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Behavioural Economics on the Financing of the Renewable Energy Sector: The Case of Finnish Parliament's Presentation HE 175 2017 to Support Renewable Energy Suppliers

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<p>Climate targets are key political subjects, thus renewable energy operators have a significant role. Finland's government has committed to the Paris climate agreement of keeping temperature rise below 2 Celsius to pre-industrial levels and the European Union has set a target at decarbonizing the economy by 2050. Finland's individual goal is to cover 50% of its energy demand by renewable energy by 2020.</p> <p>Behavioural economics has been studied since the 18th century with key findings on institutional herding resulting from asymmetric information, information cascades, reputational reasons and purely psychological factors such as from the impact of availability and preference for conformity. Institutional herding has mainly been studied through commercial institutions, hence this research has studied governmental funding. The purpose of the research is both to understand better what drives governmental renewable energy funding and to provide further information on ongoing behavioural economics studies. The most valuable gain is acquiring a deeper understanding on whether the Finland's new funding methods support the set climate targets and understand which pitfalls should be avoided in order to create future schemes, which would support the set targets.</p> <p>The research resulted in finding high levels of governmental level herding in terms of tender schemes in order to fund renewable energy. Evidence for both rational and spurious herding was found. Governments share mutual information on price savings, technology development and on strategies to achieve climate goals and utilize the recommendations of the same international networks such as OECD, but also evidence for spurious herding was detected as the tender schemes are mainly suited for big investors and market disturbances cannot be covered through tenders, which both suggest that the tender scheme does not fully serve the initial climate target, but rather indicates irrational herd behaviour.</p>	
Keywords	Behavioural economics, renewable energy, governmental funding

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Glossary

- CAPM** Measuring deviations from equilibrium in capital asset pricing models prices is utilized in herding studies. The model focuses on investigating adjustments on fundamentals. (Hwang & Salmon, 2004).
- CSAD** Cross-sectional standard deviation measures the average absolute value of deviation of stocks against the returns of equally weighted market portfolios. Herding is detected through the relationship of CSAD and market return (Spyros, 2013).
- LSV** According to stock market analysts Lakonishok, Shleifer and Vishny named method is used for analyzing herd behaviour. Proportion of net buyers relative to the total market actors who trade a particular stock minus an adjustment factor, is calculated (Spyros, 2013).
- PCM** Price cost margin (Boone, 2008) is designed based on LSV. The measure can detect the direction and intensity of trading. (Bikhchandani & Sharma, 2001)
- SPEC** Firm-quarter-specific measure of speculative intensity is utilized for studying the impact of noise and quality of prices on returns. Noise can be detected as behaviour reflects actions beyond information. (Hoitash & Murugappa, 2008)

1 Introduction

Behavioural economics has been studied since the 18th century, but recently it has received more public attention through the Nobel prize winner, economist and psychologist Daniel Kahneman's book *Thinking, Fast and Slow* (Kahneman, 2012). There is a significant amount of evidence of institutional herding and pure psychological factors affecting manager decision making.

Renewable energy operators have an immensely important role in reaching climate targets, which 117 countries, Finland included, have committed to. In 2017 the Finnish government decided to propose a new funding strategy in order to support renewable energy operators after many other countries began following a similar strategy. Previously behavioural economics has been able to detect institutional herding and explain what kind of reasons lie behind such behaviour, including whether herding has been rational or spurious. As climate targets are one of the key current political goals, it is important to inspect how the decisions have been made, and whether they are based on accurate information and aim towards the set targets in the best possible way or whether they are not entirely rational but rather based on behavioural laws.

Governmental financial decision making has not been studied before from the point of behavioural economics and thus ideal measuring methods do not exist. The thesis analyses the environment of the proposal HE 175 2017 in order to provide more understanding of the governmental financing. Further studies should be conducted in order to understand the possibility of information cascades and to go beyond annual data.

Behavioural economics has been studied widely globally, and a significant amount of information on the impacting factors has been found. The challenge has been to identify the accurate reason of events, for instance whether high returns follow from herding or whether herding results from them.

Several methods of measuring herding have been developed, from calculating the number of agents ending up on the same side of the market to linear formulas analysing momentum, which has been found to be linked to herding behaviour. Impacts of herding have resulted in a debate, whether they cause price destabilization or not and whether herding is internationally transferable.

Data on the renewable energy funding schemes is widely available globally. However, the trend is rather new and the success of the new schemes is still uncovered and will be difficult to analyse in the near future as the fast development of renewable energy technology has a great impact on it.

The thesis has its foundation on a literature review of behavioural economics and international networks, which mostly consists of secondary sources. The literature review was utilized in order to gain understanding of the principles of the subject and to understand any existing gaps in previous knowledge. In order to understand which specific factors impact on Finnish renewable energy funding scheme and how the scheme can provide more understanding to the wider context, a case study of the proposal HE 175 2017 was conducted. The review on international networks was found important in order to understand which structures direct Finnish policy creation in general in order to understand the political dynamics in-depth and to avoid simplifying political behaviour.

2 Literature review

2.1 Reunifying psychology and economics

The birth of behavioural economics is considered returning to the roots of economics as it resembles the ideas of Adam Smith, one of the fathers of economics. (Thaler, 2016) The old views considered psychology and economics closely related as psychology is considered the underlying base for all social sciences, thus for economics as well. The two fields separated in the early 20th century as the fields favoured different styles of academic research. Psychologists were interested in experimental studies whereas economists preferred utilizing mathematical methods. In the 1950's polymath Herbert Simon took a step forward to reunify the two sciences by acknowledging the limits of human rationality in economics. Later in the 1970's the unification developed further as psychologists begun theorizing cognitive mechanisms by studying judgement and economic decision making. (Camerer, 1999)

Economics are divided into several views. "The most important are classical economics; neoclassical economics* (an approach to economics founded on the principles that people are rational and have discernible preferences based on value; that people maximize utility while firms maximize profits; and that people act independently with full and relevant information)" (Collins 2017: 22).

Neoclassical approach holds ideas, that

i)agents have well-defined preferences and unbiased beliefs and expectations, They make optimal choices based on these beliefs and preferences. This in turn implies that agents have infinite cognitive abilities (or, put another way, are as smart as the smartest economist) and infinite willpower since they choose what is best, not what is momentarily tempting. iii) Although they may act altruistically, especially towards close friends and family, their primary motivation is self-interest" (Thaler 2016: 1578).

The new views are divided further, the Neo Austrian approach considers economy to be constantly evolving whereas Post Keynesian believes equilibrium to be predetermined, individuals acting based on self-interest and are guided by a transparent power. (Clarke, 1987-88)

The reunification of psychology and economics established four basic principles of economics, which are contrary to the ideas of classical economics. The first one, Expected Utility Theory expects that the value of risk is based on the potential outcome. In case two gambles have a common probability of a common outcome, the outcome will be neglected. Another principle, loss-aversion, confirms the same idea. Gains have twice as much value compared to losses when analysed how much people dislike losses. This can potentially explain why environmental damage is valued expensive. Surveys describe, that people ask 2 to 10 times more money when acceptance for environmental damage is demanded. (Camerer, 1999)

The main idea of behavioural economics is that individuals are not necessarily rational actors in financial markets. A case of this can be that a larger reward is promised in a week and only a smaller one now, people tend to prefer the smaller immediate reward. In case a year is added to the former equation, people tend to estimate themselves to be more patient, but after the year has passed they result not to be as patient as estimated. This can lead to time-inconsistent behaviour. (Thaler, 2016) The third basic principle of behavioural economics is thus exponential discounting, which takes into account the preference for immediate rewards and refers to costs and benefits incurring in the future of economic choices. (Camerer, 1999)

Equilibria is the fourth principle of behavioural economics. The term refers to situations, where supply meets demand and is commonly used by economists in system studies. Like in any other science, equilibrium is a fundamental instrument. It refers to behaviour where the aim of actions is to reach a situation with no particular action. According to T.W. Hutchison evidence for real economic forces to be moving economy towards equilibrium need to be shown in order for the equilibrium analysis to be useful at all. (Clarke, 1987-88) The process of equilibria formation however has not been studied widely. It is believed, that equilibrium was formed as a result from learning process, which indicates that individuals do not automatically act rationally but have learned to act more so based on previous mistakes and successes. (Camerer, 1999)

On the contrary the previously discussed Post Keynesian approach considers equilibria to be a pre-determined force of nature and describes correlated rational individual behaviour naturally to aim towards the equilibrium state.

