Competitive Advantage of German Renewable Energy Firms in Russia.

An Empirical Study based on Porter's Diamond

This article analyzes the competitive advantage of German renewable energy firms in Russia. Based on Porter's diamond model of competitiveness we examine the demand for renewable energies in Russia and the ability of German firms to meet this demand. While the overall demand for renewable energies in Russia is still low, the study reveals remarkable differences in the fields of biomass, solar and wind energy. Our findings are meant to address managers in the renewable energy industry and to aid policy makers in environmental support and action.

Keywords: Renewable energy, Russia, Porter's Diamond

Introduction

Russia’s demand for renewable energy

In terms of power generation, Russia ranks fourth behind the US, China and India and has some of the largest reserves of natural gas and coal worldwide (European Bank of Reconstruction and Development [EBRD], 2005). Today the energy mix in Russia is dominated by gas which accounts for 54 percent of total primary energy supply (TPES) and 43 percent of electricity generation (Merle-Béral, 2006). Contrary to most other countries, Russia may be among the beneficiaries of global warming during the next years. Lower winter heating costs, a longer and more northerly agricultural growing season and increased tourism could have positive effects on local energy demand while the global demand for oil will not fall significantly in the future (Stern, 2008).

In contrast to many developed countries and emerging markets, Russia does not make large efforts to complement fossil funds by renewables. Currently the use of renewable energy in the TPES accounts for one percent, only. Oil and gas are comparable cheap and perceived as specific industries by the Russian government. As a consequence, investments in renewable energies are much lower than in other countries. On the other hand, Russia has very favorable conditions for wind power, solar energy and biomass. According to its size and variety of geographic features, Russia is said to be a renewable energy sleeping giant and does not have any lower renewable energy potential than China or the European Union (Grigor’ev & Cuprov, 2008).

In almost all parts of Russia there are three types of renewable energy sources which could be economically used already today. These are wind power, solar energy and biomass. Russia’s forests cover more than 40 percent of the entire landmass and represent nearly one quarter of the worldwide forests. This leads to gigantic biomass energy resources, which are so far only minimally exploited (EU-Russia Technology Centre, 2004). With its vast size, Russia receives a lot of solar radiation. The highest potential for solar energy can be found in the Southwest of the country, e.g. in the North Caucasus. Until now, however, the building of a solar power plant has been postponed (World Energy Council [WEC], 2007). In large parts of Russia, wind energy has a gigantic potential, which is realized to a minimum degree, only. In 2007, the share of wind energy accounts only for 0.1 percent of renewable energies and only 0.001 percent of the total energy production in Russia. Up to 10 percent of the total electricity generation could be allocated as wind energy (Grigor’ev & Cuprov, 2008).

Russia has a great potential to increase its use of renewable energies, which can be important in the Russian energy mix in the future (Merle-Béral, 2006). Russians slowly realize the risks that environmental issues pose to economic growth and are becoming more ecologically conscious (O'Neill & Lawson, 2007). Large parts of the country are contaminated by leaky pipelines or polluted by outdated power plants. Moreover, Russia has ratified the Kyoto protocol in 2004 and thus committed itself to reduce CO_2 emissions. Thus, it is worthwhile to analyze the potential of biomass, solar and wind energy in the country and how it could be realized in the future. In particular, we will analyze which role German renewable energy firms may play in this context.

The renewable energy sector in Germany

In terms of global transition from fossil fuels to renewable energy, German firms play a leading role as Germany is one of the world's leading research hubs for environmental technologies. Moreover, German firms occupy excellent market positions in all fields of renewable energies, particularly in solar, wind and biomass energies (Ernst & Young, 2008). The strong market position provides German firms with the unique chance to supply the world market with its own green technologies and to create long-term competitive advantage (Petermann, 2008), while ensuring climatic compatible growth in emerging markets.

In the past decade the share of renewable electricity has more than doubled, and no other country was able to grow renewable energy capacity as quickly as Germany (Wüstenhagen & Bilharz, 2006). During this time many German firms have advanced to be national and international competitive. They provide key components in biomass, solar and wind facilities (Kohler, 2008). A survey of 1,500 firms in the environmental industry confirmed that the renewable energy business is booming (Federal Ministry of Environment, Protection of Nature and Nuclear Safety, 2007). This fast development brought Germany in a lead market position in environmental technology. Lead markets link critical future challenges to technological innovations and are highly competitive (Mansfield, 1968; Porter, 1990). German firms in the renewable energy sector are characterized by high R&D expenditures and a large number of patents, which is the basis of their technological leadership (Umweltbundesamt [UBA], 2007). German firms develop high-quality technical solutions that gain worldwide acceptance (Kaiser, 2007). Already today, German renewable energy technologies are exported and own a leading market position in many countries (Kohler, 2008). It is expected that this leading role will help them to benefit also from the growing demand in the emerging markets in Eastern Europe and Asia (Federal Ministry of Environment, Protection of Nature and Nuclear Safety, 2007).

For determining whether German firms in the renewable energy sector have a competitive advantage in Russia in biomass, solar and wind energy, Porter's Diamond (1990) is elaborated as theoretical concept. This concept is argued to be an appropriate framework because it suggests that the national home market (Germany) plays an important role in shaping the extent to which it is likely to achieve advantage in other countries (Russia).

In the next section, Porter's model is described and adapted to the renewable energy industries. Afterwards, propositions for determining the competitive advantage of German firms in Russia will be derived. Then the measures to empirically test the approach for the renewable energy industry will be explained. In the following section, the findings will be presented and discussed. Finally, we will summarize the main contributions of this study, discuss its limitations and provide recommendations for further research.

Theoretical Framework and Research Propositions

Competitive Advantage and Porter's Diamond Model

During recent years, many researchers have discussed competitive advantage of nations, industries, and firms from various perspectives. Basically there exist two conflicting perspectives on the determinants of competitive advantage. While researchers, such as Barney (1991) and Grant (1991) focus on resource-based explanations for competitive advantage, industrial economists such as Porter (1980) propose industry-based explanations. In this study we focus on the competitive advantage of a specific industry and therefore, follow Porter's approach. According to Porter, competitive advantage in a given industry is a combination of the ability to innovate, to improve processes and products as well as to compete (Porter, 1990:69). For determining national competitive advantage in different industries, Porter (1990) developed a conceptual framework which he labeled diamond that consists of four interrelated determinants:

Factor conditions represent the factor endowment of a country and can be distinguished in basic factors and advanced factors. Natural resources, physical resources, unskilled labor as well as capital resources belong to the basic factors, whereas modern digital data communication infrastructure and highly educated personnel represent the advanced factors.

Demand conditions describe the manner of domestic demand for products or services in a certain industry. Three broad attributes are significant: The composition, the size and pattern of growth as well as the internationalization of domestic demand.

Related and supporting industries are industries, in which firms can share activities intersectorally in the value chain, e.g. technology development, suppliers, distribution channels and marketing

Firm strategy, structure and rivalry describes the conditions of a country determining how firms are organized and run. Also goals (i.e. firm goals, goals of individuals), domestic rivalry and new business formation determine this factor.

