Final Report

# Ranking the Competitiveness of Retail Electricity and Gas Markets: A proposed methodology

to

**Agency for the Cooperation of Energy Regulators**

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# Ranking the Competitiveness of Retail Electricity and Gas Markets at the National Level in Member States of the European Union and in Norway

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# Executive Summary

The Agency for the Cooperation of Energy Regulators (ACER) commissioned IPA Advisory (IPA) in May 2015 to conduct a Study regarding "*Ranking the competitiveness of the retail electricity and gas markets at the national level in Member States of the Union and in Norway*".

The scope of work comprised:

- a review of relevant literature;
- the identification and assessment of indicators that ACER can use to evaluate retail market competition in electricity and gas;
- the development of a methodology for using these indicators to rank the competition performance of retail electricity and gas markets in Member States (MS) of the European Union (EU) and Norway; and
- undertaking a Pilot Study of this method for a small number of countries.

The emphasis, as requested by ACER, has been on how to rank the countries through establishing a composite indicator (CI) of competition. In practice, we have also looked at data for *all* countries, as we believe it necessary to assess the indicators and understand how they can be combined into a CI. As part of this we have developed a CI tool, which calculates CIs for retail electricity and gas markets. For the purposes of this project, we have focused on the household sector as data are more readily available than for the retail sector as a whole. However, the proposed method is applicable to either.

### *The role of a composite indicator*

Across the studies of competitiveness in energy we reviewed, numerous different indicators have been used; with most of the studies noting that relying on a single indicator is mistaken, rather a number of indicators should be considered. This reflects the fact that competition is a complex, multi-dimensional and dynamic process.

A CI of competition would combine these multiple dimensions into a single metric, thereby simplifying this otherwise complex process. This simplification gives rise to the perceived benefits of CIs, which include easier interpretation of complex issues and attracting public interest (both through easier interpretation and the ability to compare countries). As a simplification, however, they do not necessarily provide for a deeper understanding of competition and detail can be lost. This can also give rise to misinterpretation, particularly if the results are not presented appropriately. Notwithstanding, CIs are potential complements to, but not replacements of, more detailed analysis of the component indicators and they enable ranking of countries.

### *Method for ranking retail electricity and gas market competitiveness*

We propose a method for the development and dissemination of a CI that comprises three main steps:

- selecting indicators;
- combining indicators; and
- presenting results.

We apply this method to both retail electricity and retail gas markets, focusing on households, as data availability is better in this segment. Notwithstanding the same method could be applied to non-household retail energy markets.

### *Selecting indicators (see Chapter 4)*

The indicators we propose are included in the CIs are shown in Table 1. The choice of these indicators was pragmatic, balancing the availability of potential indicators against the various aspects of competition that are relevant. In practice, some indicators more closely capture the aspects of competition of interest than others. Moreover, whilst data series for indicators were selected, in part, on their availability, data within these series were sometimes incomplete. The method involves identifying these gaps and filling them by either current proxy data or historical data, where available. The relationships between these data are then calculated and considered.

### *Combining indicators (see Chapter 5)*

To combine individual indicators into a composite, choices need to be made as to how data (which are in different units of measurement) are normalised and weighted, before being aggregated. These choices are, ultimately, subjective. We propose that data for each indicator are normalised into a range of zero to 10, depending on the values they take. This largely removes the effect of outliers, allows for some measure of comparative performance between countries, and allows scores to more closely reflect the expected implications for competition. We propose that the weights of individual indicators within the CI are determined using expert judgement, based largely on our views as to the relevance of the indicator to competition. Where there are missing data (to avoid biasing the CI downwards), weights for other indicators for that country are increased. The proposed weights of each indicator are summarised in Table 1.

Table 1: Proposed indicator weighting

| | **Proposed weights** |
|---|---|
| **Structure / Features**, comprising: | **30%** |
| *CR3* | *(10%)* |
| *Number of suppliers* | *(10%)* |
| *Ability to compare price easily* | *(10%)* |
| **Behaviour / Conduct**, comprising: | **30%** |
| *Annual net entry* | *(10%)* |
| *Supplier + tariff switching* | *(7.5%)* |
| *Non-switchers* | *(7.5%)* |
| *Number of offers per supplier* | *(5%)* |
| **Outcomes / performance**, comprising: | **40%** |
| *Price dispersion* | *(13.3%)* |
| *Does the market meet expectations* | *(13.3%)* |
| *Average mark-up* | *(13.3%)* |

Having combined the indicators, the robustness of the results then needs to be assessed. We propose that the method identifies confidence in results, based on the completeness of

the data, as well as the sensitivity of results to the choices on normalisation (by considering the outcomes from alternative approaches) and weighting (through a Monte Carlo analysis[1]).

### *Presenting results (see Chapter 6)*

We propose a number of ways in which the results of the CI can be presented, including an ordinal ranking, cardinal values, and linking it to other data. Regardless of the approach adopted, we believe it important to make the basis of the CI transparent and to present results in a way which minimises the scope for misinterpretation.

