. Conclusion and discussion

The impact of COVID-19 on household financial situation depends on the length and size of the recession or depression. Some sectors are or will be more hit than others. There will be shifts in consumer demand due to COVID-19 fear. Less demand for services with close human contact is to be expected. Irrespective of the lockdown of pubs and restaurant consumer behaviour is likely to change. Consumers, especially older people and people with health problems, can be expected to behave very cautiously. In the Netherlands, especially people in Amsterdam will be confronted with a difficult financial situation, since the collapse of tourism to the city.

The OECD economic outlook 2021 summarizes the discussion about the global development of GDP in 2021 as follows: "Vaccination campaigns, concerted health policies and government financial support are expected to lift global GDP by 4.2% in 2021 after a fall of 4.2% this year. The recovery would be stronger if vaccines are rolled out fast, boosting confidence and lowering uncertainty. Delays to vaccination deployment, difficulties controlling new virus outbreaks and failure to learn lessons

from the first wave would weaken the outlook. The bounce-back will be strongest in the Asian countries that have brought the virus under control but even by the end of 2021, many economies will have shrunk from 2019 levels before the pandemic." (OECD 2020a).

The recovery of GDP is predicted to be slow in the Netherlands and the unemployment rate likely to remain high (even expected to increase to 6-6.5 cent despite government supportive policies) (OECD 2020a). Population with paid work is and will be more affected by COVID-19 than the population without paid work. For the former the income decline is higher than the latter who have in general a lower income, although there are retired persons with a higher income. It should be noted that about 30 per cent of the workforce in the Netherlands consist of flexible workers. This percentage has grown in the past twenty years and is one of the highest in Europe (Salverda 2018). This makes the quest for decent work most relevant (see, e.g., Timmerman 2019).

The empirical part of the paper is based on the published results of two surveys for the Netherlands. These results give an intermediate picture of the impact of COVID-19 on the financial vulnerability of consumers. Cross cultural research on this topic which takes into account various welfare regimes, aspects of temporary government support for entrepreneurs and employees, the role of flexible labour market, decent work and factors mentioned in Table 2 is needed. What we have in mind are data that can be found and shared in databases such as the European Social Survey, enabling researchers to use freely original data files on various topics of social research as work, family, health, happiness and the like (ESS 2020). A good example of this type of research can be found in Thompson et al. (2020). Comparing Spain with the Netherlands in 2016, they found that increasing financial insecurity has severe negative effects on mental, physical and social health (Thompson et al. 2020).

Anyhow, COVID-19 is likely to stay in Europe and the USA for a couple of years. So the topic of the paper will be relevant for a longer period of time just as the theoretical framework and conclusions drawn. They may be the basis for hypotheses to be tested in other settings than the Dutch one.

The two surveys discussed above make the relevance of the financial vulnerability analytics discussed in section three clear. Problems are to be expected in households with uncertain incomes, like the ones of flex workers and of self-employed; in households with inflexible budgets where, e.g., fixed and necessary expenses (like food and nutrition) are higher than disposable income; in households that are fragile because of a lack of buffers; in households with a low income for a longer period of time. Generally speaking, COVD-19 has a detrimental effect on the financial situation of households with an income procurement depending on paid work.

Serious problems are to be expected for about 4 per cent of households with a main breadwinner with paid work, despite the social safety net. This number is probably an underestimation because government support is not fully used, waiting time for support can be long, and unexpected expenses can mess up the financial situation of households. Income support for households with loss of work and income is offered at a social assistance base. This implies not only means testing of household income, but testing of household wealth as well. Some households may receive a benefit that will be lower than their fixed expenses defined in a narrow or wider sense.

Some household such as the ones of singles and the young, are less able to cope with the financial risks than others. There are lifecycle effects to be noted: young will have difficulty in finding and keeping jobs, and therefore in making ends meet. On top of this, in the Netherlands they have difficulty in finding affordable housing. It should not be overlooked that (increasing) financial insecurity has severe negative effects on mental, physical and social health (see Thompson et al. 2019, 2020). One might argue that a policy restriction to health problems induced by COVD-19 has serious societal opportunity costs. It may increase mental health problems, deteriorate physical health induced by forced idleness, and lead to severe loss of Quality Adjusted Life Years. The last may happen due to insufficient attention to health problems currently not life threatening albeit cause of avoidable mortality in later life (see, e.g., Gupta Strategists 2020). This means that the treatment of COVID-19 patients leads to severe health loss in non-COVID-19 patients given the scarcity of resources.

In the last paragraph of this paper we will discuss some elements of the issue how to help households that ended up in financial misery. Tax authorities in the Netherlands are notorious in applying the fine on fine method in default payments. Anyhow, situations in which household with financial problems are confronted with fine on fine due to inability to pay the debt should be avoided by simply avoiding the fine on fine method. In doing so the government will be very efficient in avoiding financial problems of consumers. However, this may be difficult to achieve since not only the behaviour of tax authorities stems out of mistrust of the citizen but much of the legislation passed in and approved by Parliament during the past decade is characterised by distrust towards the citizen and by putting a great emphasis on individual responsibility when things go wrong for one reason or the other. Therefore, it is not remarkable that a minority of households with financial problems are applying for help and assistance, mostly at a very late stage (see NIBUD 2019b). This calls for an active policy at the local level to reach these household one way or the other. In doing so, it is of great importance to offer highly indebted households a brighter future that is nearby. They should be out of the financial misery in outmost three years. A partly revolving fund to support and alleviate households with severe financial problems may be a good idea to achieve this aim. This may be supported by budget coaching and other accompanying activities. More generally speaking, household with serious financial problems because of COVID-19 should be assisted and not blamed.