Two exogenous factors, chance and government, may also impact competitive advantage. *Chance* contains events that cannot be influenced by firms, e.g. acts of pure inventions, major technological discontinuities and surges of world or regional demand. Finally, the *government* can influence each of the four determinants in a positive or negative way.

Our adaption of Porter's framework to the renewable energy industries in Russia is based on the suggestions and modifications of several previous studies (e.g., Cartwright, 1993; Davies & Ellis, 2000; Dunning, 1993; Narula, 1993; Rugman & D'Cruz, 1993; Sledge, 2005). First, we applied Cartwright's (1993:61) "simplified quantitative model based on interval scales with the aim of faithfully interpreting Porter's intentions." While Porter (1990) describes the diamond conditions in a narrative and qualitative way, this approach allows for a quantitative analysis. Thus influencing several subsequent empirical studies (e.g., Moon, Rugman & Verbeke, 1998; Sledge, 2005; Stone & Ranchhod, 2006; Clarkson, Fink & Kraus, 2007). Secondly, we excluded *chance* because this exogenous factor can barely be predicted (Porter, 1990; Cartwright, 1993) and replaced it with *culture* (O ´Shauhnessy, 1996; Steger, Schindel & Krapf, 2002). This is in line with Van den Bosch and Van Proijeen (1992) who criticize that the impact of national culture is given too little attention in Porter's model and suggest combining Porter's framework of competitive advantage with Hofstede's dimensions of national culture. They argue, for example, that uncertainty avoidance has a negative influence on the diffusion of new technologies. Based on these considerations our research model consists of four determining factors and two exogenous factors which have been intensively discussed in previous studies (Figure 1).

Insert Figure 1 about here

To analyze rivalry in the home market, we also integrated foreign multinational corporations as they have a decisive influence on the competitiveness of a country. The exclusive focus on home country characteristics would neglect the influence of multinational corporations on foreign markets (Dunning, 1993). In particular, we do not only look at the Russian diamond of competitive advantage, but combine this with the German one. This construction of double diamonds (Cartwright, 1993; Rugman & D'Cruz, 1993) allows us to analyze the competitive position of German renewable energy firms in Russia.

Propositions

Factor conditions, which are divided into basic factors and advanced factors, represent a country's factor endowment. Although competitive advantage can be generated by both, basic factors have a lower potential (Dunning, 1993). For the renewable energy industry, natural resources such as biomass, wind or solar irradiation can be considered to be basic factors (Vestergaard, Branstrup, & Goddard, 2004), while the infrastructure as well as the scientific and engineering institutions represent advanced factors. The stronger the advanced factors in an industry, the more competitive the firms in this industry are (Porter, 1990). Without appropriate advanced factor conditions, firms would have to expend their own resources to provide such structures for commerce. For example, the quality of employees is crucial for the renewable energy industry because of its high-tech character (especially solar resources and critical products for wind energy). The larger the pool of qualified employees in the manufacturing industry in a country, the more qualified employees are available also for foreign firms. Foreign firms also hire local employees and benefit from their number and qualification. Thus, we assume that differences in factor conditions are a main source of competitive advantage and propose:

Proposition 1a: The larger the differences in factor conditions with regard to renewable energies between Germany and Russia, the higher the competitive advantage of German firms in Russia.

Demand conditions describe the nature of domestic demand for products or services in an industry. The quality of home demand is more important than its quantity. Porter argues that demanding customers expect innovations and pressure firms to develop more sophisticated products or services. Therefore, domestic demand can be considered as a primary source of competitiveness. This would mean that a high level of demand for renewable energies in a country drives firms in this industry to become innovative and internationally competitive. Based on those considerations we assume that firms in the renewable energy sector which are highly innovative are able to customize their products better to the conditions in other countries. Therefore, we propose:

Proposition 1b: The larger the differences in demand conditions with regard to renewable energies between Germany and Russia, the higher the competitive advantage of German firms in Russia.

Related and supporting industries include firms that directly or indirectly affect a given industry. Porter (1990) argues that focal industry national success is likely if the country has a competitive advantage in related and supporting industries. The existence of successful related and supporting industries in the home market provides opportunities for communication and technical exchange. Additionally, focal industry international success can also generate demand for complementary products. For renewable energies it can be argued that particularly high-tech industries are relevant. Spillover effects of these industries may enhance the innovativeness of technologies in the biomass, wind and solar industry and thus the competitive advantage of firms operating in these sectors. Therefore the following proposition can be derived:

Proposition 1c: The larger the differences in related and supporting industries with regard to renewable energies between Germany and Russia, the higher the competitive advantage of German firms in Russia.

The factor firm structure, strategy and rivalry includes country conditions that influence domestic rivalry as well as how firms are organized and run (Porter, 1990). The more firms exist in a sector, the fiercer the competition and the stronger the pressure for innovative firm strategies and structures. Declining industries, on the other hand, are often characterized by a low degree of rivalry as well as less innovative firm strategies and structures. The same applies to industries which are dominated by monopolistic firms. We assume that this applies to the renewable energy industries as well where innovativeness and the adaptation of new technologies are key sources of competitive advantage. On the basis of this argument we can derive the following proposition:

Proposition 1d: The larger the differences in firm strategy, structure and rivalry with regard to renewable energies between Germany and Russia, the higher the competitive advantage of German firms in Russia.

Porter (1990) argues that a large diamond represents high competitiveness and a small diamond represents low competitiveness. Since the four determining factors influence each other, their relationship is better characterized by a multiplicative than by an additive combination. A country in which all four determining factors show a medium value is more competitive than a country where two values are high and two are low. Thus, we propose:

Proposition 2: The larger the diamond surface area of the German diamond compared to the respective Russian diamond, the higher the competitive advantage of German firms in Russia.

Methodology

Data Collection

Previous research in the area of national competitiveness has often been survey-based (Papanastassou & Pearce, 1999). While surveys have particular advantages, they are also often characterized by small sample sizes, subjectivity and self-reporting bias. In attempt to avoid these disadvantages, this study is based on secondary data.

An extensive set of official and semi-official international sources (e.g. Worldbank, EU, UN, OECD, IEA, UNEP & SEFI, World Economic Forum) as well as publications of non-governmental organizations (such as the World Wind Energy Association [WWEA] and chambers of industry and commerce) have been screened. Moreover, we analyzed company reports and other internet resources. Because these sources provided all data that is needed for our study, the collection of primary data was not necessary.

Method

To determine German firms' competitive advantage in Russia, we calculated two separate diamonds and compared them in form of a double diamond as proposed by Dunning (1993) and Rugman & D'Cruz (1993). The four dimensions of the diamond were specified for the renewable energy industry and calculated with a simplified quantitative model based on interval scales (Cartwright, 1993). Thereby, each variable was determined by a composite score of two causal variables, which were itemized by different proxy variables for the renewable energy industry. Table 1 lists all causal and proxy variables that we used to determine the competitive advantage of Germany and Russia.