The results presented in this Study are the outcome of our proposed methodology and the data utilised. For the definitive results reference is made to the 2014 Market Monitoring Report published by ACER.

### *Using and developing the index*

The method presented in this report, and applied to currently available data, provides a basis for producing CIs for the competitiveness of retail electricity and gas markets. We would expect that this method and the indicators included would evolve in future. For example, better indicators may become available, providing the opportunity to improve the CI. Also, currently available indicators may not be available in future (e.g. some data available last year is not available this year, whilst other indicators we have proposed including are, we understand, only going to be available every other year). As importantly, the continued collection and analysis of data and then application of the method provides the opportunity to learn and potentially improve it; it is an iterative process.

[1] Monte Carlo analysis involves calculating the CIs for each of one thousand sets of randomised weights. The range across these one thousand outcomes indicates the sensitivity to the choice of weights.

# 1. Introduction

The Agency for the Cooperation of Energy Regulators (ACER) commissioned IPA Advisory (IPA) in May 2015 to conduct a Study regarding "*Ranking the competitiveness of the retail electricity and gas markets at the national level in Member States of the Union and in Norway*".

In brief, the scope of work comprises a review of relevant literature, the identification and assessment of indicators that ACER can use to evaluate retail market competition in electricity and gas, and a method for using these indicators to rank the competition performance of retail electricity and gas markets in Member States (MS) of the European Union (EU) and Norway (including a Pilot Study for a small number of countries).

This document is our Final Report and is structured as follows:

- Chapter 2 documents our review of relevant literature;
- Chapter 3 provides an overview of the approach to developing a CI;
- Chapter 4 considers the potential indicators of retail energy market competition;
- Chapter 5 describes the combination of the various indicators into a single CI;
- Chapter 6 considers issues in presenting the results of a CI;
- Annex A is a list of references;
- Annex B details the long-list of indicators;
- Annex C provides further details on the preferred indicators; and
- Annex D graphs the indicator data.

In the remainder of this introductory chapter, we outline the context for the study and the study's objectives.

## 1.1 Context

ACER was established as part of the EU's Third Energy Package (3rd Package).[2] As a requirement of the 3rd Package, ACER produces an annual Market Monitoring Report (MMR) that reports on progress made towards completion of a well-functioning internal energy market (IEM) in the electricity and gas sectors. The MMR, published jointly by ACER and the Council of European Energy Regulators (CEER), covers retail prices, network access, barriers to completion of the IEM, and compliance with consumer rights.[3]

To date, ACER and CEER have published three MMRs, covering the years 2011 to 2013. Chapter 2 of the latest MMR, published in October 2014 and covering the 2013 calendar year, contains an in-depth review of retail energy markets. The chapter analyses price and non-price indicators, and contains analysis of some specific and recurring issues identified as the main barriers to the efficient retail market functioning; such as consumer behaviour, end-user price regulation and barriers to cross-border entry into retail energy markets.

[2] Regulation (EC) No 713/2009 of the European Parliament and of the Council establishing an Agency for the Cooperation of Energy Regulators, 13 July 2009.
[3] The coverage of the report is areas mandated in Article 11 of Regulation (EC) No 713/2009, and also in relation to compliance with consumer rights laid down in Directive 2009/72/EC and Directive 2009/73/EC.

In the latest MMR, ACER extended the scope of the previous analysis of retail markets to include an assessment of the impact of competition levels on retail price formation and, in particular, examines why the energy component of the final consumer price still varies significantly from country to country. The study explores a range of retail markets' structural and competition performance indicators (e.g. market structure and concentration, entry/exit, mark-up, the relationship between wholesale and retail energy prices, price dispersion, consumer switching activity and consumer experiences) and their interrelation. These data are taken from a range of sources including National Regulatory Authorities (NRAs), Eurostat and DG Justice. It is important to note that ACER itself does not have any primary data collection powers, but is reliant on others, and public sources, for data included in the MMR.

In preparation for the 4th edition of the MMR, due for publication in November 2014, ACER is interested in further extending and complementing the scope of its analysis on retail markets, including the development a CI with which to rank individual countries in terms of the relative competitiveness of their retail electricity and gas markets (i.e. developing an 'ACER Index of Competitiveness of Retail Energy Markets'). It is within this context, that ACER commissioned the present study from IPA.

CIs are increasingly used to compare countries' performance against each other and over time. By combining numerous separate indicators, a CI can help summarise and simplify potentially complex and multi-dimensional issues – such as the competitiveness of retail energy markets. However, to be meaningful they must be well constructed and to avoid their misinterpretation, or inappropriate use, they must be communicated effectively.