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Towards sustainable innovations – essay in memoriam of Andries Nentjes

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Abstract:

Aim: This paper assesses theoretically and empirically three key factors for sustainable development within context of debates about economy and environment: autonomous technological change, induced technological change and barriers of entry to innovations.

Design/research methods: The paper covers a literature review on strong versus weak sustainability, followed by an explanation of autonomous technological change. Statistical analysis with literature review on induced technological change due to consumers' and policy demands for sustainable innovations, as well as literature review on policy support for the incumbent interests that rival sustainable innovations is provided. The information used is largely based on two chapters in the book on sustainable innovations (Krozer 2015), and presented in the context of long scientific cooperation with the late Andries Nentjes.

Conclusion/findings: The economic theoretical debates are hardly relevant for policies on sustainable innovations, because political views are inconsistent with observations and change during fluctuations in economic outcomes. The main conclusion is that autonomous technological change is the driver of sustainable innovations. Present policies pose barriers of entry to sustainable innovations, where the global value of support for vested interest exceeds the market potential for induced technological change due to demands of policies and consumers put together.

Originality/value of the paper: The study contribution to understanding of autonomous and induced technological change, showing that shifting policy support away from the incumbent interests towards sustainable innovations is key for sustainable development.

Keywords: sustainable innovations, income, environment, consumers, business support.

JEL: O00, O30, O31, O32, O55, Q01

1. Introduction

This paper discusses drivers of innovations that generate income growth and maintain availability of environmental qualities. Such sustainable innovations refer to renewable energy, organic agriculture, agroforestry, recycling and other businesses based on cleaner technologies which generate profits and foster environmental qualities. Andries Nentjes was a trailblazer in assessing those drivers. Using his economic model it can be shown that income growth is compatible with environmental qualities if authorities prevent pollution through regulations, because polluters have no interest to reduce their negative environmental impacts. This conclusion was published in 1973 (Kuipers, Nentjes 1973), nearly fifteen years before the popularization of the term sustainable development by the World Commission on Environment and Development (WCED 1987). Thereafter, Andries Nentjes promoted innovations for sustainable development in his advises to politicians, businesses and civil organizations, along with theorizing about policies on the sustainable innovations (Krozer, Nentjes 2006) as well as the possibilities for such innovations in businesses (Krozer, Nentjes 2008).

Our viewpoints complemented each other. While Andries Nentjes expected that authorities are drivers of change for sustainable development, my assessment was more cautious about their role and more optimistic about the role of innovating social entrepreneurs and ethical consumers that demand far reaching pollution reduction. He expressed the conventional economist opinion that markets fail to maintain environmental qualities because these common goods are difficult to appropriate, and therefore, private interests have little incentives to reduce pollution. Hence, authorities should correct this market failure through policies that maintain availability of environmental qualities, while ensuring welfare growth. This line of thought assumes that the authorities deliberate various societal interests for a common good rather than pursue interests of political elites, firms and other private groups that seek rents from the monopoly power of the authorities. My perspective as a practitioner in business referred to policy failures, such as financial support for the polluting businesses creating barriers of entry for innovators. Such support of incumbent interests is not justifiable from the welfare perspective, and rival to the sustainable innovations. Emerging innovators with social responsibilities were

obstructed when authorities entitled those incumbents for decisions about education, science, environment, and other common goods. In practice, both viewpoints are valid and their relevance varies depending on cultural traditions and political constellations.

Herewith, the policy failures are addressed because the ideas about market failures regarding the creation of common goods are part and parcel in economic theories. For decades it has been observed that entitling private interests for decision making about the common goods strengthens rent-seeking behavior of businesses, entailing clientelism and corruption, which undermine competition and welfare (Krueger 1974). Policy support of vested businesses in the past undermined economic development, due to barriers of entry for newcomers that deliver superior qualities or lower prices, as well as barriers of entry for innovators (Murphy et al. 1993). This support of incumbent interests can include non-financial licenses, property rights, concession for resources, monopoly land use, patents, author rights and other regulations, as well as financial policy instruments such as subsidies, tax exemptions, credit facilities, bonds, price discounts and other monetary gains for the existing businesses (Boldrin, Levine 2004). In environmental policies, rent-seeking behavior is widely observed when the polluting firms are licensed to operate. Moreover, polluting business are often entitled to arrangements in voluntary agreements (covenants), which undermines democratic decisions, obstructs the rule of law, and impedes sustainable innovations because of undemanding pollution reduction and fail-soft enforcement (Ashford 1996). Such agreements persist despite failures to attain sealed arrangements, because it is convenient for the authorities to shift their responsibilities for environmental qualities to market parties that aim to postpone or avoid pollution reduction. In addition, the authorities' policies are myopic when long-term interests of the common goods are subordinated to short-term private gains.

The general question addressed in this paper is what factors generate sustainable innovations from a global perspective. In answering that general question, four sub-questions are dealt with in subsequent sections. First, the ideological context of drivers for sustainable innovations is presented. Second, the role of knowledge in generating autonomous technological change along with pollution reduction, i.e.,

changes without direct policy interventions, is elaborated. Third, the role of policy demands and consumers demands for the sustainable innovations, i.e., induced technological change, is discussed. Finally, the role of financial policy support for the incumbent businesses is analysed. Non-monetary support is not dealt with in this paper. The basis of this article in my book on theory and practice of sustainable development (Krozer 2015). The discussion reflects an important aspect of a long-lasting scientific discussion with the late Andries Nentjes.

