

Did the Financial Crisis lead to Changes in Private Equity Investor Preferences Regarding Renewable Energy and Climate Policies?*

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Abstract

Bürer and Wüstenhagen [2009] examined the preferences of sixty clean-tech venture capital and private equity investors regarding renewable energy and climate policies in 2007. This paper presents the results of a research project that examined whether these investor preferences changed due to the financial crisis. We re-conducted that part of the Bürer and Wüstenhagen [2009] survey that focuses on the preferences for twelve market-pull policies. Comparing our results with those from 2007, we found that the popularity of eleven out of twelve policies decreased. The decrease was significant for those policies that involve subsidies and trade related schemes such as CO₂ emissions and green certificates trading. The decrease in the popularity of the policies was mainly the result of changes in the preferences of European investors, whereas the preferences of North American investors did not change noteworthy.

Keywords: renewable energy and climate policies, financial crisis, clean-tech private equity, survey

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1 Introduction

Bürer and Wüstenhagen [2009] published the results of a survey that was conducted to examine which renewable energy and climate policy is preferred by venture capitalists. They conducted the survey among sixty venture capital and private equity investors in renewable energy in Europe and North America. Among other findings, they found that investors have a clear preference for feed-in tariffs. Various other studies¹ also indicated that feed-in tariffs are the most effective policy for stimulating the diffusion of renewable energy. As Butler and Neuhoff [2004] explained, the stability of the feed-in tariff policy is considered as the main driver of its success. Until recently, there seemed to be no threat to the success and the stability of feed-in tariffs. However, the financial crisis has forced the governments of several countries which apply feed-in tariffs (i.e. Germany, Greece, Spain and Italy) to cut their subsidies (Radowitz et al. [2010]) since the costs of these policies have become too large and government deficits have become too high. In Spain, especially, the subsidy cuts were found to be large and abrupt. In January 2011, the Spanish parliament approved a law that retroactively cuts feed-in tariffs for solar photovoltaics by 30% (Johnson [2011]). These subsidy cuts in combination with the financial crisis might have changed the preferences of investors regarding renewable energy and climate policies. Not only the decrease in the level of feed-in tariffs might have reduced their popularity, but the decline in the stability of feed-in tariff policies might have led to the reduction of their popularity as well. As Bürer and Wüstenhagen [2009] conducted their survey in early 2007 before the financial crisis emerged, it would be relevant to examine whether the recent financial crisis and subsidy cuts changed the preferences of venture capital and private equity investors regarding renewable energy and climate policies.

The recent financial crisis has affected the economic environment world-wide and has influenced renewable energy policies at the same time. For instance, in countries where renewable energy subsidies are paid directly by the energy consumers, governments reduced the amount spent to ease the effect of the crisis on consumers (Radowitz et al. [2010])². The amount of research that has been conducted on renewable energy and climate policies as well as investor preferences since the start of the financial crisis is limited. One of the few research projects is the project of New Energy Finance³ who published a survey that was conducted after the start of the financial

¹see for instance Butler and Neuhoff [2004] and Menanteau et al. [2003]

²This does not imply that the focus on renewable energy was reduced due to the financial crisis. For instance, the United States has stated the ambition that 85% of the energy produced in the U.S. should be 'clean energy' by 2035 (see renewableenergyworld.com 2011).

³NEF [2009]

crisis but before the subsidy cuts in various countries. The survey was held among experts from commercial banks, investment companies, infrastructure providers, and multilateral and bilateral financial institutions. Their survey showed a clear preference for feed-in tariffs as indicated in the following: 81% of the respondents preferred feed-in tariffs to all other policies, 10% believed that capital subsidies and grants to be the best policy and only 5% had energy portfolios standards at the top of their list. However, caution is required when interpreting these results as most of the respondents are from Europe where feed-in tariffs is the most common policy used. New Energy Finance also described how the U.S. market for renewable energy has changed since the crisis. According to them, the risk tolerance of investors has decreased and the capital demand and costs of borrowing have increased. Therefore, only the economically most viable projects are being financed since the start of the financial crisis. KEMA⁴ interpreted the increase of risk aversion of investors as a reason for the preference of feed-in tariffs, because this policy provides the most stable incentives for investors.