## 1.2 Objectives and tasks of the study

The purpose of this Study, as stated in the Terms of Reference (ToR), is to enable ACER "*to build and further refine the retail market monitoring methodology it uses in undertaking its monitoring responsibilities*".[4] More specifically, the objectives of the Study (as stated in the ToR) are to:

1. "*identify key quantifiable indicators among those listed … and confirm whether all or only a selection of them will be used to assess competition at national level in the Member States of the Union and in Norway*";
2. "*identify any additional indicators which will be required for the Agency's evaluation of the performance of each Member State of the Union and Norway in terms of retail market competition and assess their relevance*"; and
3. "*provide a rationale and the methodology for ranking the competition performance of retail electricity and gas markets in the Member States of the Union and in Norway based on the selected indicators.*"

The required tasks defined by ACER in the ToR are as follows:[5]

a) "*Review the most relevant existing publications for quantifying the competitiveness of a market and indicators used to assess the level of competition*";

[4] Pg 4, ACER '*Terms of Reference for Study Ranking the Competitiveness of the Retail Electricity and Gas Markets at National Level in the Member States of the Union and in Norway*'.
[5] Pg 5, *ibid*.

b) "*Propose the most relevant and quantifiable indicators as a part of the methodology*"; and

c) "*Propose the relevant methodology for the detailed data analysis and ranking of the competitiveness of the national retail electricity and gas markets at the national level in the Member States of the Union and in Norway*".

In conducting the study, we benefited from conversations with ACER and representatives of the NRAs through two teleconferences (with ACER and some NRAs) to discuss the indicators and a Workshop (with ACER and a wider group of NRAs) which focused on the methodology for a CI.

The results presented in this Study are the outcome of our proposed methodology and the data utilised. For the definitive results reference is made to the 2014 Market Monitoring Report published by ACER.

# 2. Literature Review

This chapter outlines the findings of our literature review, the purpose of which is to inform the identification and evaluation of relevant indicators of competition in retail electricity and gas markets, as well as to inform the development of the methodology for creating a composite index of competitiveness.

This project concerns retail electricity and gas markets in MS of the EU and Norway and this is the focus of our literature review, however we have also reviewed literature regarding other regulated sectors and countries outside of the EU. The literature reviewed is listed in Annex A, whilst Annex B lists the various indicators that were used in the studies and literature reviewed.

The focus of our review was on methodology and approaches. In particular, in reviewing the literature, we sought to identify:

- approaches to quantifying and benchmarking competitiveness;
- the individual indicators and metrics used in quantifying competitiveness;
- criteria used in the assessment of individual indicators and metrics; and
- best practice for the development of CIs.

## 2.1 Quantifying competition and indicators used to assess competition

### 2.1.1. Energy sector

#### *ACER/CEER – 'Annual Report on the Results of Monitoring the Internal Electricity and Natural Gas Markets in 2013' (2014)*[6]

A key document for indicators on energy markets is the 3rd Edition of ACER and CEER's MMR. Whilst ACER does not have primary data collection powers, in the MMR it consolidates a range of data and information from across EU countries. The MMR is published annually and three editions have been published to date with the latest version, therefore, benefiting from prior experience. It covers four main areas: retail electricity and gas markets; wholesale electricity markets and network access; wholesale gas markets and network access; and consumer protection and empowerment. Of particular relevance to this study is the retail section (Section 2) – where any future CI would most likely be reported.

In addition to presenting a range of price information (e.g. prices for households and industrial, breakdown of household prices in capital cities (into energy, network, taxes, etc.), price structure, etc.) ACER reports on the level of competition in retail electricity and gas markets, with separate sub-sections for market structure, competition performance and consumer behaviour. This is essentially a structure, conduct and performance framework.

In broad terms, the MMR shows that European countries still have widely different retail regulatory frameworks, in particular with regard to price regulation and consumer protection, which, along with the time since liberalisation, in turn translate into different levels of market competition.

[6] This document is also referred to as the '3rd Edition Market Monitoring Report (or the 'MMR').

The main indicators presented in the retail section of the MMR are set out in Table 2, including the section of the report in which they are presented.[7] ACER's reasoning behind the selection of indicators is as follows: "*the higher the number of competing suppliers in a market (assessed from concentration and market entry indicators), the smaller retail margins should be (mark-up indicators). In the presence of competitive and liquid wholesale markets and assuming no barriers to entering markets - retail prices are expected to have a closer relationship with wholesale market prices (assessed through the evolution of wholesale and retail price indicators). Price dispersion levels may provide a measure of the level of price competition among suppliers and on the maturity of the market. Additionally, switching rate indicators will serve to indicate which competitive phase a market is in and how consumers respond to competition.*"[8]