A few definitions help to avoid misunderstandings. Following Sen (2009), welfare is defined in a broad sense as a common good of satisfying individual and social demands from an intra- and inter-generational perspective, through the generation and distribution of wealth, leisure, care and other values. Added to this, an important element is the decision making about these values across generations, sexes and races. All within the limit of existing scarce resources. Innovations are comprehended in line with Schumpeter's view (1989: 59) as "doing things differently" with reference to novel technologies, products, services, designs, images, models or other objects for profits. Their qualification as sustainable refers to substantial reduction of pollution. Pollution is considered in a broad sense as impacts that undermine availability of the natural resources, diversity of nature and landscape, health and quality of life of people. The incumbent interests are producers and consumers whose interests are vested in the past and persist due to the entitlements obtained from authorities; for instance, tax exemptions or licenses to operate. Policies are considered actions by the public authorities.

2. Debate about sustainable development

The possibilities of obtaining higher income along with better environmental qualities and policies are widely discussed. This debate is well-summarized in Pearce and Turner (1990). On the extremes, the libertarians deny environmental threats for welfare, while ecologists pursue lifestyles using only basic technologies in order to prevent environmental collapse. Generally, both reject policies as ineffective and impeding their individual choice, albeit for different reasons. Aside

of these extremes, the importance of policies for environmental qualities is widely acknowledged, although proposals and opinions differ about how to achieve changes for better environment and income. A typical environmentalist argument is that the consumption of fossil fuels, minerals, soil and other non-renewable natural resources causes irreversible degradation of environmental qualities. Furthermore, the development of substitutes for renewable natural resources, i.e., bioresources, as well as for capital and labor are sluggish or impossible in many cases. The impossibility of replacing natural capital by human capital and/or physical capital, i.e., "strong sustainability", leads to policies that aim at reducing income and consumption for the sake of better environment. This is debated by many economists who argue that the scarce natural resources can be substituted by less scarce resources if prices fully reflect the impacts of polluting activities. In this "weak sustainability" argumentation, policies can generate higher income and better environmental qualities due to the sustainable innovations if the price put on pollution is high enough.

The moderate positions in the debate on income and environmental qualities are rather fluid. For example, many adepts of weak sustainability argue that the threats to species require limited economic activities in nature protection areas because loss of biodiversity is irreversible. On the other hand, many advocates of the strong sustainability favour high taxes on emission of carbon dioxide (CO_2) as this provides incentives to develop substitutes for fossil fuels which are renewable energy and energy saving. As is discussed below, sentiments in that debate revolve but fluctuate depending on economic cycles: the environmentalist views are vocal when economies boom while the economist ones dominate during slumps. Herewith, the booms refer to periods of productivity upswing, and the slump to recessions and crises; they evolve every 40 to 60 years when the booms are driven by the basic innovations of steam, rail, electricity, chemicals and computers followed by stagnation in technologies. Beneath, highlights of this debate during last two centuries are presented. They focus on the United Kingdom (UK) and United States of America (USA) as this debate evolved mainly within the Anglo-Saks political tradition, while influencing global policies as these countries were leaders in the global economy and politics during last two hundred years.

The foundation of environmentalist argumentation is usually traced back to the writings about population by Thomas Robert Malthus in the UK by the end of the 18th century (Malthus 1826). Using observations of travellers to many countries during the 18th century, Malthus theorized about the perpetuating cycles of growing population when higher incomes reduced mortality, which caused excessive uses of land, thereby declining harvests, food scarcity and mass starvation, followed by restoration of land and recovery of income. He called for policies that restrain income and fertility, although innovations in the agriculture generated food surplus in many European countries during his life time and thereafter. This Malthusian viewpoint is paradigmatic in the conventional environmentalist thought. Malthus and many of his contemporaries were disgusted by the industrial boom of late 18th century based on steam machines and idealized the "stationary state" of rural life as expressed by John Stuart Mill, a leading liberal economist and philosopher of 18th century in the UK (Mill 1985: 116). The ideal of rural communities with anti-industrial sentiments was attractive to the wealthy nobility but rarely to farmers who migrated to cities for a better living. The environmentalist ideal evolved into the mainstream environmentalist thinking during last century (Enzensberger 1982).

However, many non-conventional environmentalists successfully pursued safer work, wholesome food, proper housing, efficient energy, public sanitation, fire prevention, waste disposal and many other innovations in public service for better livelihood. Those sustainable innovations benefited people in cities who could afford them due to better income in industries, exceeding farming income significantly. Presently, such innovations are widely considered as basics in ethical production and consumption, whilst social entrepreneurship and ethical consumption are pursued (Enzensberger 1982).

During the economic boom driven by mass transport based on coal and steel in 19th century in the UK, William Stanley Jevons argued that more efficient fuel use is countered by even larger total consumption entailing fuels scarcities, nowadays called the rebound effect (see Sorrell 2009). The rebound effects are widespread because cost-savings are often allocated in larger consumption, which can contribute to welfare but also wasteful consumerism. However, the scarcities of fuels did not appear because innovations enabled deeper and cheaper coal mining. In addition, oil

and gas production expanded in the USA and Europe. This expansion was supported by authorities that created legal frameworks for the capital holdings, financed infrastructural works for production and distribution, and supported consumption of fuels with tax exemptions and other financial means, which are maintained and expanded until present (Rosenberg 1975). Entitlements for a monopoly position on markets were also given to the incumbent businesses, which created barriers of entry to innovators despite their better environmental and economic performances. For example, the entitlements to gas and oil producers for the monopoly in street lights in the late 1800s in the USA inhibited entry of electric lighting for several decades, despite numerous city fires caused by gas and oil explosions (DiLorenzo 1996). Despite these entitlements, the electric lights disseminated during 1900s when electricity became attractive business; there seems to be an analogy with present rivalry between fossil fuels and renewable energy. The monopoly entitlements are extended to various businesses using the argument that capital accumulation is necessary for large scale investments; this ideology of "natural monopoly" is a hoax to the public used for the public services and their privatization.