In their survey, Bürer and Wüstenhagen [2009] indeed found that private equity investors clearly preferred feed-in tariffs over all other policies. European investors, especially, showed this preference. The authors⁵ explained this preference by the fact that feed-in tariffs decrease the risk for investors as compared to other policies. Another important finding from their survey was the skeptical attitude of the surveyed investors towards green certificate trading and carbon trading schemes. This might be the result of these mechanisms being viewed as 'big corporation policies'⁶, while the survey was conducted among smaller venture capital investors who invest in the more innovative renewable energy technologies. This being the year 2011, a period in which subsidies are being cut, the question remains whether there has been a change in preference of venture capital and private equity investors regarding renewable energy and climate policies. In order to evaluate this, we repeated that part of the survey performed by Bürer and Wüstenhagen [2009] that focuses on preferences for market-pull strategies. Of the sixty respondents in the Bürer and Wüstenhagen [2009] study, thirty-two were willing to participate in the survey again. We present the change in their preferences in this paper.

⁴See the KEMA 2009 report (KEM [2009]).

⁵We refer to both Bürer and Wüstenhagen [2009] and the results presented in Bürer [2008] here.

⁶see Schleich and Betz [2005], Toke and Lauber [2007], Bürer and Wüstenhagen [2009]

2 Methodology

We chose to re-conduct the survey performed by Bürer and Wüstenhagen [2009] to establish whether the current period of financial crisis has changed the preferences of renewable energy investors. The survey of Bürer and Wüstenhagen [2009] consisted of two parts: one part with questions about market-pull policies and another part with questions on technology-push policies. We chose to focus on the questions about market-pull policies as we believe that the financial crisis might have affected primarily market-pull policies as opposed to technology-push policies. In addition to respondent descriptive questions about fund size, location and the type of renewable energy the fund invests in, we asked the respondents to rate the following twelve renewable energy and climate policies on a preference scale from one to five (five being the most preferred) or to indicate that a policy has no effect or that the effect was not understood⁷. The twelve renewable energy and climate policies were (we refer to Bürer and Wüstenhagen [2009] for descriptions):

1. Feed-in tariffs (e.g. subsidies for renewable energy market take-up)
2. Reduction of fossil fuel subsidies
3. CO₂ emissions trading
4. Renewable portfolio standards (RPS)
5. Renewable fuel standards or targets
6. Green (renewable energy) quotas and certificate trading
7. General CO₂ tax or energy tax
8. Residential and commercial tax credits for renewable energy
9. Kyoto mechanisms (e.g. CDM, JI)
10. Government procurement of renewable energy
11. Production tax credits (e.g. for wind energy)
12. Technology performance standards (e.g. vehicle pollution standards)

The respondents were selected in such a way that the results could easily be compared to those of Bürer and Wüstenhagen [2009]. Specifically, we asked the same private equity companies to participate in our survey, but as we only had company but not individual respondent names, we could not ensure that the respondents were exactly the same individuals as in the Bürer

⁷Details about the survey questions are available upon request.

and Wüstenhagen [2009] study. The survey can therefore be characterized as a trend study and not a panel study. Although this might be a limitation, being that we asked the same companies to participate in our survey the respondents may be expected to have the same company characteristics as the ones Bürer and Wüstenhagen [2009] examined which makes comparing our results with theirs feasible. Another limitation of this approach is that it resulted in a smaller sample of potential respondents as we only contacted the actual respondents of the Bürer and Wüstenhagen [2009] study and did not contact their full initial pool of investors⁸. Specifically, Bürer and Wüstenhagen [2009] surveyed sixty renewable energy venture capital and private equity funds and we selected those funds to contact. We collected the contact information and the track record of the company from the company website⁹. However, the websites of some companies did not provide sufficient information. In case of limited information, a phone call was made to these companies in order to complete the necessary information. From the list of respondents from Bürer and Wüstenhagen [2009], we selected only the investment companies that were located in Europe or North America. We also removed the companies that did not exist anymore. This left us with 54 out of the original 60 funds to contact for this study. We asked these 54 companies to fill out an online questionnaire; 32 responded¹⁰. The survey was conducted between March and May 2011.