Table 2: Retail Competition Indicators in the MMR (3rd Edition)

| Section of MMR | Indicator(s) | Elec.(*) | Gas(*) |
|---|---|---|---|
| Retail prices (section 2.2.2) | Post-tax Total Prices (POTP) and Pre-tax Total Prices (PTP) of electricity and gas for households and industry | Y | Y |
| | Compound Annual Growth Rate (CAGR) in POTP of electricity and gas for households and industry, including separately for the energy and non-contestable components (for electricity only) | Y | Y |
| | Breakdown of incumbent electricity and gas POTP offers in capital cities (by energy, network, tax and renewable charge (electricity only)) | Y | Y |
| | Household and industrial electricity prices by consumption band | Y | N |
| Offers available (section 2.2.3) | Number of electricity, gas and dual-fuel offers available to households in capital cities | Y | Y |
| | 'Type of energy pricing', i.e. the proportion of offers for which the energy component is (in electricity: fixed; variable; spot-based; or regulated – in gas: fixed; variable; or regulated) | Y | Y |
| Market structure (section 2.3.1) | Herfindahl-Hirschman Index (HHI) of electricity and gas markets at the national level.[9] | Y | Y |
| | Market shares of the four largest suppliers in the electricity and gas retail markets (CR4) | Y | Y |
| | Number of nationwide household suppliers of electricity and gas. | Y | Y |
| | 5 year average annual entry/exit activity in the household electricity and gas retail markets. | Y | Y |
| | European market share of major electricity suppliers and gas suppliers | Y | Y |
| | Market shares of cross-border electricity supplier entrants in Europe | Y | N |

[7] Note: the same data may be used for more than one indicator. For example, the price CAGRs are calculated using price data.
[8] Pg 48, ACER/CEER (2014).
[9] We note that various data (including HHI, CR4, and market consolidation on a European level, and market shares of cross border electricity supplier entrants) were provided by Datamonitor and available for 2012 and/or 2013. However, we understand that, for future reports, these data will not be available.

| Table 2: Retail Competition Indicators in the MMR (3rd Edition) | | | |
|---|---|---|---|
| **Section of MMR** | **Indicator(s)** | **Elec.(*)** | **Gas(*)** |
| Competition performance (section 2.3.2) | Average annual electricity mark-ups for electricity (2008-2013) and gas (2012-2013) | Y | Y |
| | Relationship between wholesale electricity prices and the energy component of retail prices | Y | N |
| | Dispersion in energy component of retail electricity and gas prices of households in capital cities | Y | Y |
| Consumer behaviour (section 2.3.3) | Switching rates for electricity and gas household consumers | Y | Y |
| | Proportion of consumers who have switched from the incumbent gas and electricity supplier. | Y | Y |
| | Rating of consumer experience of the electricity and gas markets (relating to expectations, choice, comparability, and ease of switching) | Y | Y |
| End-user price regulation (section 2.4.2) | Are household end-user prices regulated? | Y | Y |

### *ERGEG – 'Guidance of Good Practice for Retail Market Monitoring for Electricity and Gas' (2010)*

The forerunner to ACER, was the European Regulators Group for Electricity & Gas (ERGEG), a formal advisory group to the European Commission and created by the Commission in 2003. Following a public consultation in 2010, ERGEG put forward 18 indicators, covering four areas, which it suggested the National Regulatory Authorities use to monitor the level and effectiveness of energy retail market opening and competition.

ERGEG (2010) explains that the indicators were intended to encompass the activities of all industry stakeholders, including customers, suppliers and distribution companies. ERGEG views the combined action of these stakeholders constitutes the market activity which produces the outcomes which either enhance or diminish overall welfare. Individually, ERGEG believes the indicators are insufficient to give a reliable picture of the functioning of the market. Together, and provided they are interpreted in light of their context, ERGEG believes they will offer valuable insights when monitoring the energy markets. This framework and indicators are summarised in Figure 1.

ERGEG describes the energy market as consisting of three building blocks: the market's structure, its retail market outcomes and customer satisfaction. ERGEG also recognises that customers' interaction with the market extends beyond the competitive market and therefore suggests monitoring Distribution System Operator (DSO) services as a means of fully capturing the customer's experience.

ERGEG describes the customer's experience as both a key market output and an indicator of the health of the market overall. Since it is the customer's engagement with the market that drives the benefits of competition, ERGEG encourages the observation of indicators which help build a comprehensive picture of customer satisfaction. It suggests that information on customer complaints, customer enquiries and customer information would together build a picture of the level of satisfaction of energy customers. It also recommends that data for these indicators is collected at least annually from DSOs and/or suppliers and/or third party bodies, depending on which sources are considered most suitable.

The retail market outcome indicators are intended to capture what ERGEG describes as the key elements of the customer's experience – i.e. the prices and choices that the market produces. They include: end-user price for typical household customer, price spread on comparable products for typical household customer, number of available contracts to typical household customer, and the percentage of eligible customers served under regulated end-user prices. ERGEG recommend that these indicators are calculated based on a 'typical' customer, as defined nationally under the 3rd Package[10]. We also note that during the consultation stage, ERGEG proposed inclusion of a retail margin indicator. In their final guidelines, this was removed from the list, whilst acknowledging that it could be a useful extension to the 18 indicators it put forward.

The market structure indicators are concerned with how the market is put together – e.g. how many suppliers are operating, and the market power of each supplier. These include 'classic' measures of market concentration, namely the Concentration Ratio and the Herfindahl-Hirschman Index (HHI), which ERGEG recommend are calculated annually.

The market condition and DSO services indicators are concerned with how well mechanisms are functioning – e.g. whether or not customers are switching and issues, such as repairs/connections, are being quickly addressed.