Debates about environmental policies emerged during the electricity boom early 1900s. Observations of damages caused by pollution from the expanding transport of fuels and electricity production brought Arthur Cecil Pigou in the UK to conclude that policies are needed to counter the harmful impacts of production on other interests (Pigou 1920). He advocated taxes on those so-called external effects and liabilities for damages caused by the polluters with compensations to victims. In his view, these financial instruments were more effective than regulations with norms. Environmental policies have been adopted across the world during last century, which triggered many innovations in pollution controls. Regulatory taxes and liabilities are rarely applied though widely advocated by economists as effective and efficient policy instruments because they are supposed to internalize the external environmental effect in market prices. On the contrary, focus on market negotiations in the neoclassic economics, which evolved into the mainstream economics late 1900s, opposed any environmental regulation. The basic argument is that the polluters and victims can resolve such externalities if they are free to negotiate about damages and compensations, and victims compensate polluters for their loss of

income (Coase 1972). This libertarian viewpoint was introduced in policies during 1980s as self regulation in covenants. The principle that the polluters must pay is maintained, though it is regularly undermined; for example, through income compensation for pollution reduction.

The horrors of two World Wars in the 1st half of the 20th century was followed by a boom due to expansion of technologies for production of chemicals in 1950s and 1960s; for example fertilizers and plastics. In this period, the Malthusian population theory was rephrased into the metaphor of "Spaceship Earth", where the environmental qualities pose limits to all human activities (Boulding 1966). This idea is popularized as global boundaries called environmental carrying capacity. This idea inspired many studies on population dynamics in closed systems, i.e., population without external inflows of resources, while innovation will not enable an extension of the global boundaries. A well-known study concerns a computer simulation that shows global collapse of the economic-environmental system caused by resource scarcities and pollution (Meadows et al. 1972).

However, other scholars pinpointed that the Earth is not a closed system because it receives energy inflows from the Sun, which compensates dissipation of energy during production and consumption, while mined materials remain in products which can be recycled due to innovations (Georgescu-Roegen 1971). In this line of thought, possibilities for cleaner technologies in production and consumption became the topic of interest during the economic slump in the 1970s and 1980s, and focus in the debate shifted toward continuous global welfare growth with respect to environmental qualities called sustainable development. This is assumed to be attainable due to innovations that generate income and reduce pollution, which are underpinned as sustainable metabolism, tree-like business, green consumption and other metaphors that suggest compatibility of income and environmental qualities if far reaching pollution reduction is demanded.

The ICT boom during 1990s and 2000s was accompanied by] arguments about the steady state economy (Daly, Cobb 1994), and de-growth, meaning decreasing global income with distribution of income for the sake of a better environment (Jackson 2011). However, the crisis after the financial collapse in 2008 illustrates that lower incomes do not necessarily reduce pollution because businesses spend

less on pollution reduction and consumers spend more on basic goods which are usually more material-intensive than services, thereby more polluting per unit of income. An alternative idea was launched in the United Nations, called "green growth," which advocates policies that pursue eco-innovations or sustainable innovation (UNEP 2011). Meanwhile, environmental policies are widely accepted but opinions about sustainable development vary from wholehearted trust in applications of science and technology for the pollution prevention (Pinker 2018) to tedious manoeuvring between the limits posed by environmental qualities and societal well-being (Raworth 2017).

When reflecting on the debate about income and environmental qualities, it seems that similar arguments revolve within an amalgam of various political views. These views encompass the libertarian ideas about free market negotiations next to the liberal ones about civil engagement, the conservative opinions against technologies next to the socialist ones in favor of them. Such diversity of political opinions is presumably due to various social background of participants in the environmentalist advocacy. Estimates of these participants vary because there is no membership of the environmental advocacy. Nevertheless, the membership of the nature and environmental organisations is registered; in Europe more than 30 million can be found (EEB 2020) and in USA more than 10 million members (Statista 2020a). The diversity of the political opinions and participants foster the continuity of environmentalism but not necessarily coherent policies. Environmental policies in most countries are based on extensive regulations that are rarely enforced, while environmental expenditures are compared to fostering economic development; these policies are usually paper tigers.

3. Autonomous technological change and environmental qualities

Despite low attention to and expenditures for environmental issues compared to the income growth, pollution reduction has been achieved. Globally, during the last century, real annual income grew on average nearly twice as fast than the 1.2% annual average growth of the material consumption. In some countries, even a

decrease in material consumption could be observed, i.e., pa process of decoupling and dematerialization of growth took place (Krausman et al. 2009). Moreover, innovations created a better liveable environment in many countries during last fifty years, though the environmental problems are far from resolved. Many hazards at work and in cities, measured by accidents, were mitigated during the 1970s. Waste, water and wastewater, measured by mass, were largely treated during the 1980s. Dirt, dust, smog and other health risks of local pollution, measured by health indicators. were reduced during the 1990s. Acidification of air, contamination of groundwater, losses of soil and other regional issues were contained during 2000s. Global issues of climate change, biodiversity loss and overconsumption are high on the policy agendas. All those improvements are realized along with a globally twice higher real income on average per person and better living measured by education and health for two additional billion people, but rarely by effective environmental policies. Hence, there are apparently forceful autonomous drivers for the improvements of environmental qualities.