Equilibrium is considered to show where the economy is moving, thus entrepreneur's role is to observe the correct direction before other market actors. Neo Austrian approach again considers, that equilibrium is not predetermined, but past and subjective assessments of its future determine the direction of the economy. It views the entrepreneur's role in a more active way, as a contributor to a constantly evolving economy. Neo Austrian approach does not utilize time in a conservative sense unlike the Post Keynesian approach. According to the conservative view, time is viewed in an onward sense, the equilibrium cannot be decided by travelling back in time. According to the Neo Austrian logical time, it can be travelled back and forward in order to reach the equilibrium state needed. (Clarke, 1987-88)

2.2 Psychological perspective on the standard economic model

Three bounds of human nature; unbounded rationality, unbounded willpower and unbounded selfishness are parts of the standard economic model. Unbounded rationality is explained by prospect theory, which explains how people make decisions under uncertainty and shows how unbounded rationality is unrealistic. The theory reflects docility, loss aversion and experimental findings, all key components of psychology. Unbounded willpower is familiar to everyone. Many have some time given up to the temptation of ice cream over a run or experienced another similar situation. Unbounded selfishness again has found to be unrealistic in laboratory experiments, where people are not willing to accept unfair offers. (Thaler, 2016)

Beyond the aforementioned psychological traits, two systems, heuristics, biases and overconfidence drive human behaviour in financial markets. Heuristics refer to rational behaviour, where the behaviour is based on learning from previous actions and decisions. A manager can for example observe the behaviour of other firms and presume they have private information which has led to the set action and then act based on the learning outcome. (Hirshleifer & Welch, 1995)

Two systems have a significant role in all decision making. Human mind can be divided into two systems: one and two. System 1 functions quickly making quick judgements and associations with no or very little effort.

System 2 operates in a more complex way, directing attention to problems that require more thoughtful processes and is often linked to subjective experiences such as agency, choice, and concentration. (Kahneman, 2012) Biases to availability is a typical psychological feature referring to a situation where an available option is preferred over another one, people tend to ignore statistics and are biased towards the available option. For example, when stereotypical image of a librarian is described to a person prior to presenting a question on whether person A is more likely a business or a literature student, people tend to select the literature option despite the prevailing statistics, that business students form a significantly larger portion of students compared to literature students.

Overconfidence results from the illusion of understanding and from the illusion of validity. It is strongly related to biases. The economist and psychologist Daniel Kahneman uses the term WYSIATI, which refers to "what you see is all there is". The function belongs to system 1 as the minds quickly jumps into seeking coherence. Human mind has the tendency to seek coherence in general and create stories. The illusion of understanding results from ignoring some of the existing facts for creating a coherent story, which again results into overconfidence as some of the possibly significant facts have been ignored. The illusion of validity again can be described through a visual example. Let's assume a person is looking at a row of soldiers from a distance, most likely they all look like the same height and thus identically suitable for their soldier role. However, from a shorter distance it could be observed that there are differences in their height and hence their capabilities as soldiers are different to one another. (Kahneman, 2012)

2.3 Main types of economic behaviour

Multiple studies divide behavioural economics into rational and irrational and observe the categories of feedback-trading, herding and momentum trading. Rational behaviour results from agents acting based on private information with rational motives and irrational behaviour refers to heuristics, acting based on learning from observations. Both types can be observed as herding.

It is important to note, that rational herding does not automatically result from accurate information and that irrational herding can be based on accurate information. (Galariotis, et al., 2016; Lakonishok, et al., 199; Grinblatt, et al., 1995)

Momentum investment strategies refer to strategy of buying stocks based on their past performance, and is mainly studied through mutual fund investors. A study shows, that 77% of mutual fund investors purchased stocks, that were previous winners, but there was no evidence for reversible action of selling past losers. It was found, that momentum investment provided significantly better performance than non-momentum investment. Momentum was also found to be correlated with herding, there was a significant cross-sectional dispersion in utilizing momentum strategies and trade with the herd. Despite the significant nature, it should be noted, that the level of these patterns was not substantial. (Grinblatt, et al., 1995)

Behavioural economics studies focus mainly on positive-feedback trading and herding. Positive feedback trading refers to investors purchasing past winners and selling past losers. Herding refers to behaviour where investors end up on the same selling or buying side of the market based on numerous reasons, which are further discussed later. Momentum trading refers to trading according to current fads. (Grinblatt, et al., 1995)The most widely studied type of economic behaviour is herding, thus this research focuses on its multi-dimensional features. Herding is found most common among broker-dealers and foreign banks with holdings of foreign currency. Broker-dealers, pension and hedge funds with holdings in the S&P 500 Index future contracts are found likely to herd. (Bikhchandani & Sharma, 2001)

2.4 Causes for economic behaviour

Previously in the chapter 2.3 the three types of economic behaviour were introduced: herding, feedback trading and momentum trading. Studies show they are often related and do not necessarily occur only separately. (Nofsinger & Sias, 1999) Before discussing the types further, it is important to note, that common or correlated behaviour in financial markets can be both efficient and inefficient.

Common efficient behaviour results from acting based on fundamental news and the reasons for inefficient behaviour again include a lot of variation, which is discussed in detail in the following paragraphs. (Hwang & Salmon, 2004)

Herding is found to be based on multi-dimensional market information. In case the most commonly observed part of information, price, would include everything worth considering in terms of the market, herding could not occur. Avery and Zemsky argue, that long-run financial choices are efficient and that with simple information structures herding is not possible. Herd behaviour is prevented through price adjustments, which are made by a competitive market maker, which prevents any herd behaviour. In case the market maker is uncertain about value changes herding could occur. This is due to the one-dimensional character of price. (Avery & Zemsky, 1996) Studies by Bikhchandani and Sharma support the argument as they state that private information has a significant role as also according to them herding does not rise in case price reflects full information. (Bikhchandani & Sharma, 2001)

As discussed before, studied focus on herding, which can be divided into rational, near rational and irrational behaviour. Herding is found common among less experienced professionals and under uncertain circumstances. (Spyros, 2013) Herding occurs often for reputational reasons and action is taken against personal private information. It is considered better to fail with the herd than to take the risk of possible failure alone. Especially young managers consider the market's view on their professional abilities significant and thus herd behaviour is favoured. Reputation based herding occurs as managers are evaluated from two angles, from the point of whether their investments were profitable and whether their behaviour was similar to other managers or not.

The type of herd behaviour has its foundations on the type of information the agents receive. Smart managers tend to share the same correlated information whereas the dumb managers only observe noisy signals, which is the reason for the significance for acting similarly to others. Hence when an agent imitates the behaviour of others, the market considers he has received the information they have. Unprofitable decisions will not be as harmful for reputation due to sharing-the-blame effect. Contrary behaviour is considered dumb by the market as it presents behaviour based on divergent information to agents', who in most situations succeed. (Scharfstein & Stein, 2002)

The agents who share the contrary information and trade based on that, are called noise traders. This false information is based on information, that is explained beyond detected herding. (Hirshleifer & Welch, 1995)

Compensation-based herding is favourable when a moral hazard or adverse selection occurs in terms of a single risky asset. However, studies show, that with multiple-risk assets compensation does not assist on overcoming moral hazards or adverse selection. When agent's compensation is bounded to his performance compared to the performance of others in the market, agent is likely to make decisions based on benchmark's actions as agent's compensation decreases when the benchmark's performance outweighs his. This type of compensation scheme causes inefficient portfolios and possibly herding, as agents act based on the same benchmark. (Bikhchandani & Sharma, 2001)

The representativeness of institutional inertia also supports the aforementioned arguments. Inertia occurs most likely when a new manager is substituting an old one and needs to act under uncertainty. The new manager can only observe decisions of other firms, but is blind to the underlying information of his own firm. He has access only to partial information as he can observe what his company decided in the previous quarters, but does not possess information on why the particular decisions were made. The decision could have been made due to idiosyncratic reasons. The uncertainty can possibly enhance the possibility of herding as managers need to act based on others' decisions due to lack of information. It is found, that institutional inertia is more common in stable environments, where the frequency of policy changes such as staff turnover and record keeping policies are low. Thus new information under partial recall usually means higher likelihood for maintaining old policies than under full recall in a stable environment. Partial recall refers to a new manager and thus in a stable environment, it is not likely that a new manager would decide to herd. (Hirshleifer & Welch, 1995)

Related to uncertainty, preference for conformity is found to cause particular behaviour. The preference for conformity is recognized by five theories. First one refers to a threat in a case of changes. The threat of sanctions can prevent people from acquiring change, even when people are aware of a demand for it.