Figure 1: ERGEG Indicators (and Categorisation) of Retail Market Monitoring

| Customer satisfaction | Retail Market Outcomes | Market Structure | Market Condition and DSO services |
|---|---|---|---|
| • Customer complaints<br>• Customer enquiries<br>• Customer information (reliable price comparison website available) | • End user prices for typical household customer<br>• Price spread on comparable products<br>• Diversity of contract offers<br>• Regulated end-user prices | • Number of active suppliers<br>• Market concentration (shares by number of customers and / or consumption)<br>• Branding (% of customers served by a DSO that has separate branding from the supply branch of its vertically integrated undertaking) | • Switching rates<br>• Renegotiations<br>• Delays in switching process<br>• Failure to fulfil the switch<br>• Connections<br>• Repairs<br>• Disconnection rates<br>• Maintenance services. |

### 2.1.2. Multi-country studies of energy market competition

#### *London Economics – 'Energy Retail Markets Comparability Study - A Report for DECC' (2012)*

London Economics, in a report commissioned by the UK's Department of Energy and Climate Change (DECC), assess the trends and position of the UK electricity and gas retail markets relative to comparable jurisdictions in terms of prices, competition and profitability. The report analyses each of these three areas, using comparators from two main comparator groups: the EU-15 and selected OECD jurisdictions (including the United States and New Zealand).

[10] This could be based on the most typical contract and/or by consumption level. The monitored price should reflect the most common national offer, or an average of offers available if this is considered nationally more appropriate.

The competition component of the analysis includes a number of indicators of competition including market share of the largest suppliers and the HHI. Market shares are measured primarily based on the C3 measure (combined market share of 3 largest suppliers), on the basis that it is considered more informative than C1 (market share of largest supplier) while having better data availability than C5. The study also uses data on the total number of suppliers and main suppliers, and information from an EC survey that focuses on consumer perspectives.

In discussing how to measure competition, the report points out that the indicators don't necessarily provide a full picture of competitive intensity. It notes that the market structure and outcome variables are not a direct measure of the intensity of supplier competition, and highlights the fact that the market concentration data it uses was mostly at the national level. Low concentration at a national level can mask high concentration at a regional or local level.

The study also included competition variables in a number of panel regressions on price, but in general, found only a weak downward and sometimes ambiguous impact. For gas prices, some regressions suggested that greater concentration (C3 measure) had a small, but statistically significant (at the 10% level) upward effect. The study concluded that data problems could underlie the weak evidence, with more work required to meaningfully compare competition data.

### *VaasaETT – 'World Energy Retail Market Rankings 2012', Utility Customer Switching Research Project (2012)*

VaasaETT provides a ranking of world energy retail markets. The sole metric on which the ranking is based are customer switching rates. The advantage of this metric is described as being highly objective, measurable and comparable between markets. The customer switching rate metric is calculated by dividing the number of customers who switched suppliers in a given period by the total number of customers in the market, and the result is then converted to an annual rate[11]. The study covers 38 countries.

VaasaETT defines the most competitive markets as those in which "*activity is (in the current year) over 20% and has been consistently around 20% for at least three years. These are markets where high levels of switching and competition are an inevitable reality of the market, where at least half of all customers have switched supplier. These are the truly competitive markets where customers come first (or on a level par with other key business objectives) and complacency leads to major losses of customers*". They also note that "*prices will not necessarily be lower than in less active markets, nor may retailer image be higher, but a high emphasis is placed on the development of long-term lifestyle and added value services. Energy efficiency, smart home, demand response and other offerings are expected to flourish in such markets, depending on regulatory and other market structure conditions"*.

### *NordREG (Nordic Regulators) – 'Nordic Market Report 2010' (2010)*

NordREG, an organisation established in 2006 to improve cooperation between the energy regulators of the Nordic region (i.e. Denmark, Finland, Norway and Sweden), has been working to achieve a harmonised Nordic retail energy market.

[11] For example, if 1% of customers switch suppliers in a given month, that month would have a 12% annualised customer switch rate.

In their 2010 Nordic Market Report, NordREG developed a set of retail market indicators with which to quantitatively measure the development of competition in the electricity markets in the Nordic area. NordREG explains that the indicators were selected on the criteria that they should be based on "hard reliable data", which is available immediately, and which is comparable across all Nordic countries.

The four indicators are: (1) number of suppliers; (2) supplier switching rate; (3) price differences in the retail market (price spread); and (4) concentration in wholesale markets (HHI). All indicators are shown with a score between 1 and 5, where 1 indicates low competition and 5 indicates a highly competitive market. The score is attributed against a set of defined criteria, e.g. a switching rate of greater than 12% equates to a score of 5, between 9% and 12% the score is 4.