A major driver of changes is the growth of services exceeding the growth in agriculture and industry. In effect, during the 20th century, the share of agriculture in the global economy declined on average by -0.9 a year, the share of industries by -0.1% whilst the share of services increased by 0.2% a year. The service sector grew particularly fast during the second half of the century, when global income growth accelerated, resulting in a 26% larger global share of services in the global economy in 2000 compared to the year 1900. Services covered 60% to 75% of the countries' economic value by 2010 compared to 35-45% hundred years earlier (PBL 2020). Drivers of that sectoral growth are vividly discussed in economics, but consensus exists that higher productivity is the key for the growth, whereas productivity is largely driven by knowledge, in particular practical knowledge called know-how. Along with higher productivity in agriculture and industries, defined as higher value of output per area of land and per worker, services became more productive by output value per worker even though services employed more people during that century. Within services, the knowledge work expanded fast measured by the number of workers. Scientists, engineers, educators, managers, policymakers, as well as other experts, craftsmen and artists constituted a small group of specialists

early 1900s. Their number grew to a quarter of all waged and non-waged workers in high-income countries hundred years later, whilst low-income countries catch up fast. Within knowledge work, know-how about production and deliveries grew particularly fast when enabled to use the theoretical knowledge, open social relations, inventive creations and other human capabilities and tools for solving complex problems. This know-how usually compounds labor, capital and knowledge resources for the engineering of natural resources into demanded, thereby valuable products (Mokyr 2002). Know-how generates productivity growth when it improves the resource use efficiency along with pollution reduction as co-benefit. These improvements constitute so-called autonomous technological change.

The mechanism of autonomous technological change is explained by looking into the box of a production function. A generic engineering model of production can be used in which the demanded output quality – a valuable product – is pursued with use of several input qualities of natural resources, given labor, capital and knowledge resources. Herewith, know-how is needed for the optimal use of natural resources in order to obtain the demanded product. When not done properly, the outcome may be negative from the economic and / or environmental point of view. In this model, loss prevention is a key factor for more effective use of resources, thereby a driver of autonomous technological change.

The role of know-how for the loss prevention can be illustrated with a hypothetical production function without any know-how, meaning that solely trial and error processes take place. This situation implies that the output qualities are a factorial function of input qualities (natural resources):

$$N_i = N_o! + 1 \tag{1}$$

For N_o, number of output qualities, N_i, number of input qualities.

Hence, an entrepreneur who aims to attain a demanded product with several natural resources without any know-how must consider numerous possible output qualities, but only one of them is the proper one. Imagine yourself cooking with unknown ingredients while aiming at a tasty dish. For example, with three input qualities of natural resources, seven possible output qualities must be considered ($3*2*1+1 = 7$), while six of them are not-satisfactory. Four input qualities deliver twenty-five possible output qualities ($4*3*2*1+1 = 25$), twenty-four of them being

not satisfactory. And so on (Leeuwen 1989). Given that any production involves several dozens of natural resources, a myriad of non-demanded output qualities can be generated in a situation of negligible know-how. Each non-demanded output quality is a resource loss that can be remade into the desired quality with additional input, or is discharged into the environment as pollution. Both are costly. The remaking is costly to the producer and pollution is detrimental for society.

More know-how enables to generate a larger number of the demanded products and prevent some losses, thereby reducing pollution. For example, the energy output per fuel input increased from 4% on average in 1900 to nearly 50% nowadays (Smil 2017). This reduced losses of heat, dust and other emissions. In effect, more know-how enlarges the number of desired products, generating income and reducing pollution, in turn decreasing the costs of pollution abatement in case of demand for pollution reduction. Improved loss prevention, often called cleaner production, generates income growth along with pollution reduction quasi-autonomously whilst higher demands for pollution reduction require better loss prevention, thereby more effective production which generates income, ceteris paribus. This is ignored, for example, in the advocacy of degrowth (Degrowth Declaration 2008). Know-how improves loss prevention but consumers demands can generate more complex production, meaning larger number input qualities, which requires more and diverse know-how. For instance, developing electric cars requires know-how about electricity and about ignition. Hence, the engineering performance in time can be conceptualized as a race between the growing know-how for loss prevention and more complex production due to the changing demands. Inter alia, some types of production hardly improve with much know-how, creating another challenge in addition to deficient know-how. For example, feed conversion in animals hardly changed despite much knowledge about animal metabolism and know-how about feeding. The feed conversion ratio of animals is the energy content of meat divided by all energy inputs needed for the production of meat. The energy content of meat is usually below ten percent (Statista 2020b).

Given the resource prices, larger know-how for loss prevention means higher costs, which may generate exponential improvements of the economic performance because it leads to provision of desired products and reduces costly discharges. Loss

prevention is economically feasible when costs of know-how are compensated by the increased value of demanded products and the lower cost of discharges. It should be noted that demands for pollution reduction increase the costs of discharges, thereby making the use of know-how more attractive. If the benefit of the loss prevention exceeds the costs of know-how, innovation-rents are gained (a rent is net income from an asset). When the innovation-rents are allocated to knowledge work for new valuable novelties, or inventions are generated, this may lead to the appearance of innovations on the market. However, part of these innovation-rents is consumed by shareholders, another part is lost because due to inflation, while potential rents may disappear in financial loss when knowledge fails to invent or inventions fail in sales. Hence, loss prevention due to know-how reduces discharges of materials and energy into environment, which increases the production value due to more demanded products and reduces the costs of pollution, whilst the allocations of innovation-rents into novel valuable products can generate profitable innovations but they also risk failures. Combined valuable products, cost-saving pollution reduction, profitable innovations and risk of failures generate income growth along with pollution reduction as a side-effect of better know-how. This combination explains the autonomous technological change, called autonomous because emerges without specific external factors, through more effective production.