Insert Table 1 about here

For the purpose of constructing and interpreting the double diamonds with regard to the size of the axes and the surface area, we added the two causal variables *market volume* and *structure/strategy* of Porter's original study (1990), which were not included in the quantitative approach of Cartwright (1993). For the measurement of the proxy variables we computed an interval scale with a minimum of zero and a maximum of ten. If a causal variable was determined by more than one proxy variable, the arithmetical average was calculated. This resulted in one score with values between zero and ten.

For government and culture, we adopted a three-point scale from Cartwright (1993). For example, an interventionist policy with a negative impact on the diamond was evaluated with -2, a policy that has no influence on the diamond with zero and a government that facilitates the diamond process with +2. We summed up the scores of both factors and obtained scores between -4 and +4. Thereby, every score point represents 10 percent. Hence, a score of +4 extends the axes of the diamond to 140 percent of its initial value and a score of -4 reduces the axes to 60 percent.

Measures

Factor conditions. To determinate basic and advanced factors, we adopted measures used in several previous studies. Basic factors were measured by the amount of natural resources (Clarkson, Fink, & Kraus, 2007; Vestergaard et al., 2004) and advanced factors by the number of scientific and engineering institutions (Nair et al., 2007), infrastructure (Sledge, 2005), and patent applications (Clarkson et al., 2007; Sledge, 2005).

Natural resources are crucial for the renewable energy industry because without biomass, sun-light or wind, renewable energy could not be generated. The natural resources could also be regarded as an influencing factor on the national level as they are available for all industries in the same way. In this case, the natural resources are input factors for generating renewable energy and, therefore, regarded as an industry level factor. To analyze natural renewable energy resources, their potential in Germany and Russia was examined and approximated in terms of megawatts with reference to the most recent predictions.

Scientific and engineering institutions are considered to be knowledge resources that increase the advanced factor endowments in knowledge-intensive industries, such as the renewable energy industry (Porter, 1990). In our study we measured the scientific and engineering institutions with the index "Quality of Math and Science Education" taken from the Global Competitiveness Report 2007/2008 (Porter, Sala-i-Martin & Schwab, 2007).

We measured infrastructure by using the Renewables Infrastructure Index, which is one element of the Ernst & Young Renewable Energy Country Attractiveness Index and offers specialized and current information for this industry (Ernst & Young, 2008). Since only data for Germany are available, we used qualitative data for the Russian renewable energy infrastructure (United Environment Programme (UNEP) & Sustainable Energy Finance Initiative (SEFI), 2008; Wookey, 2008) and interpreted them in an analogous manner.

Beise and Cleff (2004: 479) argue that "the country-specific attributes that increase the international competitiveness of a locally adopted innovation are more important for the international success of a firm's innovation than other advantages a country can have as the first to market." The renewable energy industry is highly innovative and innovations are generally generated through R&D. Patents are an indicator for innovation and provide information about specific technological areas (Johnstone, Hascic, & Popp, 2008). In our study, we used the actual number of patents in each renewable energy technology as a measure for innovative strength. Therefore, initially, the relevant IPC codes for renewable energy technologies were established (Organization for Economic Co-operation and Development [OECD], 2008a) and the latest available data (2005) of all relevant patents in biomass, solar and wind energy were extracted from the OECD patent database (OECD, 2008b). Before the linear transformation of the data into scores between zero and ten we log-transformed the original quantitative data because of the large gaps between the country values.

Demand conditions. We measured this factor by combining consumer sophistication as well as size and growth of home market demand (Sledge, 2005; Moon, Rugman & Verbeke, 1998; Brouthers & Brouthers, 1997). The market volume of the home market is determined by the current market size and the future market growth for a technology.

Market size has been used in recent studies, however, with different methods of measurement. Nachum (1998), who investigates the Swedish engineering consulting industry, measures the size of home demand in terms of total annual investment in engineering consulting within a country, and Sledge (2005) uses the automotive competitor revenues within the home country as a percentage of the total global automotive industry. In this study, we used the total capacity in megawatts installed until the end of 2007 to determine market size. We also log-transformed this data before the linear transformation.

Market growth is as important as the absolute size of the market and indicates a future trend. A fast growing domestic market inspires the firms in a country to adopt new technologies and leads them away from the belief that “such technologies would make existing investments redundant” (Porter, 1990: 94). We derived the data for this item from the alternative policy scenario of the World Energy Outlook 2006 for biomass and wind energy (2004 – 2015). In this report, values for Germany are not available, so we used the data published in a report of the German Federal Ministry of Environment, Protection of Nature and Nuclear Safety (2009) instead. For solar energy, values of the European Photovoltaic Industry Association (2008) “Global Market Outlook for Photovoltaics until 2012” were used. The market growth for solar energy was only determined from 2007 to 2012. For the solar energy market growth in Russia, quantitative data are not available, so we had to use qualitative data instead (Gati, 2008; Worldbank, 2007).

To determinate sophistication of home demand, most recent studies use R&D investments (Boyle et al., 2008; Vestergaard et al., 2004) as well as sophisticated and demanding buyers (Moon et al., 1998; Sledge, 2005) as proxy variables. We measured R&D investments in the renewable energy industry by using the venture capital and private equity (VC/PE) investments in 2007 for each technology. VC/PE investments describe “all money invested by venture capital and private equity funds as equity in the firms developing renewable energy technology” (Boyle et al., 2008). The relevant data was obtained by combining the VC/PE new investments in technology in 2007 and the VC/PE transactions by country in 2007 (UNEP & SEFI, 2008). For Russia, quantitative data for VC/PE investments were not found, instead we used qualitative data sources to describe renewable energy investments in Russia (Worldbank, 2007).

Firms can also gain competitive advantage if domestic buyers are sophisticated and demanding with regard to products or services (Porter, 1990). Moon et al. (1998) and Sledge (2005) consider that demand sophistication will increase with the level of education. Therefore, we used the education index of the United Nations Development Programme to measure this item (United Nations Development Programme, 2008). This measurement was similar to Moon et al. (1998) who determine the consumer’s sophistication for the automotive industry by using the percentage of the population with higher education in the home market.

Related and supporting industries. Although the related and supporting industries can differ for each renewable energy technology, they all belong to the medium and high-tech industry. Examples for these are the high-tech companies Conergy and M+W Zander FE GmbH which are suppliers for firms in the biomass, solar, and wind energy sector at the same time (Conergy, 2008; M+W Zander, 2008). Based on these considerations we measured the strength of related industries by the share of medium & high-tech value added in total manufacturing in a country (United Nation Industrial Development Organization [UNIDO], 2008).

The renewable energy industries and their related and supporting industries are considered to be very innovative. Therefore, we used gross domestic expenditure on R&D as a measure for the level of development of the supporting industry (Nachum, 1998; Maxoulis, Charalampous, & Kalogirou 2007). The data was extracted of the OECD Factbook 2008, which provides a global overview of the major economic, social and environment indicators (OECD, 2008c).