NordREG makes a number of observations in relation to these indicators:

- *Number of suppliers*. A large number of suppliers in a country does not necessarily imply competitiveness, especially if there are lots of local monopolies. NordREG only includes suppliers who cover the whole of their country. NordREG also notes the difficulty in defining the thresholds for the scoring criteria for this indicator as the "optimal number" needed for competition is hard to define (i.e. one could be sufficient if there are no entry barriers and switching is costless);
- *Switching rates.* These should be considered in relation to the price spread and the benefits available from switching, i.e. the less benefit to a consumer from switching, the less likely they are to switch;
- *Price differences (spread)*. NordREG notes that for homogeneous products, a low price spread is an indication of a competitive market. The price spread used "*will be calculated as the ratio between the lowest and highest price at the retail market, offered for the most commonly used product in each country*"[12]; and
- *Market concentration*. The HHI is used, with the assumption that the more concentrated a market, the less likely it is to be well functioning. NordREG also comments: "*The index however is not a very good indicator of the competitive character of a market since it merely points out the structural dominance of the market*".[13]

### *Defeuilley, Christophe – 'Retail Competition in Electricity Markets', Arsen Working Paper No. 5. (2008)*

Defeuilley (2008) argues that because the theoretical concepts underpinning the introduction of competition into retail energy markets draws heavily on the Austrian School of Economics, neither consumers' decision processes nor the sector's technical characteristics were adequately accounted for, leading to the effects of competition being overestimated. The paper also highlights importance of understanding the percentage of customers who are active on the market, i.e. who exercise their freedom of choice. This is made up of several groups of consumers: those who have changed supplier (expressing a switching rate), those who renegotiated their contract with the incumbent (but without switching), and those who made enquiries and compared the different suppliers, but then stayed with the same supplier. Unfortunately, as other studies have shown[14], a part of these active consumers fall into categories that are partially or totally non-observable. Essentially, those are the ones who do not end up switching supplier. It is therefore difficult to obtain a precise estimate of the percentage of active clients on electricity retail markets.

[12] Nordic Market Report 2010, NordREG, pg.48.
[13] *Ibid*, pg.49.
[14] Loomis D., Malm E., (1999).

### *OXERA Studies (Various)*

Oxera has carried out a number of assessments of EU and G7 energy market competitiveness since being commissioned in 2003 to devise a market competitiveness ranking methodology by the UK's Department of Trade and Industry (DTI)[15]. Oxera (2007) sets out an adapted version of this methodology and applies it to determine whether the UK will achieve its target of being among the top three most competitive energy markets in the G7. The starting point of this Oxera study is an 'initial filtering' in which all countries with markets that do not display a few crucial and defined characteristics (i.e. unbundling of transmission, supply market opening) are removed. Without these characteristics, these markets are not considered to be competitive.

The detailed methodology is then only applied to a handful of countries. The methodology uses indicators of the four main segments of the supply chain: upstream markets, wholesale markets, network activities and retail supply. The set of indicators refers to aspects such as basic market structures (for example through assessment of market share data), the nature of commodity trading (through the existence of standardised contracts and credible price reporting) and the degree of non-discrimination (captured in network activities by the existence of regulated third-party access (rTPA)). These indicators are converted into standardised scores and weighted in order to derive the overall score. The end result is a competitiveness score (between 0 and 10) for each of the countries.

In the downstream electricity retail supply market, Oxera collected data on market concentration (scoring: 20-30%=10; 30-40%=8; 40-50%=6; 50-60%=4; 60-70%=2; >70%=0) and annual gross switching rates (scoring: >5%=10; 0%=0; linear in between) to which they attach weights of 70% and 30% respectively[16]. The basis for the weighting is not explicit, it is noted that while high switching rates are necessarily reflective of competition, low switching rates may reflect either a competitive or uncompetitive market.

To compute an overall country energy market competitiveness score, Oxera weigh the contribution to competitiveness from the gas and electricity markets based on their relative sizes in that country, as measured by final demand for that product in Million Tons of Oil Equivalent (MTOE) in each year. The weight is calculated as the percentage of gas or electricity demand to total energy demand. Under this approach, electricity market competitiveness scores will be more relevant in determining the overall energy market scores for countries that have low gas market weighting, and vice versa. Oxera (2007) reviews this aggregation method and discusses a number of alternative weighting methodologies that could be used for future papers. One of these is the 'rebased cardinal approach', a two-step procedure in which the electricity and gas scores of the most competitive countries is changed to a maximum of 10 and others' scores are changed proportionally, with scores then weighted according to relative market size.

### Forfás – *'Electricity Benchmarking Analysis' (2006)*

As Ireland prepared to implement the Single Electricity Market (SEM) in 2007, Forfás[17] (2006) developed a series of indicators to evaluate Ireland's comparative electricity performance in terms of price, security of supply, service access and quality, and the

[15] See: Oxera (2003) and Oxera (2007).
[16] These are cardinal variables. For binary variables, e.g. does a certain characteristic exist in the market, Yes=10 and No=0.
[17] Forfás, now dissolved, was the national policy advisory board for enterprise, trade, science, technology and innovation in the Republic of Ireland.

competitive landscape. As part of the study, Pöyry developed a CI which scored a range of countries (from 1 to 10) in terms of electricity price, security of supply, service access and quality and then combined the results using equal weightings.