The second theory is called payoff interactions, which refers to a model according to which one's action benefit several people. The third theory presumes people preferring acting similar to others, which creates a stabilized action, but not necessarily an ideal one. The fourth and the fifth theory do not recognize errors in mass behaviour as they simple presume agents acting wisely independently and sharing their results with others. Thus the theories presume people only developing considered behaviour further. (Hirshleifer, 1995)

Literature shows many more information related reasons for herding. Asymmetric information, information cascades and spurious herding are directly related to information flow. Asymmetric information refers to institutional investing, where some of the agents receive information before others. It should be noted, that investors tend to purposefully acquire information on certain stocks for compensational reasons., which is partial reasons for some investors possessing information earlier than others. (Devenow & Welch, 1996) Thus asymmetric information based herding is more difficult to acknowledge as asymmetric information trading is commonly related to investment strategies, which aim at avoiding risk. The risk avoidance is executed through reverse trading once the information becomes available for the whole market. Long holding period increases the risk, which is why investors tend to trade with high volume in the initial period and reverse their actions in the second one. Early trading may also be an indicator of reputational goals. By trading early, agents want to signal the market their skills of being able to acquire information earlier than others. Evidence shows, that early traders tend to profit more than others and thus supports both the investment strategy and reputation argument. (Hirshleifer & Subrahmanyam, 1994)

Informational cascades are the most common explanation for herding. They are a special case of inertia occurring due to information uncertainty. They are formulated very quickly and slowly only if the original information is conflicting. A cascade occurs once an agent makes a choice and is followed by another agent. It is very unlikely, that after this the third agent would take an alternative action. Even noise signals often lead into cascades. However, a different study argues, that herding can only occur when agents possess superior information. (Hirshleifer & Subrahmanyam, 1994) Evidence shows, that after only ten individuals, the likelihood for a cascade is 99%. (Hirshleifer, 1995)

The cascade model is based on agent ignoring his private information and following the herd. Cascades can be divided into DOWN and UP cascades, which refer to herd either rejecting or adapting. The formation of a cascade happens as in the following, an individual receives either signal H or L, which refer to accepting and rejecting. The second individual can easily determine which signal the first individual has received. He compares his private signal and the observed signal and makes his choice. In case the first two individuals have both either adopted or rejected, then the third individual will as well. For these social patterns, no logical reason has been found.

Commonly cascades are lasting. It is found, that after the 100th individual, there is only a 5 % chance of choosing the best alternative. This means, that there is only a 9,35% probability for a cascade becoming reversed a one point in time. The most prominent time for this is just before the individual number 101, when the situation is more volatile. There are three scenarios, which can lead into breaking a cascade. The case of public information been released at a later point of time, the case of relative preference changes from adopting to rejecting and the of case some agents have more accurate information than others can cause the change to occur. (Hirshleifer, 1995)

Overall herding is found to result mainly from managers' decisions and not only following from and to industries with similar size and book to market ratio stocks. Evidence shows, that intentional herding is very common as post mandatory electronic filings, when decisions of other firms can be publicly observed, there is an increased level of herding. (Choi & Sias, 2008)

2.5 Measuring economic behaviour

Significant evidence for institutional industry herding has been found, there is significant correlation between the fraction buying an industry this and the previous quarter. The cross-sectional correlation averages 40%. (Choi & Sias, 2008) There are multiple ways how evidence for these results and the related ones have been found. CAPM in equilibrium, equilibrium models, CSAD, LSV, PCM, SPEC, cross-sectional variation, formulas utilizing herding variables and quarterly data are mainly utilized for detecting repetitive behaviour in financial markets.

A common metric used to measure institutional herding has been proposed by stock market analysts Lakonishok, Shleifer and Vishny, hereafter referred to as LSV. LSV is the most commonly utilized method for analysing herd behaviour. "They compute herding as the proportion of net buyers...relative to the total money managers who trade that stock minus an adjustment factor, that declines as the number of money managers active in that stock rises." (Spyros, 2013) The idea is straight forward, herding is taking place in case there is an excess number of traders ending up on the same side of an individual stock.

The LSV measure utilizes the investment behaviour of 769 U.S. tax exempt equity funds with a slight emphasis on larger firms. Despite its common use, the measure has some limitations. It measures only the number of investors on each side and not the number of stocks they trade. Hence herding toward particular stocks would not show up in the LSV measure. Also measuring development over time is not completely possible with the LSV. Whether herding occurs towards stocks in general, it can be detected, but whether the same funds are bounded to these stocks over a period of time, it cannot be seen in the LSV measurement.

Price cost margin (Boone, 2008), PCM hereafter, is a measure designed based on LSV and it creates more value for the fundamental measurement. The measure can detect the direction and intensity of trading. It measures the extent of the portfolio weights moving in the same direction. However, that neither is flawless. As the weight increases along with the amount traded, results tend to be biased as the larger portfolios tend to have weight excessively. (Bikhchandani & Sharma, 2001)

Herding in simple terms can be defined as agents ending up on the same side of the market. The phenomena has been studied through the following formula:

$$H = | B/(B+S) - p | - AF$$

B stands for net buyers in the given quarter and S represents the agents selling the same quarter. P represents that ratio of buyers relative to all agents active in the same time period. AF functions as an adjustment factor and is the expected value of $| B/(B+S) - p |$ in case there is no herding. (Lakonishok, et al., 1991)

Firm-quarter-specific measure of speculative intensity, SPEC hereafter, has been utilized for studying the impacts of inaccurate information, which is also known as noise, and of the quality of prices on returns. Noise can be detected when behaviour extends beyond available information. Herding and following trends create sub-sequential correlation in trading volume and trigger order imbalances, which is why SPEC measurement studies autocorrelation in daily trading volume and is adjusted for the extent of information available. The measurement utilizes price information, which cannot fully reveal all possibly underlying information and therefore the SPEC measure is not flawless either. It should also be noted, that autocorrelation can arise simply from strategies of buying with a large volume once others are acting the opposite way. (Hoitash & Murugappa, 2008)

Hwang and Salmon have utilized measuring deviations from equilibrium in CAPM prices in order to recognize herding. The model focuses on investigating adjustments on fundamentals and hence studying certain types of stock instead of particular investors. (Hwang & Salmon, 2004)

Institutional investing behaviour's impact on stock prices has been studied through comparing quarterly data. The buyers and sellers are divided into groups and these groups again into another sets of groups based on the gap between net purchases and net sales. The comparison method is problematic in the sense, that it provides information based on only between quarters and not within. (Lakonishok, et al., 1991)

Cross-sectional standard deviation, CSAD hereafter, measures the average absolute value of deviation of stocks against the returns of equally weighted market portfolios. The measure should indicate even a small increase or decrease in the presence of herding. Hence the possible herding is detected through the relationship of CSAD and market return, the value of the relationship reveals the possible herding. (Spyros, 2013)

2.6 Impacts of economic behaviour

It is important to study whether institutional investors destabilize stock prices as they form the largest part of the market. In 1989 institutional investors formed 70% of trading in New York Stock Exchange. They could potentially increase long-term price volatility by deviating prices from their fundamental values. (Lakonishok, et al., 1991)

A common belief is, that herding occurs specifically during financial crisis, however, studies show the opposite. The evidence shows, that herding occurs right before and after a financial crisis, but the very crisis functions as a turning point. Especially the Russian crisis showed evidence, that financial crisis stimulates behaviour towards market efficiency. This is explained by the earlier argument of market correcting itself to reflect all information. (Hwang & Salmon, 2004) Another common belief is, that herding and price bubbles are linked. Literature shows varying views on the subject. It is also suggested that the bubbles create anti-bubbles, where prices fall right after the high rise of them.