Firm structure, strategy and rivalry. This determinant is separated into two causal variables rivalry as well as structure and strategy. We measured rivalry by the competition in the home product market. Structure and strategy were determined by corporate mergers & acquisitions (M&A) in a country and the capacity of innovation. To measure the competition in the home product market, we used a qualitative description similar to the method applied by Nair et al. (2007). Therefore, we examined the total turnover in a country, amount of firms, firm size and the number of employees.

We measured structure and strategy with the amount of M&A activities (Sledge, 2005) and the innovation drive (Clarkson et al., 2007). Continuing M&A activities in the renewable energy industry represent a consolidation that tends to create tighter market conditions (Boyle et al., 2008). Additionally, backward vertical integration up to the level of component making can be expected across all renewable energy technologies (Haag, Hauff, & Dringenberg, 2007). We used corporate M&A volume by country of target which is considered to be an appropriate proxy variable to represent firm strategy and structure (Sledge, 2005). To determine M&A activity in the renewable energy industry, corporate M&A by country of target in 2007 was utilized. We obtained the data from the "Global Trends in Sustainable Energy Investment 2008" report of UNEP & SEFI (Boyle et al., 2008). For Russia, neither quantitative nor qualitative M&A data could be found. Based on literature research we assumed that considerable M&A activities did not take place in Russia. Another element of firm strategy and structure is the firm's innovative drive, which is extremely important for the renewable energy industry. We measured innovative drive with the capacity of innovation that describes how firms obtain technology (Clarkson et al., 2007). The data was derived from the Global Competitiveness Report 2007/2008 (Porter et al., 2007).

Government and culture. We measured government with governmental support for renewable energy technologies (Vestergaard et al., 2004). Government is a decisive factor for the renewable energy sector, because without public support there would be no market for renewable energy technologies (Beise & Rennings, 2005). The main governmental influence on the international competitiveness of renewable energy technologies lies in the financial support in the form of feed-in tariffs (Wüstenhagen & Bilharz, 2006). By 2007, 37 countries had already adopted feed-in policies and more than half of these countries passed these policies in recent years (Renewable Energy Policy Network for the 21st Century [REN21], 2007). In addition to feed-in tariffs, many other important promotion policies exist. Further financial support instruments are direct investment support, soft loans and tax allowances (Grotz, 2005). Another important factor is the stringency of environmental regulations, which represents a critical factor for comparative advantage (Porter & Van der Linde, 1995; Costantini & Crespi, 2008). In the short run, firms can also benefit from fairly crafted environmental regulations that are stricter or are introduced earlier than those faced by their competitors in other countries. Consequently, stringent environmental regulations stimulate innovation and enhance competitiveness (Porter & Van der Linde, 1995). In this study, we examined all information about financial support systems for renewable energy technologies as well as environmental regulations with a qualitative measure used by Vestergaard et al. (2004), and calculated a score between -2 and +2.

To measure the impact of culture on the renewable energy industry, two of Hofstede’s cultural dimensions, uncertainty avoidance and masculinity are utilized. Concerning the latter, Kedia and Bhagat (1988) argue that masculine countries are generally more effective in new technologies than feminine countries and support this argument with the successful technological diffusion in the highly masculine countries Japan, Singapore, Hong Kong and Taiwan. Uncertainty avoidance has an important impact on the internationalization of home demand. The more uncertainty is avoided in a culture, the less it is open to foreign influences. Also the openness to new ideas is strongly negatively correlated with uncertainty avoidance (Hofstede, 2001; Van den Bosch, F & Van Prooijen, 1992). Hofstede (2001) measured uncertainty avoidance on a scale between zero and 100, with zero representing low uncertainty avoidance and 100 representing high uncertainty avoidance. Masculinity was measured in a similar way. We calculated the arithmetical average of both items and linearly transformed it into a score between (-2) and (2).

Findings and Discussion

In the following, we report the main findings by comparing the diamonds of Germany and Russia for the renewable energy industry. We distinguish between biomass, wind and solar energy and report the findings related to the individual dimensions of the diamond first. Afterwards, we analyze the diamond surface areas for the three technologies.

Diamond axes

Government and culture influence all other determinants in size and are therefore presented first.

Insert Table 2 about here

Table 2 shows that both determinants have a positive impact on the renewable energy industry in Germany, especially for the solar and biomass industries. The influence on the wind industry is also positive, but the score is slightly lower. This can be explained by the fact that wind energy is already a relatively mature technology and the governmental support has been reduced during the last years. In Russia, government and culture have a strongly negative impact on the renewable energy industry. First, there is no law to support renewable energies (Grigor'ev & Cuprov, 2008) and only limited promotion policies were set up. Second, little attention has been paid to regenerative energy sources in terms of Russia's massive fossil fuel reserves (International Energy Agency [IEA], 2007; WEC, 2007). Similarly, culture has a more positive influence in Germany than it has in Russia. The German culture is much more masculine which means that the likelihood of adapting and implementing innovative renewable energy technologies is much higher than in Russia. For example, innovative technologies for energy saving and renewable energies are very common in Germany but have not yet found large acceptance in Russia. Thus it can be assumed that German renewable energy firms have considerable competitive advantage in Russia with regard to governmental support and culture.

There are also significant differences between the two countries in terms of factor conditions. This is mainly a result of the excellent advanced factor conditions in Germany. The quality of math and science education as well as the renewable energy infrastructure is much better than in Russia. Moreover, Russia is far behind in terms of patent applications in this field. On the contrary, little differences exist in terms of basic factor conditions. While the conditions for biomass and solar energy are less favorable in both countries because of the relative small numbers of sun hours and the limited natural biomass resources that can be used for energy generation, the wind conditions are good. Thus, in accordance with propositions 1a a high competitive advantage of German firms in Russia in these area can be assumed.

In terms of demand conditions, Germany stands apart in its level of R&D spending for renewable energy technologies (UNEP & SEFI, 2008). The demanding customers as well as high research and development expenditures are reasons why Germany reached a lead market status in the renewable energy industry worldwide. Demanding customers pressure firms to continuously innovate and improve their products. Compared to Germany, the scores for Russia are much lower. The differences are particularly large in terms of sophistication. Moreover, Russia has a very low solar energy score, which can be explained by both the lack of currently installed solar energy capacity as well as the absence of R&D expenditures for solar technology (Worldbank, 2007; WEC, 2007). In both countries, the market for renewable energy grows rapidly. This trend is expected to continue in the next years. The absolute level of demand however is much lower in Russia. Following proposition 1b, a comparative advantage of German firms with regard to this dimension can be assumed.

The related and supporting industries reveal large differences between Germany and Russia, too. Table 2 indicates that the values for Germany are significantly higher than those for Russia, thus supporting our proposition 1c. The largest differences can be observed in the solar and wind energy sector. The competitive advantage that may result from this favorable position of German firms is, however, reduced by high customs and local content requirements in Russia. Thus, German firms in the renewable energy sector can exploit their advantage only if companies in related and supporting industries invest in Russia, too. If German firms had to rely on local suppliers, their competitive advantage in Russia is considerably reduced.