To quantify the competitive landscape, the study looked at concentration in retail and wholesale markets, market opening, switching rates, and the percentage of foreign ownership, combining these into a rating from 0 to 10. The competitive landscape indicator was evaluated separately from the CI but no explanation for this is given in the report. The study finds that there is no obvious correlation between performance on the CI and the competitive landscape indicator in half of the benchmark countries. In the other half, performance on the CI and the competitive landscape indicator are closely aligned - Denmark, Finland, New Zealand, the UK and the US score well (6 or above) for both indicators, while Ireland and Singapore score poorly on both.

### 2.1.3. Country-Specific Studies of Energy Market Competition

#### *Australian Energy Market Commission – '2014 Retail Competition Review' (2014)*

In 2014, the Australian Energy Market Commission (AEMC), which is responsible for monitoring the state of competition in electricity and natural gas retail markets, assessed the state of retail energy competition in all national electricity market (NEM) jurisdictions as part of a single, annual competition review.

In its report, the AEMC states its belief that "*effective competition requires effective participation of customers and retailers*" and therefore focus their assessment on "*whether customers are aware, informed and engaged, and whether retailers are competing to provide the products customers want.*"

The paper examines a number of different indicators that consider:

- customer switching behaviour;
- ability of suppliers to enter the market;
- independent rivalry within the market;
- differentiated products and services;
- price and profit margins; and
- the exercise of choice by customers.

Although the report doesn't try to combine the individual indicators into a single number, it does point out that, while each of the indicators provides a useful check on the state of the market, an adverse finding for a single indicator is not necessarily indicative of a systemic problem with the way in which the market functions. As AEMC explain "*in a well-functioning market we would expect retail margins to fluctuate. Similarly, we would expect to see periods of retailer entry followed by consolidation, and for consumer satisfaction to change as retailers search for ways to improve their services.*"[18] Accordingly, these indicators should be looked at in combination when considering the state of competition.

#### *BNetzA (Bundesnetzagentur) (Germany) (2012) – 'Energy Monitoring Report.'*

Bundesnetzagentur in its monitoring report on electricity and gas performance in Germany discusses the relevance of switching rates, number of suppliers, and wholesale market liquidity as vital and necessary components of competition. However, it highlights how the

[18] AEMC (2014), pg. 11.

volatile renewable energy sector and its non-market mechanisms lead to crowding out and distorting effects on the otherwise competitively organised conventional generation sector. These effects are seen as a threat to competition in the energy market.

The report also highlights that security of supply and competition are not entirely inconsistent with one another, and rather that competitive framework conditions in fact are an efficient means of securing efficient, reliable, and cost saving supply. It concludes however that any success in market development under competitive conditions is by no means permanently assured.

### *Office of Gas and Electricity Markets (OFGEM) (Great Britain) (2013, 2014)*

In Great Britain, there have been numerous initiatives relating to competition in energy markets. For the purposes of this review, we have looked at two main sources: (1) the framework set out by Ofgem for assessing the state of competition in energy markets published in 2013; and (2) publications from the investigation into the state of competition in the energy market by the Competition and Markets Authority (CMA).

In Ofgem (2013), Ofgem, working with the UK's competition authorities, sets out how they proposed to assess the state of competition in the energy markets in Great Britain. This followed their Energy Supply Probe, launched in 2008, and subsequent Retail Market Review.

Ofgem's report focuses on a framework to assess how well competition is serving the interests of households and small firms. The focus is more on the domestic than small business sector, as Ofgem's previous work suggested that there were fewer competition problems in the small business sector. Ofgem's framework includes a description of a well-functioning energy market. The framework, summarised below, in Figure 2, considers characteristics of the market over the shorter term (near-term allocative benefits of competition) and longer term (dynamic benefits of competition), recognising that competition is a dynamic process. Ofgem stresses that the indicators should not be assessed individually. Whilst the focus is on retail supply, Ofgem also recognises that there may be certain features of the wholesale market, or in the interaction between wholesale and retail markets, that also affect consumers.

In its subsequent assessment of the market (Ofgem (2014)), applying the framework that had been developed, structured the assessment into four main areas: (1) consumer engagement and response; (2) unilateral market power / tacit coordination; (3) barriers to entry and expansion, and vertical integration; and (4) profitability. Following this assessment, Ofgem referred the energy market to the CMA, who are currently conducting an investigation into competition in the energy market.[19]

[19] Ofgem made the reference in June 2014. CMA published provisional findings and possible remedies in July 2015, with final findings due by December 2015.