Support for the possibility of price bubbles and crashes is provided by Hwang and Salmon. (Hwang & Salmon, 2004) Suppressing private information can lead to herding, in which case prices do not reflect full information as there is a lack of social learning due to the unavailable significant private information. Evidence also shows, that uncertainty regarding an agent's information accuracy has a significant role. When this detail is factored in a model, herding can lead into subsequent crashes and price bubbles. According to Avery and Zemsky this type of volatility is possible due to its multidimensional nature. In a simpler structure, where market is learning only about single-dimensional instrument, price, this sort of volatility is not possible. (Avery & Zemsky, 1996) Nofsinger and Sias add, that institutional herding can occur for psychological reasons and hence cause temporary price bubbles as herding is not rational and based on accurate information. (Nofsinger & Sias, 1999)

No evidence is found, that institutional trading would drive prices away from their fundamental values. Noise traders are found to cause returns on stocks to be more volatile and thus making other traders more cautious. This type of behaviour causes prices to deviate less from their preceding mean. (Hoitash & Murugappa, 2008) However the destabilizing effect is possible in smaller and more volatile industries, where herding results from managers' decisions. (Nofsinger & Sias, 1999)

Study shows evidence, that buy-side herding is shown to have destabilizing effect on prices as sell-side herding has shown to have the opposite effect. Institutional purchasing is also believed to have a more permanent effect as selling often takes place only for liquidity needs and thus is not a long-term solution. (Spyros, 2013) According to Nofsinger and Sias there is a strong positive correlation between institutional ownership and returns over the same period. This indicates either strong price impact of institutional trading or high frequency of positive-feedback trading by institutional investors. The observation, that stock purchased by institutions frequently outperform the stocks they sell, support the latter alternative. (Nofsinger & Sias, 1999)

3 Case study background: international networks

International networks including professionals on particular domains are utilized in governmental decision making as they provide more democratized policies and better understanding on complex global issues. The democratization happens as the expert groups represent civil society's voice, which is considered in otherwise rather closed decision making. (Reinicke, 1999-2000) However, it has been criticized, that specifically the use of networks make decision making less democratic as citizens are uninformed of policy venues. (Stone, 2008)

The effects of globalization have made policy governing more complicated. Increasing worldwide issues such as environmental issues and refugee matters have an immense impact transnationally. This has created the demand for political and economic leaders to re-evaluate their roles. (Stone, 2008) Particularly the need to understand a cause-effects has increased, which policy makers often lack in expertise. Also the lack of power beyond territorial borders widens the need for international public policy, especially as the effects of actions become increasingly transnational. However these networks do not substitute existing governmental organs, but complement them. Critique on the third sectoral networks provides the argument, that usually large networks dominate the field, which creates the risk of new innovations by smaller networks becoming ignored. (Reinicke, 1999-2000)

A commonly utilized network is called an epistemic community. Epistemic communities are groups of recognized professionals in a particular field of knowledge. Epistemic community holds "(1) a shared set of normative and principles beliefs...2) shared causal beliefs...(3) shared notions of validity...in the domain of their expertise; and (4) a common policy knowledge" (Haas, 1992). The difference to other interest groups are their shared causal beliefs. They seek to promote their principled beliefs and prefer to be linked to communities who act accordingly. Their main task is to recognize the interests of countries and bring up immense dimensions. Despite the national nature of epistemic communities, often their views spread in international conferences and research collaboration, which can make the advice given transnational. They also impact on the creation of social institutions.

As discussed previously a number of facts makes decision making difficult. The complex and uncertain nature make the matters difficult to solve without expert advice. Particularly interlinkages, how policies impact one another, is difficult to understand without assistance. Advice seekers are divided into two groups; those who seek information which supports their pre-existing goals and those who seek for credible information for the sole purpose of it. It should also be noted, that governmental decision making is not as simple as it might seem by observing independent state policy creation and expert advice utilizing. Ultimately policies are derived from historical decision making, which impacts on the process of analyzing the interests of each country. (Haas, 1992).

The international networks create wide gaps on policy adaptation between countries. Network member countries can present a high volume of adaptation a certain measure whereas the other countries may not. Many developing countries do not have the needed resources to be part of international networks, which makes them less likely to adopt similar policies to the recommended ones. Also the power shifts between different networks impact on policy adaptation. (Stone, 2008)

OECD is the organization for economic co-operation and development, that works to create better policies on key global matters on national, regional and local level. It brings different interest groups such as governments, labour representatives and academia together representing about 80% of world trade and investment. (OECD, 2019)

As Finland is part of OECD, it has been recognized, that in 2009 Finland's greenhouse gas emissions were exceeding Kyoto commitments and that its energy use and CO₂ emissions were higher than in most OECD countries. Hence OECD set the following recommendations; to strengthen environmental efforts and simultaneously stimulate its economy, to review the usage of economic instruments from environmental and economic perspective as well as to promote eco-innovation for instance by considering how environmental policy could stimulate innovation and to direct attention to the use of particular economic instruments. (OECD, 2009)

4 The case of Finnish government's proposal HE 175 2017 to fund renewable energy suppliers

4.1 Introduction

Finland's government proposed a new funding method for renewable energy in 2017 through the tender scheme HE 175 2017. The Finnish Parliament states that European Union goals strongly direct its operations. In terms of renewable energy, the goal to be achieved in Finland by 2020 is to cover 38% of energy consumption with renewable energy according to the European Union targets. (Parliament of Finland, 2017)

The outlook and challenges for Finland's public finances state, that Finland has had difficulties reaching its key financial targets and that its public finances have not been strong for a decade. Savings worth one billion euros are planned to be made by reducing obligations. (Ministry of Finance, 2017) The Ministry of Economic Affairs and Employment of Finland describes that the key motive in terms of renewable energy is to move away from fossil fuels and to diminish the amount of greenhouse gas emissions. It also recognizes that the use of renewables improves the level of independence with respect to energy supply. Currently approximately 40% of end consumption is covered by renewable sources, the goal is to change the figure into 50% by 2020. (Ministry of Economic Affairs and Employment of Finland)

Through a tender process the government sets a maximum volume or price for the particular tender whereas feed-in tariffs, which have formerly been widely used for the purpose, provide a fixed price or a sliding premium on top of the electricity price and this way guarantee profitability for investors. (Fell, 2017) In order to achieve the climate goals, there needs to be a certain level of investment directed towards renewable energy. Without the government subsidies, the current price level of renewable energy is not profitable for investors (Karagiannopoulos, 2018) In case risk grows as policy support decreases, investors are going ask for a higher return for their investments, which again results in difficulty achieving the climate goals. (Noothout, et al., 2016)

The new scheme is significantly more cost-efficient as it creates only 5% of the expenses compared to the feed-in tariff system. A large reason for this is the unexpected change in electricity prices, which have lowered significantly. The budget for the system is 3,5 million per year and it is going to last 12 years, thus totalling 42 million euros. (Laatikainen, 2019) On the contrary, electricity prices are predicted to experience a significant increase in the future. It is estimated, that they will grow 35-40% by 2028 compared to the levels in 2016. The increase will result from the demanded renovation of the grid, which will demand investments of 9,5 billion euros. (Ahtela, 2018) There are also other factors which create expenses in the electricity sector. In December 2013 Fortum sell its electricity distribution network to Caruna, which in 2017 formed 21% of the Finland's electricity distribution being the biggest single energy distribution operator in Finland. (YLE, 2013) Caruna has been blamed for tax planning, which created a 12 million euro bill in 2017 for Finland to carry. The company utilizes a balance release regulation according to which it can reduce all interest payments in its taxation as long as its level of debt level does not exceed the debt level of the whole international concern. (Kaleva, 2018) Finnish government would be able to modify the tax law in order to prevent the type of tax avoidance, but have not chosen to do so. (Finnwatch, 2018) Caruna's activities have been criticized also due to the high increase in electricity distribution prices. Caruna raised the prices 22-27% at once after which a regulation of a raise maximum of 15% was implemented. (Ahtela, 2018)