The high scores for Germany with regard to firm strategy, structure & rivalry can be explained by the long history in the use of renewable energy in the home market, the high level of competition in all sectors and the increasing consolidation processes taking place there (Haag et al., 2007; UBA, 2007; UNEP & SEFI, 2008). In Russia, significant differences exist within the individual industries, i.e. the rivalry in the biomass and wind energy sector is stronger than in the solar industry. For example, in the wind industry several local companies produce turbines. Apart from this, equipment of foreign companies (e.g. Vestas, Sulzon and Siemens) is imported. Moreover, the installed turbines are often old or bought second hand (Boyko & Matevosyan, 2007). Relating to our proposition 1d, this implies a significant competitive advantage of German firms in Russia which is greater for this than for any other dimension of the diamond.

Diamond surface areas

After reporting the main findings for each of the six dimensions of the diamonds separately we will now analyze the diamond surface areas for the three technologies. Porter suggests that a large diamond represents high competitiveness and a small diamond represents low competitiveness. The diamond surface area is calculated by summing up the individual areas of each quadrant's triangle as shown in table 3.

Insert Table 3 about here

Our results reveal that Germany has significantly larger diamond surface areas for all technologies than Russia. According to our proposition 2 this means a high competitive advantage of German firms in all three renewable energy industries in Russia. The largest difference can be observed in the solar energy industry and the smallest difference in the biomass industry. The wind industry ranks between these two.

The comparison of the surface areas indicates also remarkable differences within the two countries. In Germany, the wind energy diamond is by far larger than the biomass diamond, and in Russia the biomass diamond and wind energy diamonds are both twice as large as the solar energy diamond.

Contributions, Limitations and Implications for further research

This study was aimed to examine if German firms in the renewable energy industry have a competitive advantage in Russia and on which determinants this advantage is based. We used a modified version of Porter's diamond model and specified this for the renewable energy industry. We then tested the model empirically in Germany and Russia on the basis of secondary data.

The results demonstrate that German firms have a significant competitive advantage in all three technologies (Figure 2). The positive governmental and cultural influences have been decisive for the favorable development of the renewable energy demand in Germany over many years. Moreover, German firms face strong rivalry and the suppliers as well as the related and supporting industries in this sector are well developed. Disadvantages occur merely in natural factor conditions and here mainly in the low numbers of hours of sunshine. In Russia, on the other hand the renewable energy industry has not yet been developed. Particularly, lacking governmental support and unfavorable cultural conditions limit its development. Moreover, the renewable energy industry in Russia suffers from significant disadvantages in terms of related and supporting industries as well as with regard to firm strategy, structure and rivalry. Thus, an important policy implication for the Russian government would be to focus on this dimension of the diamond and to provide better conditions for Russian renewable energy firms. In particular, venture capital to strengthen their innovativeness and the promotion of cooperations with foreign partners may be appropriate. Moreover, governmental support would have a positive impact on the three other dimensions of the diamond, too.

Insert Figure 2 about here

When interpreting these results it has to be taken into account that this study only presents a snapshot of the current situation. Since the renewable energy industry is very dynamic, a replication of this study in some years might come to different results. For example, with the ratification of the Kyoto Protocol in 2004, Russia has committed itself to fulfill various energy targets. This might lead to a considerable change of Russia’s renewable energy policy and thus improve the competitiveness of this industry. Since the other five dimensions of the diamond are much less likely to change in the near future, however, the competitive advantage of German firms in Russia can be assumed to sustain for a long time. Thus German firms are in a very favorable position when this renewable energy sleeping giant will awake.

Some limitations result from the methodology of this study. Most of the secondary data was taken from official statistics, of which a few were not up to date. For the share of medium & high-tech value added in total manufacturing, for example, the most recent data available is for 2003. This applies particularly to variables that are not directly observable such as firm strategy or government policies. Although our measures may not be perfect reflections of these variables, we relied on those indicators, which have been used in previous studies most often. Moreover, we argue that our findings are robust to the use of alternative measures. For example, the results do not differ significantly when using the Ease of Doing Business Index (The World Bank Group, 2009) instead of financial support systems an alternative measure of governmental policies. For several variables no statistical data could be found, so that we had to rely on subjective perceptions.

As mentioned earlier, the diamond model of competitive advantage is not without critique, too. For example, the role of government is controversially discussed. While according to Porter (1990: 680), “government has an important role in influencing the ‘diamond’ but its role is ultimately a partial one. It only succeeds when working in tandem with the determinants”, Stern (2008: 412) argues that “government has an important role in directly funding skills and basic knowledge creation for science and technology”, which is crucial for the renewable energy industry.

Therefore, further research should focus on the governmental influence on the development of renewable energy industries and analyze this factor in more detail. The cultural influence on the development of the renewable energy industry should also be analyzed further. Similarly interesting would be a longitudinal study which reflects the changes in the competitive position of German renewable energy firms in Russia over time. Finally, future studies should consider the impact of competitive advantage in quantitative terms such as FDI outflows, market shares or profitability. Like most previous research, this study is based on the assumption of Porter that high scores for the six determinants of the diamond lead to competitive advantage without being able to statistically proofing this relationship.

References

Barney, J.B. (1991) Firm resources and sustained competitive advantage. *Journal of Management*, **17**, 99-120.

Beise, M. and Cleff, T. (2004) Assessing the lead market potential of countries for innovation projects. *Journal of International Management*, **10**, 453-477.

Beise, M. and Rennings, K. (2005) Lead markets and regulation: a framework for analyzing the international diffusion of environmental innovations. *Ecological Economics*, **52**, 5-17.

Boyko, A. and Matevosyan, J. (2007) The Russian wind of change. *IET Power Engineer*, April/May, 44-47.

Boyle, R., Greenwood, C., Hohler, A., Liebreich, M., Sonntag-O'Brien, V., Tyne, A. and Usher, E. (2008) *Global trends in sustainable energy investment 2008*. Analysis of trends and issues in the financing of renewable energy and energy efficiency. London: United Nations Environment Programme and New Energy Finance Ltd.

Brouthers, K. D., and Brouthers, L. E. (1997) Explaining National Competitive Advantage for a small European Country: a Test of Three Competing Models. *International Business Review*, **6**(1), 53-70.

Cartwright, W. R. (1993) Multiple Linked "Diamonds" and International Competitiveness of Export-Dependent Industries: The New Zealand Experience. *Management International Review*, **33**, 55-69.

Clarkson, M., Fink, M. and Kraus, S. (2007) Industrial clusters as a factor for innovative drive – in regions of transformation and structural change: A comparative analysis of East Germany and Poland. *Journal of East European Management Studies*, **12**(4), 340-364.

Conergy (2008) *Firm homepage.* Retrieved September 03, 2008, from http://www.conergy.de.

Costantini, V. and Crespi, F. (2008) Enivronmental Regulation and the Export Dynamics of Energy Technology. *Ecological Economics*, **66**, 447-460.