The following describes the characteristics of the respondents in our survey: 94% of the respondents have invested in renewable energy, whereas was planning 6% on doing so. The geographical distribution of the respondents is comparable with the 2007 study since 47% of our respondents are located in North America, 25% in the UK and 28% in the rest of Europe. It was found that 41% of the funds focus their clean-tech investments in Europe, while 22% of them focus on North America. Furthermore, 19% focus on both Europe and North America and 19% focus on more than three of the regions.¹¹.

It was further found that 35% of the funds focus on seed and start-up capital (i.e. the early stage investments), 42% of the funds focus on the expansion stage and 19% on a later stage. The remaining 4% of the funds focus on all investment stages. The funds participating in the survey have different levels of exposure to clean-tech investments and have different sizes: 29% of the funds had a clean-tech exposure of up to 10 million euro, another 29% had an exposure between 10 million and 100 million euro, 18%

⁸Bürer and Wüstenhagen [2009] interviewed some of the respondents at a conference.

⁹As it turned out, only one individual that participated in the Bürer and Wüstenhagen [2009] study, participated in our survey.

¹⁰A list of respondents is available upon request.

¹¹Possible answers were Europe, North America, South America, Africa, Asia and Australia/New Zealand whereby respondents could select more than one answer.

of the funds had an exposure between 100 and 250 million euro and the last category (between 250 million and 1 billion euro) accounts for 25%. The funds were also asked about their total firm size. The largest categories are 0 - 50 million euro, 100 million - 250 million euro and 250 million - 1 billion euro, each accounting for approximately 25%. The funds with sizes between 50 and 100 million euro and between 250 million and 1 billion euro account for 9% each. 6% of the funds invited to complete the questionnaire did not provide an answer.

The characteristics of the respondents in the samples of Bürer and Wüstenhagen [2009] and ours were found to be comparable. For instance, the percentage of the funds located in North America, the U.K. and the rest of Europe was found to be similar. Among the differences between the samples, the most noteworthy appeared to be the fact that more companies focussed on North America in the Bürer and Wüstenhagen [2009] study than in ours. Apparently, the focus of the companies shifted from investments in North America to investments in Europe. Other small differences between the samples in terms of investment stage, clean-tech exposure and total funds size were found. Therefore, we concluded that there are no substantial differences between these two samples. We therefore felt confident that the research outcomes between these two samples are comparable.

3 Results

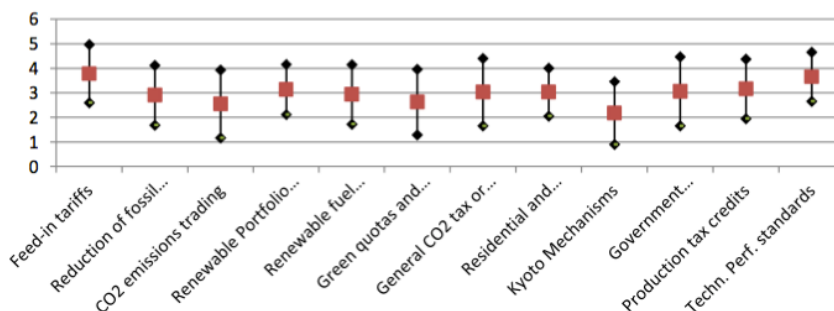
This section presents the results of our survey and compares these with the results of the survey by Bürer and Wüstenhagen [2009]. Feed-in tariffs obtained the highest score with an average of 3.87 out of five. Another popular policy was technology performance standards, with an average of 3.66. Less popular policies were CO₂ emissions trading, green quotas and certificate trading as well as Kyoto mechanisms. This might be explained by the fact that these policies imply more risk for investors since market prices for CO₂ and green certificates fluctuate (Bürer and Wüstenhagen [2009]) and investors can be expected to be more risk averse in times of crisis. Another explanation why these policies are less popular might be that market based mechanisms have been shown to be less efficient¹².