Antti Kohopää from Energiategollisuus has presented critique on the proposal. One of the key reasons for the proposal is its cost-efficiency. However, Kohopää argues that despite the single round cost-efficiency, market disturbances need to be covered by the government or customers in the long-term. He also thinks the proposal is not technology neutral as it does not allow water power operators to bid. (Kohopää, 2017)

The tender process is open to wind power, combined heat and power, biogas, solar and wave power plants located in Finland. The projects need to fulfil the following requirements:

1. the project needs to be new meaning renovation projects are excluded,
2. the project cannot have received state aid previously,

3. the operator cannot have done any binding procedures in terms of the project prior to bidding,
4. the required land use permits and equivalents need to be legally in force prior to bidding,
5. the plant needs to have an offer from the relevant electricity distribution network for a connection contract. (Muraja, 2017)

In order to participate the bidders needed to calculate premiums on top of their production's price and estimate annual production capacity. (Laatikainen, 2019) Each winner of the tender receives the premium it has offered. The premium consists of two parts, fixed and flexible, which are paid on top of the market price of electricity. The premium depends on the market price as follows: if the average price of three months at the location of the plant is less than 30€/mWh, the operator will receive the premium it offered and the premium is thus called fixed. In case the market price exceeds the 30€/mWh, but falls under the sum of the market price and offered premium together, a flexible premium will be paid based on the difference between the price on the market and the combined price. A premium will not be paid in case the market price exceeds the combined price of 30€/mWh and the offered premium. (Muraja, 2017)

4.2 Changes in renewable energy funding

The proposal HE 175 2017 changed drastically the support level wind power receives. The Finnish Energy Agency accepted seven wind power projects out of 26 applications. The highest premium offered was 23€/mWh. The accepted offers however were significantly lower, varying between 1,27 and 3,97 euros per MWh. As the results show, the projects were selected based on their affordability.

The selected projects were Kestilä Kokkonevan Tuulivoima, CPS Finland's Lakiakangas, Puhurin Parhalhti in Pyhäjoki, Puhurin Hankilanneva in Haapavesi, Kalax Vindkraft Kalax Närpiö, Tuuliwatin Simo Leipiö 2 and Tuulipuisto Hirvinevan Hirvineva-Liminka. The approved projects produce approximately 1,36 tWh of electricity annually. In order to apply the sum in a perspective, in 2018 Finland consumed 87 kWh. (Laatikainen, 2019)

Funding renewable energy through tender schemes is an increasing trend. Many governments have decided to change from administrative feed-in tariffs into tendering schemes in order to manage their renewable energy sector. (Renewables Global Status, 2017) In the 1990's the United Kingdom was one of the first countries to adopt the policy as part of their Non Fossil Fuel Obligation. In 2009, there were at least nine governments, which decided to advance the use of renewable energy through tender schemes. In 2010 the same figure was 21 and in 2013 it was up to 44. In 2015 it was identified that at least 64 countries were utilizing tenders as part of their renewable energy strategy. In contrast, in 2016 feed-in tariffs were used approximately in 75% of photovoltaic projects and in 45 % of wind projects globally. (Fell, 2017) The tender funding trend is relatively new as are renewable energy technologies as well. There are several advantages and disadvantages to the schemes. The main reasons for utilizing the schemes are its possibilities in funding in a well-planned, cost-efficient and transparent manner and the potential of applying other objectives at the same time. (Ferroukhi, et al., 2015)

The strengths of tenders and auctions, which are very similar to one another, are flexibility, real price discovery, greater certainty regarding prices and quantities, commitment and transparency. Weaknesses lie in relatively high transaction costs and in risk of underbidding, delays and overbidding. Flexibility refers to the particular area's economic state, energy resource structure and the level of advancement in both power in general and renewable energy sector. Real price discovery minimizes the gap between information volume between the regulator and project developers, which is particularly significant because renewable energy technologies develop constantly and without transparent and competitive policies real price will not be easily revealed. Greater certainty regarding prices and quantities provide stability both for regulators and project operators. Through providing a stable revenue, regulators are able to control both for price and quantity while ensuring the target is met more accurately. Commitment and transparency provide security for investors even in the circumstances where market and policy landscapes change. The agreed contract that results from auctions provide this greater level of regulatory stability. (Ferroukhi, et al., 2015)

In terms of the weaknesses, overbidding has resulted to have serious consequences as it led selling Finland's former tele company Sonera to Telia in 2000 as Sonera overbided in the mobile telephone network licence auctions organized by Germany and Italy. The technology was estimated to develop much faster, which resulted in a situation where Sonera invested 4,3 billion euros in the licences but as the technology did not develop fast enough, the company did not afford to build the demanded infrastructure and the licences ended up being useless. (Kaleva, 2015) Relatively high transaction costs cause problems mainly for smaller bidders and administrative costs can grow into high barriers and thus reduce competition. The risk of underbuilding and delays refer to overambitious bidding which can result from overconfidence in the evolution of technology costs, and from financial burdens caused by delays. (Ferroukhi, et al., 2015)

The president of Energy Watch Group, Hans-Josef Fell, believes there are many more issues with tenders. He believes that tenders are mainly suitable for large investments, when they aim for intervention, want to include large investors or to advance grid connection. In terms of smaller investments, the tender scheme can work against climate goals as it can disturb the development of renewable energy as smaller market participants are not allowed to participate. The qualities that support large investments and are observed as positive from government perspective are actually negative in terms of smaller investments. As the market decreases as the number of agents decreases, the market becomes less transparent, which can also encourage corruption. Tender schemes determine very specifically the volume and price in advance, which prevents the market from creating new innovations and thus prevents the free market forces from making an impact. Overall, tenders do not promote advanced and diversified solutions as the number of actors is limited. (Fell, 2017)

4.3 Tender initiators

4.3.1 Divergent policies in Germany compared to Sweden

Previously it was described how more than 64 countries have started to utilize tender schemes in order to manage their renewable energy strategies. Below the policies and data of six European countries are examined in order to gain a deeper understanding on the subject.

Germany's Federal Ministry for Economic Affairs and Energy states that the share of renewable energy has grown from around 6% in 2000 to around 36% in 2016. The goal is to be able to cover 40-45 % of electricity with renewables by 2025. The Ministry describes increasing the share of renewables as a key strategy in the energy transition and tells that energy supply should become more climate friendly and more independent in terms of fossil fuel imports. Since January 1st, 2017 Germany's level of renewable energy funding has been set by auctions, similar to tenders. In 2000, when the level of renewable energy was only 6%, the market was funded through fixed tariffs and a purchase guarantee. The Renewable Energy Sources Act EEG and its 2014 revision have been key events in the process of changing the renewable energy sector in Germany. (Federal Ministry for Economic Affairs and Energy, 2019)

Germany mainly favors a market premium scheme, but small plants up to 100kW are still supported through a feed-in tariff system. In 2014 Germany launched its first pilot-tender solely for solar energy producers. The scheme was expanded to other technologies as well in 2017. The tender system includes a sliding feed-in premium provided to the auction winner. There are different requirements for each technology separately. The eligible operators are new on-shore wind producers, off-shore wind operators, solar operators and biogas producers. In terms of solar operators, the project needs to be bigger than 750kW and a single bid for ground-mounted projects cannot exceed the capacity of 10mW. Wind energy tenders include the size limits for pilot projects: a maximum size of 125kW and for other projects the minimum size of 750kW. Biogas schemes offer support for 20 years for new plants and 10 years for existing ones.