Davies, H. and Ellis, P. (2000) Porter's competitive advantage of nations: Time for the final judgement? *Journal of Management Studies*, **37**, 1189–1213.

Dunning, J. H. (1993) Internationalizing Porter's diamond. *Management International Review*, **33**, 7-16.

Ernst & Young (2008) *Renewable Energy Country Attractiveness Indices. Q1-2 2008.* London: EYGM Limited.

European Bank of Reconstruction and Development [EBRD] (2005) *Russia – Country Profile*. Retrieved June 15, 2008, from http://www.ebrdrenewables.com/sites/renew/Shared%20Documents/Country%20Profiles/Russia.pdf.

European Photovoltaic Industry Association (2008) *Global Market Outlook for Photovoltaics until 2012*. Facing a sunny future. Retrieved September 27, 2008, from http://www.epia.org/fileadmin/EPIA_docs/documents/EPIA_SG_V_ENGLISH_FULL_Sept2008.pdf.

EU-Russia Technology Centre (2004) *Renewable energy sources potential in the Russian Federation and available technologies*. Retrieved September 19, 2008, from http://www.technologycentre.org/upload_files/Report_RE_English_.pdf.

Federal Ministry of Environment, Protection of Nature and Nuclear Safety (2007) *Green Tech made in Germany. Environmental Technology Atlas for Germany*. München: Vahlen.

Federal Ministry of Environment, Protection of Nature and Nuclear Safety (2009). *Leading scenario [Leitszenario] 2009*. Federal Ministry of Environment, Protection of Nature and Nuclear Safety: Bonn.

Gati, T. T. (2008) Renewable Energy in Russia's future. *Journal of Foreign Affairs and International Relations*, **3**, 1-7.

Grant, R.M. (1991) The resource-based theory of competitive advantage: implications for strategy formulation. *California Management Review*, **33**, 114-135.

Grigor'ev, A. and Cuprov, V. (2008) *Energiezwerg Russland*. Osteuropa, **58** (4-5), 275–286.

Grotz, C. (2005) Germany. In Reiche, D. (Ed.). *Handbook of Renewable Energies in the European Union*: 141-160. Frankfurt a. M.: Peter Lang.

Haag, W., Hauff, J. and Dringenberg, H. (2007) *Zukunft der erneuerbaren Energien – Erneuerbare Energien als Wachstumstreiber für die Deutsche Energiewirtschaft.* Retrieved June 24, 2008, from www.atkearney.de/content/misc/wrapper.php/id/50033/name/pdf_atkearney_studie_renewables_1193217196d569.pdf.

Hofstede, G. (2001) *Culture's consequences*. 2nd edition. Thousand Oaks, CA: Sage Publications.

International Energy Agency [IEA] (2007) *Global Best Practice in Renewable Energy Policy Making*. Retrieved June 15, from http://www.iea.org/textbase/work/2007/bestpractice/Workshop_Proceedings.pdf.

Johnstone, N., Hascic, I. and Popp, D. (2008) Renewable energy policies and technological innovation: Evidence based on patent counts. *NBER Working paper series*, ***13760,*** Cambridge, MA: National Bureau of Economic Research.

Kaiser, R. (2007) *Wirtschaftsförderung durch erneuerbare Energien – Was bringt uns das?* Paderborn: BMU.

Kedia, B.L., Bhagat, R.S. (1988) Cultural Constraints on Transfer of Technology Across Nations: Implications for Research in International and Comparative Management. *Academy of Management Review*, **13**, 559-571.

Kohler, S. (2008) Renewables in Germany. A Success Story, *Made in Germany*, **3**, 6-7.

M+W Zander (2008), *Firm homepage*, Retrieved September, 03, 2008, from http://www.mw-zander.com/.

Mansfield, E. (1968) *Industrial Research and Technological Innovation: An Economic Analysis*. New York: Norton.

Maxoulis, C.N, Charalampous, H.P., & Kalogirou, S. A. (2007) *Cyprus solar water heating cluster: A missed opportunity? Energy Policy*, **35**(6), 3302-3315.

Merle-Béral, E. (2006) Walking the Giant. *Our Planet*, **16** (4), 20-21.

Moon, H.C., Rugman, A.M. and Verbeke, A. 1998. A generalized double diamond approach to the global competitiveness of Korea and Singapore. *International Business Review*, **7**, 135-150.

Nachum, L. (1998) Do the diamonds of foreign countries shape the competitiveness of firms? A case study of the Swedish engineering consulting industry. *Scandinavian Journal of Management*, **14**(4), 459-478.

Nair, A., Ahlstrom, D. and Filer, L. (2007) Localized Advantage in a Global Economy: The Case of Bangalore. *Thunderbird International Business Review*, **49**(5), 591-618.

Narula, R. (1993) Technology, international business and Porter's "diamond": Synthesizing a dynamic competitive development model. *Management International Review*, **3**(2), 85–107.

O' Shaughnessy, N. J. (1996) Michael Porter's competitive advantage revisited. *Management Decision*, **34**(6), 2-22.

O'Neill, J. and Lawson, S. (2007) Things are heating up: Economic issues and opportunities from global warming. *Goldman Sachs CEO Confidential Issue*, **1**.

Organization for economic co-operation and development [OECD] (2008a) *Compendium of patent statistics 2008.* Retrieved September 28, 2008 from http://www.oecd.org/dataoecd/5/19/37569377.pdf.

Organization for economic co-operation and development [OECD] (2008b) *Patent database. Patents by Main IPC*. Retrieved September 28, 2008, from http://www.oecd.org/ document/41/0,3343,en_2649_34451_40813225_1_1_1_1,00.html.

Organization for economic co-operation and development [OECD] (2008c) *Factbook 2008: Economic, Environmental and Social Statistics. Science and technology - Research and Development (R&D) - Expenditure on R&D.* Retrieved September 28, 2008, from http://ocde.p4.siteinternet.com/publications/doifiles/07-01-01-g1.xls.

Papanastassou, M. and Pearce, R. (1999) *Multinationals, technology and national competitiveness*. Cheltenham: Edward Elgar.

Petermann, J. (2008) *Energie – Motor der Wirtschaft*. In Petermann, J. (Ed.), Sichere Energie im 21.Jahrhundert,13-24. Hamburg: Hoffmann und Campe.

Porter, M. E. and van der Linde, C. (1995) Towards a new conception of the environment-competitiveness relationship. *Journal of Economic Perspectives*, **9**(4) 97-118.

Porter, M. E. (1980) *Competitive Strategy.* New York: The Free Press.

Porter, M. E. (1990) *The competitive advantage of nations*. London Basingstoke: Macmillan.

Porter, M. E., Sala-i-Martin, X. and Schwab, K. (2007) *The Global competitiveness Report 2007/2008*. Geneva: World Economic Forum.

Renewable Energy Policy Network for the 21st Century [REN21] (2007) *Global trends in sustainable energy investment 2007*. Retrieved June 09, 2008, from http://www.ren21.net/pdf/Glob_Sust_Energy_Inv_Report_2007.pdf.