Figure 1 provides an overview of the average scores and the standard deviations for the different policies.

Our research objective was to examine whether private equity investor

¹²See: European Commission, 2008, The support of electricity from renewable energy sources.

Figure 1: Average scores and standard deviations for different renewable energy and climate policies

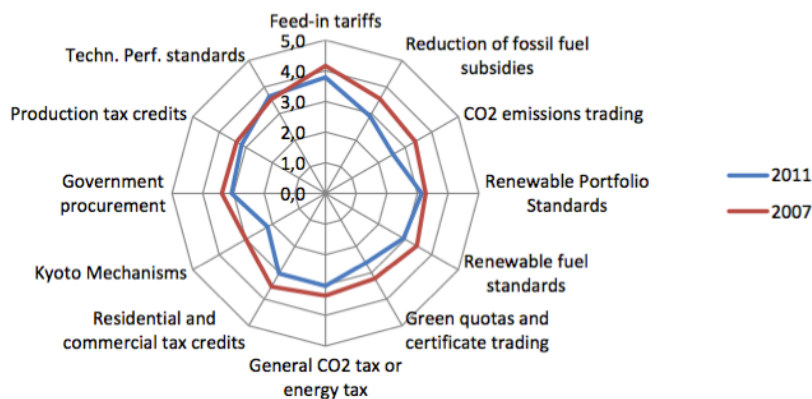


policy preferences changed over time as a result of the financial crisis. Figure 2 shows the scores for the different policies from the Bürer and Wüstenhagen [2009] study (indicated by 2007 in the graph) and our study (2011). This figure clearly shows that almost all policies obtained a lower score in 2011 than in 2007. The only exception is technology performance standards for which the score was higher in 2011 than in 2007. The preferences decreased to highest degree for the following policies: reduction of fossil fuel subsidies, CO₂ emissions trading, green quotas and certificate trading as well as Kyoto mechanisms. We attribute the lower scores for these policies in 2011 to the financial crisis as governments cut their subsidies for renewable energy as well as the fact that market prices became more volatile. The support for feed-in tariffs, renewable fuel standards, CO₂ tax, tax credits and government procurements declined by a small amount. The finding that support for feed-in tariffs remained more or less stable might be explained by the fact that feed-in tariffs provide the most stable incentives for investors who are more risk averse in a time of financial crisis (KEMA 2009). The policies that had the same scored in both 2007 and 2011 were renewable portfolio standards and production tax credits.

To shed more light on the potential significance of the differences, we performed a t-test to determine whether the mean scores in 2011 are equal to the scores in 2007. To do so, we calculated the difference between the mean score of each policy in 2007 and in 2011 assuming that both samples are independent¹³. Table 1 contains the t-statistics of the differences be-

¹³One might argue that the samples are dependent as the respondents come from the same private equity companies as in the 2007 study. However, the time period and the actual individuals surveyed differ. Furthermore, assuming independence yield more conservative results as we measure the difference between the two means.

Figure 2: Scores for renewable energy and climate policies in 2007 and in 2011



tween the mean scores of 2007 and 2011¹⁴

As indicated in table 1, the difference between the mean score of 2007 and the mean score of 2011 for feed-in tariffs has a t-statistic of 1.57. This indicates that the difference is positive; i.e. feed-in tariffs had a higher score in 2007 than in 2011 as already observed in figure 2. The t-statistic of 1.57 indicates no significant difference on the 5% level, so we concluded that there is no significant change in the preference of investors regarding feed-in tariffs in 2011 as compared to 2007. The same conclusion holds true for renewable portfolio standards, renewable fuel standards, general CO₂ tax or energy tax, residential and commercial tax credits, government procurement, production tax credits and technology performance standards (the preference of the latter policy increased in 2011, expressed by the negative t-statistic, although the increase was not significant). A significant reduction in preference was noticed for reduction of fossil fuel subsidies, CO₂ emissions trading, green quotas and certificate trading as well as Kyoto mechanisms.