A new project also needs to have the minimum size of 150kW and the maximum of 20mW. There is no size restriction for existing plants in place. However, they require a payment claim from German Renewable Energy Sources Act for a maximum of eight years. Biomass receives support for 20 years in terms of new plants and for 10 years in terms of existing plants. Regarding size, a biomass project needs to be bigger than 150kW and it cannot exceed the size of 20mW in case the project is new. There are no size restrictions in place for existing biomass plants. Price caps are € ct. 7,00/kWh for biomass, and for solar and onshore wind together € ct. 8.75/kWh. Price cap for solar is adjusted on a monthly basis, and was € ct. 8.75 in the October 2018 tender. Volume caps depend on the tender round. Between 2017 and 2018 the cap was 1550mW for off-shore wind from 2021 onwards the cap is set at 700-900mW. (Sternkopf, 2019)

Germany's latest tender resulted in a list of successful bidders such as ABO Wind, Baywa r.e., Boreas Energie, Denker & Wulf, Energiekontor, Wpd and other wind operators. The total capacity resulted 476mW of wind power and 178mW of solar power, which is 68% of the target amount of the Federal Network Agency. The decline in bids was contrary to previous experiences as the previous tender received bids for 465mW, but aimed only for 175mW. (Tsanova, 2019)

Sweden also has ambitious goals as it aims to cover 100% of its energy demand with renewable energy in the long-term. The Swedish government has proposed a significant increase in the investments in solar energy in order to reach the target. It wants to increase the investment into 390 million SEK between 2017-2019, 36 million euros. (Government Offices of Sweden, 2014-2019; Government Offices of Sweden, 2019)

Sweden's support schemes do not include tenders but are based on a quota system. Their Electricity Certificates Act binds the electricity operators to confirm through certificates that a certain quota of the electricity they produced was produced through renewable sources. Sweden's tax regulation system again allows to reduce real estate tax in case electricity is produced through wind energy. With smaller generator capacities than 50kW, the electricity is not taxable. In case the production in wind, wave or solar schemes exceeds the limit, the production is entitled to a specific micro production tax allowance. Sweden also permits subsidies for photovoltaic installations. (Vågerö, 2019)

4.3.2 Parallel policies in Denmark, Netherlands, Greece and Spain

Denmark's goals are to be independent from fossil fuels by 2050 and to cover 50% of its energy mix with renewable energy by 2030. It presented its first technology-neutral tender in the autumn 2018 with a premium price cap of 130DKK/mWh, 17.43€/mWh, which includes the cost of grid connection and is aimed to be paid on top of the market price. The budget totals 112 million euros, which is estimated to cover 140mW of on-shore wind. Denmark has 5,751mW of existing capacity prior to the tender. The new system is significantly more cost-efficient as the previous system provided a premium of 250DKK/mWh. (Richard, 2018)

Previously Denmark has launched a pilot project for mills and a scheme for wind and solar PV. The Danish Ministry of Energy, Utilities and Climate has approved financing of 1.015DKK (approximately 136 million euros) between 2018 and 2019. The costs are distributed between the state, consumers and grid operators. Consumers are obligated to pay a surcharge payment based on their consumption to an electricity supply company. The tender functions through a "pay as bid" system and has a cap of øre 13 per kWh (approximately 2 cents per kWh). In terms of lead time, the realization period for on-shore wind and solar cell is set at two years and for off-shore wind the implementation period is set at four years. In case the winner of the tender does not fulfil his obligations, the operator needs to be pay the corresponding loss. (Wikberg, 2019)

The pilot project was launched because Denmark wanted to retain its position as one the leading countries in the development of renewable energy. The pilot functioned with a first come first serve principal and had a budget of DKK 150 million (approximately 20 million euros) in order to support windmills in the time period of 2018 – 2019. The support timeline follows a prototype permit maximum, totaling three years of support. (Wikberg, 2019)

The Netherlands has held multiple tenders with the aim to increase the off-shore wind generation capacity from 1000 MW in 2013 to 4500 MW in 2023. (Anciaux, 2019) The government has set a target of covering 16% of electricity needs through renewable sources by 2023. (Power Technology, 2019)

Tenders have been awarded to Borssele 1, 2, 3, 4 and 5. To reach the climate target, five off-shore areas have been determined and tenders for them will be organized in the future. (Anciaux, 2019) Borssele Wind Farm sites 1 and 2 received subsidies on July 5th 2017 out of 38 competing bids. The operator Ørsted Borssele 1 B.V. will build the farm 22km from the coast of the Zeeland province and will be able to provide the capacity of 752mW. (Anon., n.d.) The operator will receive financial compensation for a period of 15 years with the Dong Energy's winning bid of 72.7€/mWh excluding transmission costs. The plants are expected to be completed by 2020 and to provide electricity for equivalent to the annual consumption of one million households. (Power Technology, 2019)

Spain has mainly utilized a price regulation system in order to manage the renewable energy generation. However, the royal decree 15/2018 presented the use of tenders. The tender was open to new solar PV and wind energy plants in the mainland electricity grid. The last round had a volume cap of 3000mW, but the cap can be changed in certain circumstances. The price was set at the lowest approved discount rate and it was identical to all participants. Each operator was obligated to pay a participation guarantee of 60€/kWh. (Jimeno, 2019)

Greece has used tenders together with a tax regulation mechanism and a net metering scheme since 2017 in order to fund its renewable energy operators. The system works through a feed-in premium, which is granted based on the results of the tenders. Greece follows a "pay as bid" principle, which means that the amount of the premium is defined based on the bidding amount and hence identical services can receive different premiums. In 2016 Greece launched its first pilot tender and in 2018 two tenders for solar PV and wind energy were organized. The tenders were technology specific and each divided into two categories based on their size. In the December 2016 tender the total solar capacity equaled 40mW. The price cap was set at 104€/mWh for PV installations smaller than 1mW and for installations bigger than 1mW at 94€/mWh. In the July 2018 round, wind energy between 3mW and 50mW in size were eligible and the maximum total capacity was set at 300mW. The bidding started from 90€/mWh. In December 2018 the eligibility requirements were the same, but the the cap at the total maximum was set at 229mW and bidding started from 79.77€/mWh. (Maroulis, 2019)

4.4 HE 175 2017 winners

ABO Wind won more than 120,000mWh in the Finnish tender, which forms approximately 9% of the total capacity in the tender round. The operator will produce the electricity with the wind farm Kokkoneva with seven turbines that are up to 250 meters high and can provide the total capacity of approximately 30mWh. (Windfair, 2019) The company has a strong international background with project development in five continents in 16 countries. Its installed and commissioned capacity totals 922 wind, solar and bio gas plants. The plants prevent carbon dioxide emissions of 2 million tons annually. In terms of production rate, the plants can reach around 3 million mWh each year corresponding to the electricity demand of 2 million people domestically. Financially, annual project volume is about 300 million euros.

CPC Finland is a subsidiary of Germania Windpark, which is one of Europe's oldest companies in the field. They have built or designed 310mW worth of operators currently operating in Europe and hold a portfolio of over 2000mW. (Suomen tuulivoimayhdistys) Globally CPC Germania's installed wind power capacity equals 490,000mW. Stakeholders are located in nine European countries, in Turkey and in the U.S. (CPC Germania)

Kanteleen voima owns the Finnish wind power developer and producer Puhuri Oy. Kanteleen Voima is owned by 28 Finnish small and medium size companies such as Katternö Group, Suomen Voima, Kaakon Energia, Valkeakosken Energia and Ålands Elandelslag. (Puhuri; Kanteleen voima)

Kalax Vindkraft is owned by NTR Sweden Holdco 2 AB, which again is part of NTR Renewable Energy Income Fund 2, which is NTR's project to increase the amount of onshore wind power in Europe. (Vindin, 2019) The company was established in 1978 and has operated 656mW worth of wind and solar projects in Europe and the U.S. (NTR, 2019)

The Finnish company Tuuliwatti is owned by St1 and S-Voima. It forms a large part of Finland's wind power production, in 2015 it produces over third of it. The company has 130 designed or completed plants in Finland and investments domestically totalled 250 million domestically and internationally 650 million in 2017. (Tuuliwatti, 2019)

Winda Power Oy is a Finnish company with active cooperation with European companies. In terms of size, in 2017 its revenue totalled 4,9 million euros. (Winda Power Oy; Talouselämä) The equivalent figures for Tuuliwatti were 58,5 million, for Puhuri Oy 6 million and for ABO Wind Oy 53,9 million euros. (Taloussanomat n.d. a; Taloussanomat n.d. b; Taloussanomat n.d. c)

4.5 Political objectives

The European Union has set a goal of decarbonizing the economy by 2050 and more specific goals to be achieved by 2020. Eurostat recorded the goals:

Greenhouse gas emissions to be reduced by 20% compared to 1990; Share of renewable energy sources in final energy consumption to be increased to 20%; Energy efficiency to be improved by 20%;(Eurostat n.d.)