Rugman, A. M. and D'Cruz, J. R. (1993) The "double diamond" model of international competitiveness: The Canadian experience. *Management International Review*, **33**(2), 17–39.

Sledge, S. (2005) Does Porter's diamond hold in the global automotive industry? *Advances in Competitiveness Research*, **13**(1), 22-32.

Steger, U., Schindel, C. and Krapf, H. (2002) The Experience of EMAS in three European countries: a cultural and competitive analysis. *Business Strategy and the Environment*, 32-42.

Stern, N. (2008) *The Economics of Climate Change*. The Stern Review. Cambridge: Cambridge University Press.

Stone, H.B.J. & Ranchhod, A. (2006) Competitive advantage of a nation in the global arena: a quantitative advancement to Porter's diamond applied to the UK, USA and BRIC nations. *Strategic Change*, **15**, 283-294.

The World Bank Group (2009). *Ease of Doing Business*. Retrieved October 2nd, 2009, from http://www.doingbusiness.org/EconomyRankings/.

Umweltbundesamt [UBA] (2007) *Wirtschaftsfaktor Umweltschutz – Vertiefende Analyse zu Umweltschutz und Innovation, Forschungsprojekt im Auftrag des Umweltbundesamtes.* Berlin: UBA.

United Environment Programme [UNEP] & [SEFI] (Sustainable Energy Finance Initiative). (2008) *Global trends in sustainable energy investment 2008. Analysis of trends and issues in the financing of renewable energy and energy efficiency.* Data Set. London: United Nations Environment Programme and New Energy Finance Ltd.

United Nation Development Programme (2008) *Education Index*. Human Development Report 2007/2008. New York: United Nation Development Programme.

United Nation Industrial Development Organization [UNIDO] (2008) *CIP Variables. Share of Medium- and Hightech Value Added in total Manufacturing Value Added (Percentage)*. Retrieved September 24, 2008, from http://www.unido.org/fileadmin /user_media/Services/Research_and_Statistics/full_sample_regional.xls.

Van den Bosch, F. and Van Prooijen, A.A. (1992) The competitive advantage of European nations: the impact of national culture — a missing element in Porter's analysis? *European Management Journal*, **10**(2), 173–177.

Vestergaard, J., Branstrup, L. and Goddard, R. D. (2004) *Industry formation and State Intervention: The Case of the Wind Turbine Industry in Denmark and the United States*. Retrieved May 01, 2008, from http://www.hha.dk/man/cmsdocs/publications /windmill_paper2.pdf.

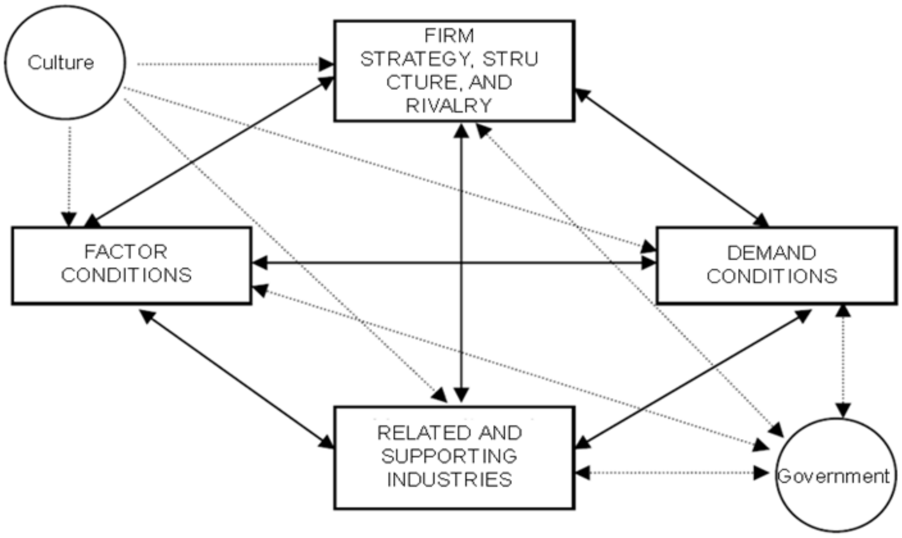
Wookey, J. (2008) Renewables stay low on the energy agenda. *Euromoney*, **39**(465), 98-103.

World Energy Council [WEC] (2007) *2007 Survey of energy Resources*. London: World Energy Council.

Worldbank (2007) *Project brief on a proposed global environment facility grant in the amount of US $ 10 million to the Russian Federation for a renewable energy project*. Report No. 40083. Retrieved September 12, 2008, from www-wds.worldbank.org.

Wüstenhagen, R. and Bilharz, M. (2006) Green energy market development in Germany: effective public policy and emerging customer demand. *Energy Policy*, **34**(13), 1681-1696.

FIGURE 1
Porter's Diamond Model



Source: modified from Porter (1990)

TABLE 1

Operationalization of Porter's diamond for the renewable energy industry

Determinants	Interval scale	Causal Variable	Proxy Variable
Factor Conditions	**(max. 20)**		
Basic	(1-10)	Natural Resources	Available potential of renewable energy resources
Advanced	(1-10)	Scientists, Infrastructure & Innovation	- Quality of math and science education - Renewable energy infrastructure - Patent applications field under the PCT for renewable technologies
Demand Conditions	**(max. 20)**		
Market Volume	(1-10)	Market Size & Growth	- Currently installed capacity in MW - Market growth (% p.a.)
Sophistication	(1-10)	R&D Investments & Sophistication	- New investment by region (VC/PE) 2007 in million USD - Education index
Related & Supporting Industries	**(max. 20)**		
Related Companies	(1-10)	Related & Supporting firms	Share of medium & high-tech value added in total manufacturing
Support	(1-10)	R&D investments	Gross domestic expenditure on R&D
Firm Strategy, Structure & Rivalry	**(max. 20)**		
Rivalry	(1-10)	Competition in Home Product Market	Competition intensity
Structure/Strategy	(1-10)	M&A Innovative Drive	- Corporate M&A by country of target - Capacity of innovation
Government and Culture	**(max. 4)**		
Government	(-2-2)	Government Support	- Financial support systems and environmental regulations
Culture	(-2-2)	Impact of national culture	Hofstede: Values for "Masculinity" and "Uncertainty Avoidance"