Our survey also allows for the comparison of the differences in preferences between North American and European funds. Figure 3 compares the preferences of North American based and European based funds found in our survey. The graph in figure 3 shows that the funds focused on North

¹⁴To calculate the differences, we didn't have the mean scores of 2007 as Bürer and Wüstenhagen [2009] presented the mean scores and standard deviations for each policy in a graph. To obtain the 2007 scores, we calculated these numbers directly from their graphs. Therefore, there might be a slight difference between the actual numbers from the Bürer and Wüstenhagen [2009] study and the ones we use here. However, we believe that these differences to be very small.

Table 1: **T - statistics for the differences between the scores in 2007 and 2011)**

Policy	t-value
Feed-in tariffs	1.57
Reduction of fossil fuel subsidies	2.38*
CO ₂ emissions trading	2.81*
Renewable portfolio standards	0.50
Renewable fuel standards	1.90
Green quotas and certificate trading	2.08*
General CO ₂ tax or energy tax	1.06
Residential and commercial tax credits	1.93
Kyoto mechanisms	2.76*
Government procurement	1.11
Production tax credits	0.70
Technology performance standards	-0.50

* significant at the 5% level

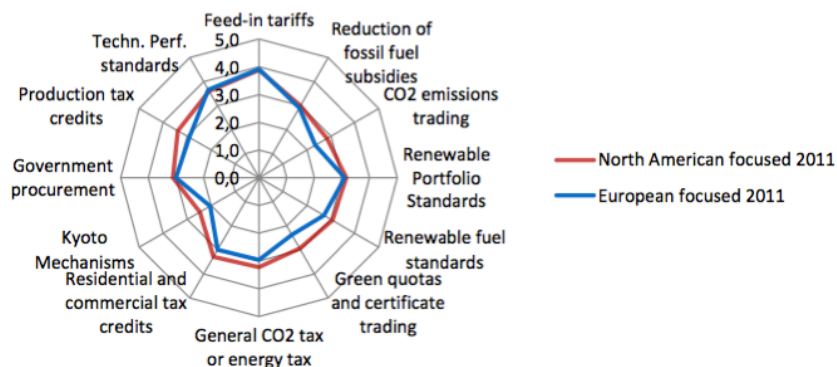
America are slightly more positive about different policies than the European funds.

The observation that North American focused funds are generally more positive about the different renewable energy and climate policies is surprising, since one of the conclusions of Bürer and Wüstenhagen [2009] was that European private equity investors were generally more positive about renewable energy policies. To shed more light on this finding, we compared the scores for funds from both regions between 2007 and 2011 in figure 4.

Figure 4 indicates that the preferences for renewable energy and climate policies of North American private equity funds have more or less remained stable over time; feed-in tariffs still being the most popular policy. The policies for which the investor preferences did decrease were the reduction of fossil fuel subsidies, CO₂ emissions trading, renewable portfolio standards, renewable fuel standards and Kyoto mechanisms. Technology performance standards and CO₂ taxation are the only two policies which became more popular in 2011. Figure 5 shows the scores in 2007 and 2011 for European funds where differences with the North American funds are apparent.

Among the European focused funds, the different policies mostly scored lower in 2011 as compared to 2007. Only technology performance standards and renewable portfolio standards remained at the same level. Feed-in tar-

Figure 3: Scores for renewable energy and climate policies between North American and European funds



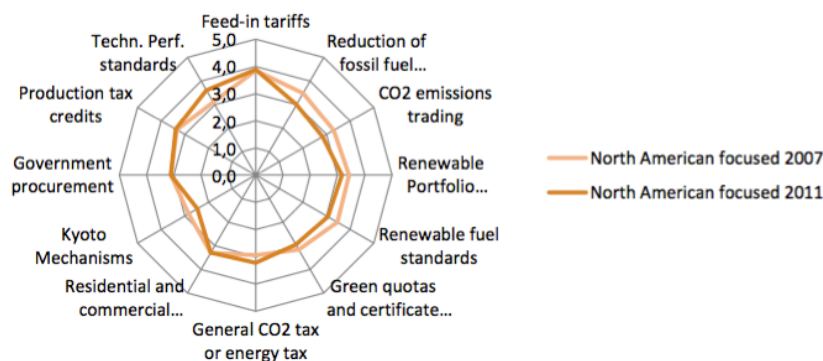
iffs, among other policies, showed a small decrease, but was still the most popular policy. The biggest decrease in popularity were seen in CO₂ emissions trading, green quotas and certificate trading, Kyoto mechanisms and government procurement of renewable energy.