Given that the material and energy costs constitute only a part of total production costs, the scales of loss prevention and allocation of innovation-rents must be large in order to generate the income growth accompanied by pollution reduction. However, direct estimates of these scales are not possible because data on the product value and cost reduction of pollution due to loss prevention and the sales of all inventions are unavailable. An indirect estimate can be based on the comparison of indexed Gross Domestic Product (GDP) in USD and the materials use in tons. The scale is estimated with OECD data on member countries during, for the sake of this example, the period 2000-2010, because the OECD database on materials is most complete. The index base is year 2000 = 100. The GDP index is corrected for indexed labor costs in order to exclude the impact of changing labor costs. If the indexed GDP increases after correction for labor costs and the indexed materials, an increase indicates there are innovation-rents due to loss prevention. In

the OECD, the increase was on average about USD 4 800 billion a year during those ten years (this number reflects the corrected GDP increase by USD 337 billion in 2001 compared to 2000, up to USD 11 146 billion in 2010 compared to 2009). This is almost 11.7% of the USD 41 000 billion GDP of the OECD members. If it is assumed that the allocation mechanism is globally similar to the OECD countries, considering that the OECD has a share of 59% in global GDP, the global innovation-rents amount to USD 8 200 billion, about 12.6% of global GDP. These data indicate a slower growth of material use than of GDP, and even a decrease of material input use in some countries (Krozer 2015).

4. Opportunities for sustainable innovations due to induced innovations

Technological change can be induced by the specific demands of public authorities and consumers. These demands generate opportunities for innovators if they can outperform rival incumbent businesses by prices and qualities. However, the opportunities do not guarantee sales of innovations. The demands provide opportunities for sustainable innovations when the authorities aim to prevent harms to health and nature, or consumers express interest for their well-being and work performance. The former can achieve its aim by regulation, the latter by purchases.

High environmental qualities are particularly important for knowledge work, not only for the well-being of the individuals, but also due to its potential positive impact on knowledge-worker performance. The line between work and leisure is typically blurred for most knowledge work. Whilst knowledge work rarely performs when it is bound to agriculture or industry, it flourishes due to social interactions that generate formal and informal exchanges of the professional knowledge. These knowledge spillovers emerge when people of various interests interact in spacious, tranquil, lush public spaces. These spaces are found in rural areas without sufficient density of various people and in quasi-rural environment with high diversity of people in parks, campuses, terraces and suchlike urban creations of meeting points.

The regulatory demands refer to direct regulations in the form of licenses and performance standards, as well as indirect regulations such as taxes, subsidies and

other financial instruments. They address issues in the process of extraction of
natural resources – safety in mines, liability for oil and gas spills, obliged
reforestation and so on – and pollution controls in all business sectors and in
households. Market opportunities in the extractions of natural resources cannot be
estimated directly because data on available technologies is deficient. The indirect
estimates based on the rents from extraction of natural resources are indicative; these
rents are sales of commodities minus costs of extraction. Assuming competition in
the sales of commodities and extractions technologies, an increase of rents indicate
the market value that can be accrued when better technologies are demanded. The
estimated rents in extraction of coal, oil, gas, forest and minerals are based on the
World Bank database for the period 2004-2012. Fluctuations in data after the
financial crisis in 2008 make it necessary to shorten the period to 2004-2008. The
annual average increase in rents was USD 1 100 billion a year. Furthermore,
markets in renewable energy, energy efficiency and water supply should be added to
the resource extractions. These are estimated to be about USD 400 billion a year
(Copenhagen Cleantech Cluster 2012). Hence, market opportunities for the
sustainable innovations in the extraction of natural resources including energy are
about USD 1 500 billion a year, i.e., 2.3% of global GDP in 2010. Data about global
pollution controls are not available. Most complete data can be found for the 28
member states of the European Union (EU). The estimated rent is on average about
USD 200 billion annually for the period 1995-2010, i.e., 1.5% of the EU GDP in
2010. If this percentage would apply to the global scale, assuming that pollution
relates directly to the countries' GDP, about USD 1 300 billion a year is spent
globally on the pollution controls. It should be noted that countries with material-
intensive, polluting industries might have a higher percentage than that 1.5% of
GDP average in the EU (e.g., Australia and Canada), while the percentage for EU
countries with much services as well as low-income countries is lower. In sum, the
regulations of environmental qualities generate yearly about USD 2 800 billion
market opportunities for sustainable innovations, approximating 3.7% of global
GDP.

As mentioned, the consumers demand of attributes of environmental qualities is
reflected in purchases. These purchases refer to qualities within the cultural

expressions of nature. For example, 'natural' because made of bioresources, 'fair trade' because paid to indigenous community, 'ecological' because low-pollution, 'animal friendly' because allowing space, and suchlike consumptive cultural purchases and uses of nature; herewith, this type of consumables are labelled as natural blends. For convenience, the natural blends are divided into three markets with sufficient distinction to avoid double counting: products that express ethical purchases because they express the consumers responsibilities for nature and people; services that provide experience of nature on locations; and images of nature in media, culture and education. All these markets provide opportunities for sustainable innovations.

The global estimates are only indicative because of poor data. Data on all ethical purchases can only be found for the UK, but even these data vary from USD 54 billion (Co-op 2019) to USD 106 billion (Triodos 2017) for nearly the same year due to difference in the definition of the purchases. Scaling up of the UK data to the global level would show a unreliably large global market. It has been suggested that about 3% of the consumer purchases in the EU can be considered as ethical purchases (Vringer et al. 2013). These purchases per capita are rather high in Austria, Denmark, Switzerland, Germany and the UK, while being lower in other EU countries. Assuming that 2% of the disposable consumer expenditures in the OECD countries and 1% in the non-OECD countries are spent on ethical purchases, the global market opportunities for the sustainable innovations related to ethical purchases are about USD 700 billion annually (1.0% of global GDP in 2010). Visits to and holidays in nature is becoming popular, and ecotourism is a growing business. Inquiries into the tourist destinations suggest that nearly USD 600 billion is spend on the ecotourism annually, showing faster growth than international tourism as a whole (Balmford et al. 2015). Even larger expenditures are made on domestic tourism for health, wellness, and nature (Krozer, Lordkipanidze 2018). Assuming arbitrarily that one third of the stated preferences in international ecotourism is revealed because spent in the nature resorts, which means excluding mixes of leisure, culture and other forms of tourism, the global market for sustainable innovations in ecotourism exceeds USD 200 billion per year. This is

excluding the domestic expenditures on the ecotourism, which can double that estimate. This number amounts to 0.3% of global GDP in 2010.