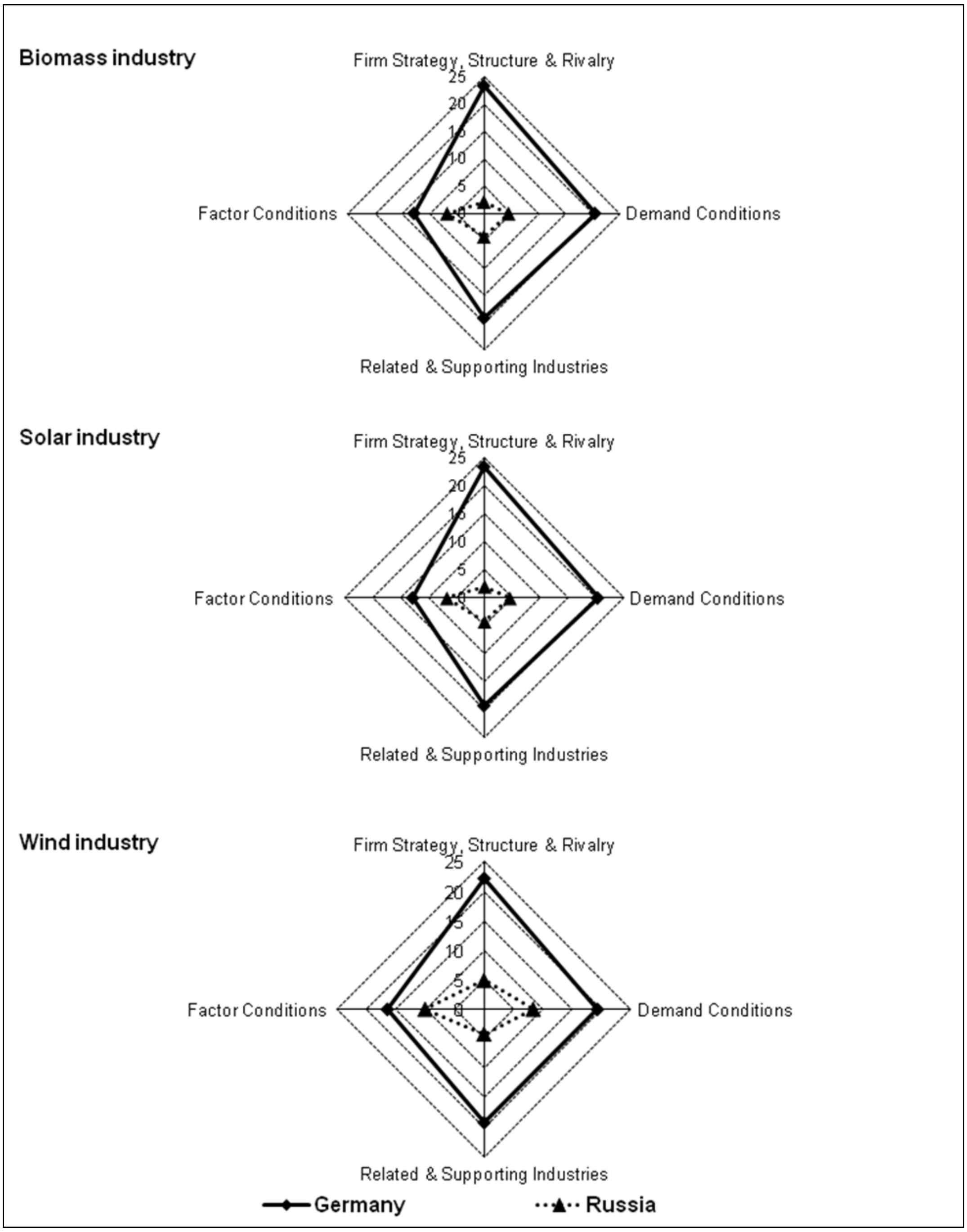
TABLE 2
Descriptive Results and Differences

			biomass	solar	wind
Government and Culture	**Germany**	government	2,0	2,0	2,0
		culture	0,0	0,0	0,0
		sum	2,0	2,0	2,0
	Russia	government	-2,0	-2,0	-2,0
		culture	-1,0	-1,0	-1,0
		sum	-3,0	-3,0	-3,0
	Difference		**5,0**	**5,0**	**5,0**
Factor conditions	**Germany**	basic	3,6	3,6	7,2
		advanced	9,2	9,2	9,2
		sum	12,8	12,8	16,4
	Russia	basic	3,5	3,5	7,0
		advanced	3,3	3,3	3,0
		sum	6,8	6,8	10,0
	Difference		**6,0**	**6,0**	**6,4**
Demand conditions	**Germany**	market volume	10,8	8,4	7,2
		sophistication	12,0	12,0	12,0
		sum	22,8	20,4	19,2
	Russia	market volume	4,9	0,7	4,6
		sophistication	3,9	3,9	3,9
		sum	8,8	4,6	8,4
	Difference		**14,0**	**15,9**	**10,8**
Related and supporting industries	**Germany**	related companies	9,6	10,8	10,8
		support	8,4	8,4	8,4
		sum	18,0	19,2	19,2
	Russia	Related companies	2,8	2,1	2,1
		support	2,1	2,1	2,1
		sum	4,9	4,2	4,2
	Difference		**13,1**	**15,0**	**15,0**
Firm strategy, structure & rivalry	**Germany**	strategy, structure	11,4	11,4	11,4
		rivalrly	10,8	12,0	10,8
		sum	22,2	23,4	22,2
	Russia	strategy, structure	1,4	1,4	1,4
		rivalrly	3,5	0,7	3,5
		sum	4,9	2,1	4,9
	Difference		**17,3**	**21,3**	**17,3**

TABLE 3
Calculation of diamond surface areas

Biomass industry	Germany	Russia
$\mathbf{A_{SD}}$ = Firm Strategy, Structure & Rivalry × ½ × Demand Conditions	246	21
$\mathbf{A_{RD}}$ = Related & Supporting Industries × ½ ×Demand Conditions	200	21
$\mathbf{A_{FR}}$ = Related & Supporting Industries × ½ × Factor Conditions	115	17
$\mathbf{A_{SF}}$ = Firm Strategy, Structure & Rivalry × ½ × Factor Conditions	142	17
Area surface	**703**	**76**
Difference (Germany - Russia)	**591**	
Solar industry	**Germany**	**Russia**
$\mathbf{A_{SD}}$ = Firm Strategy, Structure & Rivalry × ½ ×Demand Conditions	239	5
$\mathbf{A_{RD}}$ = Related & Supporting Industries × ½ × Demand Conditions	196	10
$\mathbf{A_{FR}}$ = Related & Supporting Industries × ½ × Factor Conditions	123	14
$\mathbf{A_{SF}}$ = Firm Strategy, Structure & Rivalry × ½ × Factor Conditions	150	7
Area surface	**708**	**36**
Difference (Germany - Russia)	**671**	
Wind industry	**Germany**	**Russia**
$\mathbf{A_{SD}}$ = Firm Strategy, Structure & Rivalry × ½ × Demand Conditions	213	21
$\mathbf{A_{RD}}$ = Related & Supporting Industries × ½ × Demand Conditions	184	18
$\mathbf{A_{FR}}$ = Related & Supporting Industries × ½ × Factor Conditions	157	21
$\mathbf{A_{SF}}$ = Firm Strategy, Structure & Rivalry × ½ × Factor Conditions	182	25
Area surface	**736**	**85**
Difference (Germany - Russia)	**665**	

FIGURE 2
Renewable energy diamonds for Germany and Russia



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