Europe is said to be a leader in terms of renewable energy globally and it is wanted to be maintained not only because it makes Europe more independent energy supply wise. Europe has the required industrial structure, knowledge and competent workers, which all make it a pioneer. The European Parliament states that additional investments are needed in order to utilize the strengths. It believes that binding national targets are the most prominent way to achieve the set goals. However only general principles should be in place as member states should be able to adjust them based on their individual social, geographical and climate-related factors. (Blanco López, 2017)

It has been found common that many countries have practiced retroactive measures, which has created uncertainty among energy investors. The loss of funders creates a great risk of not being able to achieve the set climate goals. Thus one of the key goals of the European Parliament is to enhance legal certainty. (Blanco López, 2017)

Globally 117 countries have committed to the Paris agreements of keeping temperature rise below two Celsius compared to pre-industrial levels and pursuing methods to aim the figure to be even lower, 1.5 Celsius. (United Nations, 2019)

At the end of 2016, renewable energy targets were confirmed in 176 countries, the majority of them including targets for specific technology use, renewable share of overall energy or economy-wide targets. 89 countries set targets to achieve a certain level of renewables for primary use. (Renewable Energy Policy Network for the 21st Century, 2017)

Other political forces that impact on Finland are its commitments to the Arctic Council. Finland is the chairman of the Arctic Council between 2017 and 2019. The Arctic Council represents international Arctic cooperation on a governmental level. The cooperation started in Rovaniemi in 1991, where the Arctic Environmental Protection Strategy was adopted, which again led to the formation of the actual Arctic Council in 1996. The member states and the permanent participants representing indigenous people are committed to protecting the environment and sustainable development of the Arctic area. (Ministry for Foreign Affairs of Finland, 2017)

As the chairman, Finland wants to highlight the commitment to the Paris 2015 climate agreement. The global warming is still expected to continue for decades with significant impacts on the Arctic. It is believed it is necessary to work on processes on improving resilience and adaption to the changing climate in the Nordic area and enhance the subject in the global climate talks. Finland aims to increase the level of collaboration between the Arctic Council and the Arctic Economic Council in order to improve facilitating business-to-business activities and responsible economic development including energy development. (Ministry for Foreign Affairs of Finland, 2017)

Renewables 2017 Global Status report argues, that global investing trends in renewables are against the European Union and Arctic Council goals. New investment in renewable power and fuels declined 23% compared to the previous year (as illustrated in the figure 1.), when hydropower projects with a minimum size of 50mW were excluded. Overall, the investments fell around 14% in developed countries, but there was a minor increase in Europe. However, for five years in the row, the investments in renewable energy were approximately double compared to the investments in fossil fuel generation.

A significant reason for the fall in investments was the strong decline in the cost of solar PV and on- and off-shore wind power. The acquired amount of energy demanded smaller investments than before. The report describes that developing countries were leading the renewable sector investments for the first time in 2015, but the trend turned already in 2016, when Europe accounted for 25% of the investments. (Renewable Energy Policy Network for the 21st Century, 2017)

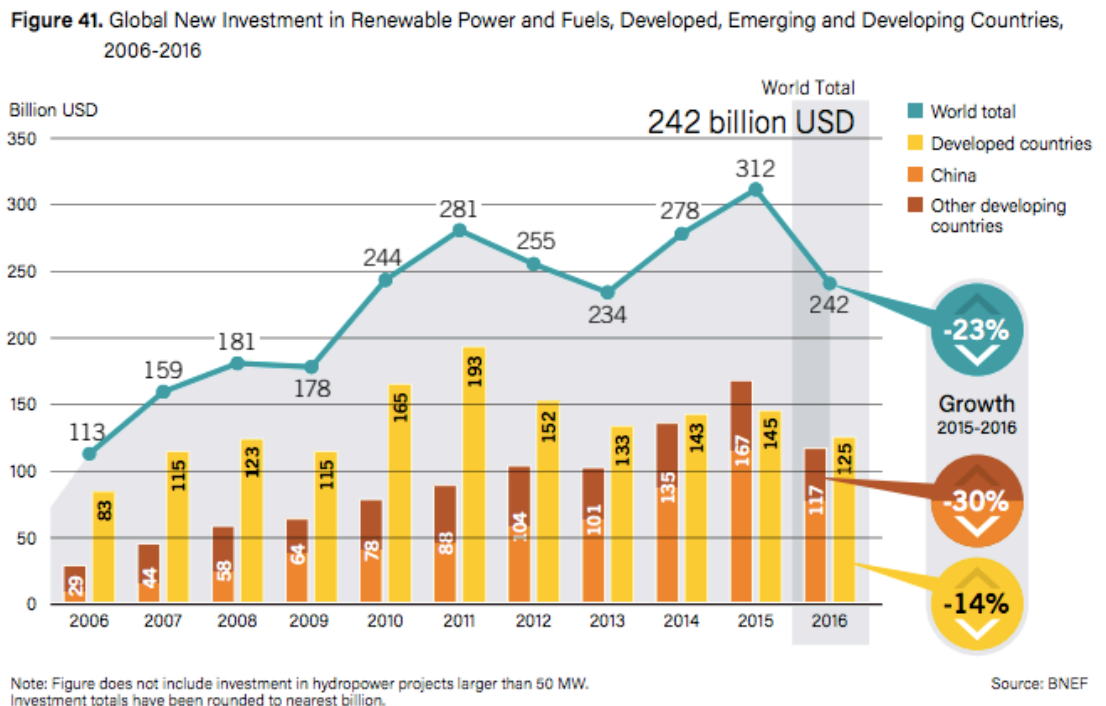
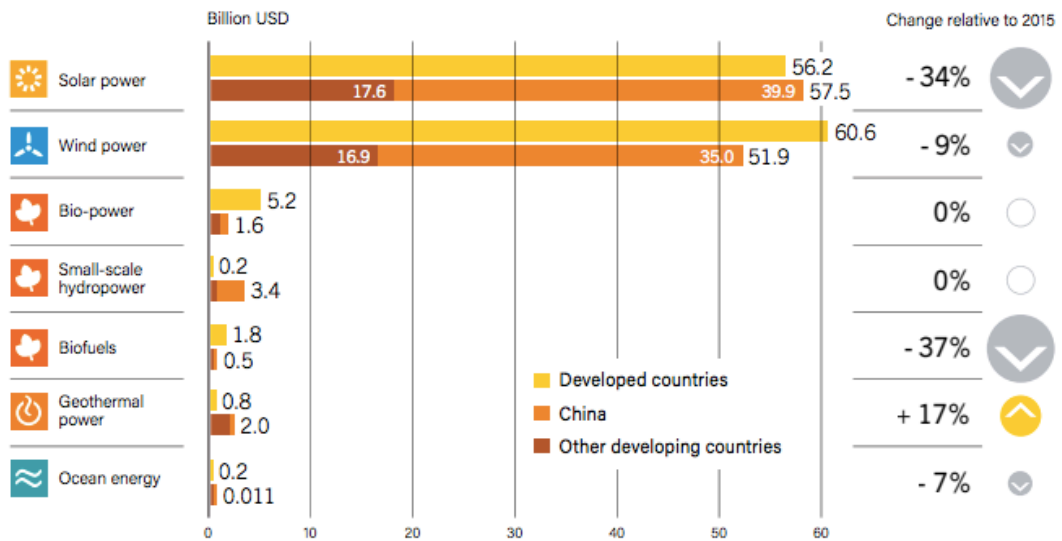


Figure 1 Global investments in renewable energy dropped significantly. (BNEF cited in Renewable Energy Policy Network for the 21st Century, 2017)

Technology wise solar and wind power dominated the investment sector (as illustrated in the figure 2.) and accounted for 47% of investments each. Investments in biofuels and ocean energy fell drastically. Biofuels decreased 37% and ocean energy 7%. In terms of investment type, global research and development investments decreased by 7%, but the governmental portion grew by 25% in comparison to 2015 figures, Europe being the largest regional funder. On the market side, investments in renewable energy operators and funds decreased 53%.

The share of venture capital and private equity investment fell by 4% in 2016, but on the positive side acquisition activity increased by 17%. Debt acquired from commercial banks formed the largest part of renewable energy investments.