Opportunities also emerge in media, education and other cultural activities, but data are unavailable. If it is assumed that the above mentioned 40 million members of environmental organizations in Europe and USA spend on their consumption of leisure, culture, education directly in relation to the natural blends, the global market opportunities for sustainable innovations in cultural expressions are about USD 42 billion (0.07% of global GDP). This number is probably an underestimation of all expenditures on nature in media, because many non-members are also passionate consumers of the natural blends in media. Globally, about 800 billion market opportunities exist for sustainable innovations due to the natural blends, which is about 1.4% of global GDP (Krozer 2015).

While data lack, an indication of the size of the total global market opportunities for the sustainable innovations is more that USD 3 600 billion a year. It is mainly consumers demands that create opportunities, as ethically purchases are on the rise ones. Although the growing consumer demands for natural blends may justify far reaching regulatory measures, regulations have been relaxed in the EU and USA during last decades. This seems to be beneficial to the polluters, but they risk losses of market shares to competing sustainable innovators. While the market opportunities due to the regulatory demands decrease in the USA and Europe, they expand in many Asian countries. Market losses can be observed in renewable energy because the Chinese solar producers outcompete the European ones, in the electric cars because Japanese outcompete the USA producers. Another example is bioresources, because Indian producers take lead in bioplastics. However, links between the regulatory demands and sales of innovations can be disputed. Moreover, entitlements to the polluting business through lax policies can deplore sustainable innovations. For instance, in the Netherlands producers of pollution control equipment were trailblazing in many areas due to stringent demands during 1970s and 1980s, but they lost market shares from 1990s on when self regulation was pursued under various political composition of the government (Krozer 2008).

5. Barriers posed by present policies

Regarding large and growing demands for environmental qualities which create market opportunities for the sustainable innovations, fast dissemination of technologies that reduce pollution can be expected. However, complaints about impediments are too notorious to be dismissed as soundbites of grumpy technology producers. Several impediments related to information deficiencies can be pinpointed; for example, trade-offs between functional performance and the environmental performance of supplied technologies; lack of interest and deficient knowledge of adopters about the environmental issues; difficulties to handle profitability and environmental qualities in purchases because these goals can collide; deficient links between demands of authorities and adopted sustainable innovations, and others. All these impediments related to imperfect information about the sustainable innovations can be relevant in addition to the conventional risk of adopting innovations because of technical and managerial uncertainties during uses.

The barriers to entry for the sustainable innovators posed by authorities implies impediments for the dissemination of novelties because policies impede sales and operations of these innovators on different markets. Here, only tangible barriers to entry are addressed; whether they are on purpose, or by incidence is not assessed. In particular, the financial policy support for the incumbent interests whose activities are polluting is estimated. The financial policy support creates barriers to entry because incumbents' interests are rival to the sustainable innovators, and they can act at lower costs. In this discussion, focus is only on a few well-measurable global instruments in monetary terms. More barriers can be found when considering financial instruments on the country level. For sure, more research on the barriers to entry for the sustainable innovators is needed because removing such barriers can be decisive for progress toward sustainable development.

The policy support in energy addresses businesses that produce energy resources, as well as businesses and households that consume energy products and services; for example, gasoline and electricity. This support is by and large in favor of fossil fuels. Herewith, subsidies are expenditures from the public budgets. These

are statistically measured, among others by the International Energy Agency. In addition, much larger tax exemptions, credit facilities and price guarantees are dedicated to support the producers and consumers of fossil fuels which do not appear in the budgets, thereby miss democratic control and societal scrutiny. Furthermore, agreements with large energy consumers in businesses about lower energy taxes and price discounts make energy-efficiency unattractive to them, although the savings per unit energy consumption are usually cheaper in large installations than in small ones. Such agreements also undermine fair play in competition and obstruct the income distribution because small business and households must pay higher prices in order to compensate for the lower costs of large energy consumers. A comprehensive assessment of the financial support policy, excluding the tax and price agreements with large energy consumers, was carried out by the International Monetary Fund (IMF). This study indicates that abolishing this support policy would reduce government expenditure yearly aby bout USD 2 900 billion. Most of this support is aimed at reducing the price of fossil fuels (Coady et al. 2015). Assuming that 80% of that support is dedicated to fossil fuels, this makes USD 2175 billion per year, which is about one third on the global market value of energy consumption. The prices and tax discounts for large energy consumers approximate USD 180 billion a year in the EU, but they are unknown globally (Krozer 2015).

Agriculture receives large subsidies which are environmentally harmful, because they are mainly allocated to support larger use of chemicals and larger output per hectare, which in turn mainly supports large-scale farming and industrial businesses. That financial support in the EU and USA is estimated to exceed USD 430 billion a year, excluding public financing for restructuring of farmland which generates large scale agricultural units but impedes ecologically sound management (Worldwatch 2014). In addition, policies support consumption of foods through tax exemptions, which can encourage wasteful food consumption in high-income countries.