The above results show that feed-in tariffs are still the most popular policy among clean tech venture capital and private equity investors. As opposed to that trade-based mechanisms score significantly lower. We assume that this is explained by the uncertainty these mechanisms cause for investors because of fluctuating market prices, since in times of a financial crises investors are more risk averse. Comparing the 2007 and 2011 results, it becomes evident that most of the policies decreased in popularity. The preferences of North American focused investors seemed to be more or less stable, while European focused investors rated most of the policies lower than in 2007. The general decrease in the rating of the different policies is therefore mainly caused by the decrease in popularity among the European investors.

4 Concluding remarks

In order to reduce the emission of greenhouse gases and to secure future energy supplies, governments around the world are working to stimulate the deployment of renewable energy sources. Many research studies have been conducted to determine which renewable energy and climate policy is best for stimulating the deployment of renewable energy. B urer and

Figure 4: Scores for renewable energy and climate policies from North American funds in 2007 and 2011

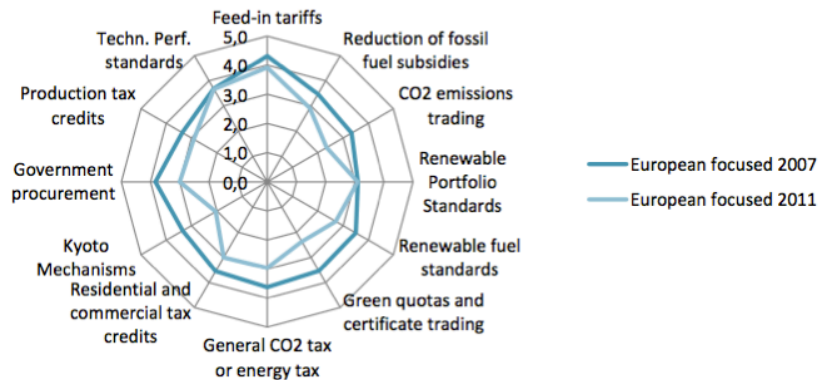


Wüstenhagen [2009] contributed to this debate as they examined which of twelve different market pull policies as well as eleven different market-push policies were preferred by venture capital and private equity investors. Their results were based on a survey that was conducted in 2007, before the current financial crisis emerged. This financial crisis has forced several European governments using feed-in tariffs to cut their subsidies. Such developments are likely to influence investor preferences regarding renewable energy and climate policies.

We contribute to this discussion by questioning whether the recent financial crisis and subsidy cuts changed the preferences of venture capital and private equity investors regarding renewable energy and climate policies. To answer this question, we re-conducted a selection of the Bürer and Wüstenhagen [2009] survey in the economic climate of 2011. The first result is that feed-in tariffs remain the most popular policy among clean tech venture capital and private equity investors. When comparing the 2007 and 2011 results, we observe that most of the policies decreased in popularity. The most noteworthy and significant decrease was found in trade based mechanisms, green quotas and certificate trading as well as CO₂ emissions trading. The general decrease in popularity of the policies is not the result of changes in preferences from North American focused investors. They rated most of the policies at more or less the same level. European focused investors, however, showed a decrease in popularity for most of the policies.

Based on the recent subsidy cuts as a result of the financial crisis, one might think that feed-in tariffs are no longer the best renewable energy and climate policy to increase private equity investments in renewable energy. This research, however, shows that this is not the case. Even though the

Figure 5: Scores for renewable energy and climate policies from European funds in 2007 and 2011



recent financial crisis and subsidy cuts in several European countries have influenced the popularity of several renewable energy policies, feed-in tariffs are still the most popular renewable energy and climate policy among cleantech venture capital and private equity investors as they provide the most stable incentives for investors.

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