Figure 43. Global New Investment in Renewable Energy by Technology, Developed and Developing Countries, 2016



Source: BNEF

Figure 2 Solar and wind power dominated the global investments trends in 2016. (BNEF cited in Renewable Energy Policy Network for the 21st Century, 2017)

Overall in 2016 the renewable energy sector received more investments than the fossil fuel sector and accounted for 65% of all investments targeted for power generator companies. In the beginning of 2017 in Europe the investment level in renewable energy fell by 61.7% and globally by 20,9% compared to the first quarter in 2016. (Renewable Energy Policy Network for the 21st Century, 2017)

5 Analysis

The case study on Finnish government's proposal HE 175 2017 was utilized in order to gain more understanding on the subject of behavioural economics and on how that can help to understand governmental renewable energy funding and creating better strategies in the future. The data was analysed without utilizing any of the presented herding measuring methods as it was considered, that they would not provide relevant information beyond observing the key figures in terms of the number of countries utilizing similar funding strategies. Also the presented limitations of different measurement styles were believed to have an inaccurate impact on potential results. The studied literature confirms, that herding measurement has proved to be rather complex and provide bias results. Some of the measurement styles can be utilized only in case access to prior knowledge on some of the parameters is provided. (Bellando, 2010) It has also been discovered difficult to distinguish imitation from clustering of trades. (Hachicha, 2010).

Governmental funding decisions have not been previously studied from the perspective of behavioural economics and hence commonly used measuring methods have not been established. Annual data of the sector was analysed in order to achieve the results presented hereafter. A similar issue to quarterly data analysis was observed, only annual results could be analysed, not data which occurred within years.

The data provided evidence, that herding has occurred, in 2015 at least 64 countries utilized tender schemes. In 2017 governmental funding grew by 25% compared to the 2015 figures. Specific schemes have been discussed previously. Whether herding was based simply on mutual accurate information or whether it was irrational will be discussed below. Herding was found to be linked with momentum and price bubbles. Price bubbles occur when only one-dimensional information is available, price in the particular case. In the case of HE 175 2017, wind power prices dropped drastically as a consequence of the tender round. However, it should be noted, that also other factors such the decreasing technology prices could have played a role. Momentum also occurred, the subsequent tender rounds within European Union kept pushing prices down. The price cap in Greece in 2016 was 10 cents per kWh, but only 0,5 cents per kWh in 2017 in Finland.

It should be noted, that also other country specific factors impacted on the prices and potentially the price cap in Greece in 2017 could still have been relevantly higher than in Finland in case Greece had initiated another tender round.

5.1 Rational herding

Rational herding occurs when information symmetry takes place and agents act based on their private information which is identical for everyone. In the case of HE 175 2017 evidence for noise trading was not found, only accurate information was available. The case study recognized 64 countries utilizing tenders in order to fund their renewable energy scheme, hence it can be said that herding occurred. However also evidence of anti-herding was found, as out of the six examined renewable energy funding schemes, Sweden's scheme did not utilize any tenders despite its ambitious climate goals. The discussion on international networks explain why the number of tender countries could be even bigger and provide further evidence for rational herding behaviour. International network recommendations have a big role in governmental decision making, and all of the interested countries are not able to become members of them due to lack of resources. In case more countries were members, it is possible the funding environment would be seen more as a cluster of funding schemes than as imitated behaviour by only part of the world.

The case study described how technology has developed significantly, which has led to decreasing costs of renewable energy generation. The information is available to all investors and thus the detected herding occurs because the agents act based on identical information. The HE 175 2017 case results showed how the price of wind power dropped drastically from previous levels, which further supports the argument on the mutual knowledge, on the price level reduction.

Despite the trend of decreasing prices, the Caruna activities show that price levels can take a reversed direction very quickly. Also the case of Sonera overbidding in 2000 shows how common information might not be accurate despite its mutual nature. The presumption of technology development ended in insufficient funds in finalizing the project in the Sonera case.

In the case of HE 175 2017 fast development of technology has been witnessed and further development has been expected. In case overbidding would occur, it would be particularly dangerous as it could potentially harm achieving the governmental climate goals. As tender process has this dangerous trait, it can be concluded that the strategy is not seamless. It can be believed, that herding based on other agents' signals has at least a partial role in submitting the tender proposal HE 175 2017.

Environmental goals again support the argument of rational herding as 117 countries have committed to the Paris agreement and the data on the six European countries' tender schemes illustrate how the key motive behind the tenders are the climate goals of the specific countries and not behaviour based solely on other's actions.

The previous discussion on international networks provides further support on rational herding. The OECD recommendations included notes on environmental issues and several recommendations in terms of economic adjustments in order to resolve them. As the examined countries are also OECD members, it can be presumed, they have utilized similar recommendations. This is because the network shares the same basic principles and likes to work with communities with similar ones. Particularly the recommendations on reviewing economic instruments and directing attention to particular economic instruments support the idea of rational herding behaviour in the case of HE 175 2017.

5.2 Irrational herding

Classical economic view, as discussed before, believes that people act rationally and efficiently under all circumstances. Thus in case irrational herding was detected in the case of HE 175 2017, it would provide more information supporting neo economic views on economic behaviour.

The psychological phenomenon discussed, exponential discounting, explains the funding scheme. Exponential discounting provides support for irrational herding as it was shown that the scheme can actually be very expensive to the Finnish government as possible market disturbances need to be covered by it.

A case of this can result from similar activities to Caruna's, where a sudden increase of electricity prices is established by an external company. Thus it can be observed, that in terms of budgeting, the actions are relatively short-sighted.

Preference for conformity could be an explaining factor as it is described that since the 1990's an increasing amount of countries have started to utilize tender schemes in their renewable energy strategies. Also the fact that the examined countries Germany, Netherlands, Denmark, Spain and Greece have invested in similar schemes in recent years support the argument. Availability and representativeness theory draw support from the same events.

The proposal allowed only big investors to participate as smaller ones would not have been able to fulfil the requirements. As the participation possibility was rather limited, the tender process prevents from new innovations entering the market, which works against the environmental goals and thus can be considered irrational.

Irrational herding can result from purely psychological reasons as discussed earlier. Finland is one of the leading countries in renewable energy technology globally and aims to maintain the reputation could explain the desire to support renewable energy with the new scheme. The scheme focuses on large operators, which operate internationally and thus can grow Finland's reputation as a renewable energy ambassador. To argue with this claim, the scheme does not support new innovations, which again supports the fact, that the focus is not only on enhancing reputation in the sector. In terms of the OECD recommendations, the recommendations that referred to supporting ecological innovations support the irrational herding arguments as the new scheme limits the number of actors and does not create best possible environment for new innovations like OECD particularly enhanced in its recommendations.

6 Conclusions

The case of Finnish government's proposal 175 2017 to fund renewable energy through tenders has shown signs of herding. Together with at least 64 countries Finland decided to utilize tender schemes instead of fixed feed-in tariffs.

Similar tender traits of Germany, Denmark, Netherlands, Spain and of Greece also support the argument. The literature review provided results on how herding is also linked to momentum trading and price bubbles, in the HE 175 2017 case a clear line of falling prices and a danger of price bubbles was detected. Through tender schemes prices are rather fixed, which creates the danger of price not reflecting full information and leads to the detected price impacts.

Evidence for both rational and spurious herding was found. Support for rational herding provided the political climate goals of Finland's government, Arctic council, European Union and the United Nations. Price savings was found to be common knowledge among all the herder countries and that supported Finnish Ministry of Finance's targets. Technology has reached the level, that renewable energy no longer needs the level of support it needed during the trend of fixed feed-in tariffs, which also supports the view of rational information based herding behaviour. Possibly the biggest role however had the OECD recommendations. International networks are widely used in policy making and they cover a large area and thus can explain why countries behave similarly.

Spurious herding was found possible as market disturbances need to be covered by government and customers, which indicates that the proposal was not entirely based on full information and on its advantages. Also the danger of overbidding and the observed exponential discounting refer to the fact, that the proposal was at least partially based on herd behaviour. The other significant argument for spurious herding is the inclusion of only big investors, which prevents new innovations entering the markets and thus does not support the climate goals, which were meant to be the initial reason for the proposal HE 175 2017.

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