Infrastructure is mainly paid from the public sources; nearly 97% of USD 2 600 billion global annual investment is covered by the public expenditures (Dobbs et al. 2013). However, the infrastructural works deplore environmental qualities on site and generate activities that cause harms to the surrounding. Moreover, the

construction of infrastructure are often more expensive than planned, many investments are unnecessary because they generate low or negative economic effects after the realization. It is shown that much infrastructure would not be built when these works would be financed from private resources, because they are costly and risky compared to many other socially beneficial investments (Flyvbjerg et al. 2003). My prudent guess is that 20% of that policy support is wasteful, which means USD 520 billion a year.

Expropriation of land from local communities for intensive agriculture, forestry and mining is supported by authorities through concessions to businesses for use of land, neglecting the pre-existing and customary local land rights. Such concessions degrade environmental qualities when the extensive use by local communities is replaced, while these communities lose their source of income. Such concessions, guaranteed by authorities as entitlements to businesses, were assessed for 22 emerging economies with the land coverage of 9 million hectares. These concessions are valued at USD 5 190 billion (Leon et al. 2013). If a 10% linear depreciation of these rights is assumed, the annual value of public support for these concessions is about USD 519 billion a year.

The total public financial support for the polluting, incumbent interests is estimated at USD 3800 billion a year, which is about 5.8% global GDP. However, it is presumably larger if more detailed assessments on the countries' levels would be carried out. The numbers show that public support to the harmful incumbent interests is larger than the global market opportunities for sustainable innovations. Moreover, much public support is accrued by large-scale firms, which implies that the shareholders obtain benefits rather than small and medium scale enterprises. This reduces competition, hampers innovations and enhances shifts of income from labor to large holders of capital.

In theory, the pace of pollution reduction can be considered a function of the allocated innovation-rents for valuable products, subject to the market opportunities for sustainable innovations, d, versus the barriers of entry, s. Hence, the factor d/s indicates the decoupling rate due to the induced technological change, meaning the rate at which the incomes grow faster than pollution. This can be formally written as follows:

$$\Delta i = \Delta v_a^{d/s} \tag{2}$$

Given that the global market opportunities for sustainable innovations approach USD 3 600 billion a year, and the barriers of entry posed by the financial support policy to the harmful incumbents exceed USD 3 800 billion a year, the decoupling rate of induced technological change is below unity. This implies slower technological change for pollution reduction than the one induced by demand. The observed decoupling is generated despite obstructions by the public authorities, thanks to autonomous technological change and better know-how. Hence, faster technological change for sustainable development and higher effectivity of production can be expected in the countries that eliminate their policy support to incumbent consumers and producers.

6. Concluding remarks

Possibilities for innovating for renewable energy, agroforestry, recycling and other sustainable innovations were discussed in this paper with regard to autonomous technological change, induced technological change and barriers to entry for innovations, in the context of debates about income growth and environmental qualities. In these debates, which has been ongoing for two centuries, the environmentalists typically assume that economies are locked-in within destructive technological patterns in the closed system of Earth. However, the Earth is an open solar system and technologies, although imperfectly, enable maintenance of environmental qualities. Mainstream economics assumes that market competition is the rational ideal, and authorities / governments are independent entities pursuing the common good. However, market participants seek rents from entitlements obtained from authorities that rather support their private interests that execute their power. Various arguments in the debate are inconsistent with observations, making the effectivity of policies for sustainable innovations disputable.

Quasi-autonomous changes have evolved during the last century, when the global economy shifted from agriculture and industries to services. Services makes more intensive use of knowledge work increased, in particular know-how. The

growing know-how enabled more effective production, which means more desired products per resources input along with pollution reduction as a side-effect of the effectivity improvements. More effective production generated innovation-rents that are partially allocated in the innovative, higher value activities. The economic benefit was estimated in this paper to approach 12.6% of global GDP in the first decade of the 21st century.

Besides for a good living, people also demand environmental qualities because their performance needs social interaction in a good environment; in particular, in the case of knowledge work. These demands generate market opportunities for sustainable innovations, which can be realized if they provide qualities and prices that are superior to existing goods and services. These market opportunities are induced by the regulatory and consumer demands. The regulatory demands aim to contain losses in extraction of the natural resources and to reduce pollution. Based on the estimates shown above the regulatory opportunities for sustainable innovations are estimated to exceed globally USD 2 800 billion per year, about 3.7% of global GDP. In addition, global market opportunities emerge due to consumer demands for ethical purchases, ecotourism and images of nature. These cultural expressions of environmental qualities generate about USD 800 billion a year, 1.4% of global GDP. Hence, global market opportunities for sustainable innovations exceed USD 3 600 billion a year, 5.1% of global GDP. This provides a strong incentive for induced technological change based on dissemination of sustainable innovations.

However, sustainable innovators face high barriers of entry posed by authorities, because of support of current business interest, being harmful to environmental qualities. In this paper, it was estimated that solely the financial support for fossil fuels, large scale agriculture, wasteful infrastructure and unfair concessions in the exploitation of minerals exceeds USD 3800 billion a year, which is about 5.8% global GDP. The barrier of entry caused by this financial support for existing producers using polluting technologies is larger than the induced technological change created by the demand for sustainable innovations. This finding indicates that globally the public authorities obstruct sustainable innovations, thereby impede progress toward sustainable development.

Possibilities for sustainable innovation are developed but they are obstructed by policy support for the environmentally harmful incumbent interests. Shifting this public support towards capacity building and income guarantees for development and dissemination of the sustainable innovations amalgamates various social interests, because it enhances productivity and foster environmental qualities through experimenting and business start-ups.

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Conflict of interest
There are no conflicts of interests involved in this publication – author copyrights remain with the author of this paper.

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