Figure 2: Ofgem Indicators of a Well-Functioning Energy Market

Shorter term

| Market Outcome | Indicator |
|---|---|
| High engagement | Switching levels (internal or external), consumer research metrics, switching drivers, switching elasticities |
| Good service | Customer complaints information, consumer research metrics, number of consumers in debt, number of disconnections, debt repayment rates |
| Clear communications (e.g. bills, letters) | Consumer research metrics |
| Pressure on supplier costs | Cost efficiency, observable pricing strategies |
| Pressure on margins | Profitability (per customer), margins (including for different retail segments |

Longer term

| Market Outcome | Indicator |
|---|---|
| Wide choice of retailer, demonstrable ability to grow from new entry | New entrants at each level of the supply chain, size and growth of recent entrants, entry costs, barriers to entry |
| Tariffs responsive to consumer needs | Innovative tariffs |
| Sustained, significant, dynamic rivalry | Changing shares in different market segments (regional, payment type, fuel, tariff type, e.g. online), concentration ratios, new and different consumer acquisition strategies / corporate strategies, market entry, market exit / merger activity |
| New commercial / business models | New entrants or existing suppliers responding to changing market opportunities, new ways of consumers engaging with energy, offering linked to other services |
| High quality of service and consumer trust | Complaints information, supply interruptions, consumer research metrics, switching experience (time & reliability vs industry standards) |

### *Competition and Markets Authority (Great Britain) (2015)*

As part of the energy market investigation the CMA has identified various "theories of harm".[20] Of particular relevance to retail markets are the theories of harm relating to whether low wholesale liquidity distorts retail competition, whether vertically integrated companies can foreclose the market to retailers, and whether energy suppliers have strong incentives to compete. Regarding the first two, CMA's initial view is that they are not a problem in the Great Britain market. In forming this initial view, CMA sought views from suppliers and generators, as well as analysing various data on market liquidity, including volume of trades of individual and aggregated products across time periods, churn (ratio of volume traded to volume consumed), bid-ask spreads, and depth (i.e. availably and spreads at different depths).

Regarding the potentially weak incentives for retail competition, a number of potential issues were identified, including weak customer responses, incumbency advantage, supplier behaviour and regulatory interventions[21]. Some 13 of the CMA's 23 Working Papers inform this part of the investigation; these include analysis of profitability (and also indirect costs per customer), the pricing strategies of the large suppliers and the scope for tacit price coordination through price announcements. CMA has noted that the large suppliers'

[20] CMA (2015).
[21] CMA has published some 23 working papers, between late 2014 and early 2015, as part of the investigation. For a full list of papers, see: https://www.gov.uk/cma-cases/energy-market-investigation

standard tariffs are consistently higher than non-standard (generally fixed-price) tariffs and that changes in tariffs have recently not closely tracked direct costs (e.g. wholesale, network and policy costs), indicating a weakening of competition. CMA's initial view is that there are a significant number of domestic energy customers who are relatively inactive. This view was formed from the potential gain from switching that exist, but which go unrealised. CMA has also looked at barriers to switching, the use of price comparison websites, and the potential for smart metering to improve customer engagement. CMA's final report and findings are expected in November/December 2015.

### 2.1.4. Other sectors

#### *Telecommunications*

In the telecoms market, Ofcom recently announced the first major review of the UK communications market in a decade. The last such review[22] took place between 2003 and 2005 and resulted in new legislation allowing rival providers to access BT's network infrastructure through Openreach. In that review, Ofcom concluded that competition was the most effective way for the industry to deliver the low prices, choice, and rapid innovation that consumers want, but that it could not be effective unless customers are able to make well-informed choices and to switch easily between suppliers.

To measure the level of competition in various markets, Ofcom evaluated 'outcomes' for both businesses and consumers, including: retail prices, service quality (for example fault rates and repair times), choice of services, awareness of the level of choice, measures of innovation, customer satisfaction and instances of particular practices that lead to consumer dissatisfaction (e.g. slamming, mis-selling and silent calls).

At the time of the review, Ofcom had already withdrawn all regulation from one wholesale fixed narrowband market, on the basis that BT's market share had trended down to around 40%, meaning it no longer had Significant Market Power (SMP) in that market. However, BT was still seen as having SMP in other markets. As part of the review, BT offered to make a number of changes to achieve equality of access in fixed telecoms and avoid a referral to the Competition Commission. To monitor implementation of these changes and their effect, Ofcom devised a set of metrics that broadly fell into four groups. The first two categories of indicators measured whether the undertakings were being complied with (to the 'letter' of the undertakings and to the 'spirit'). Intermediate industry outcomes included indicators that measured the rate at which competition was developing in particular markets. Finally, consumer outcomes measured the things that actually make a difference to businesses and consumers: for example, what choice do they have, what price do they pay, how rapidly do new services become available?

[22] See OFCOM (2005).

Figure 3: Types of Indicators


***Boyer, Marcel – 'The Measure and Regulation of Competition in Telecommunications Markets', CIRANO Scientific Series (2005)***

Boyer (2005) discusses competition in the telecommunications industry in terms of how it can best be measured and regulated. He argues that traditional measures of competition based on market shares is inadequate because the fast growing and technology driven nature of the industry means it has more of the characteristics of an emerging industry than of a mature industry. He suggests instead that competition in the local wireline industry should be evaluated from a 'process' point of view, where the emphasis is on ensuring open access to the existing network facility at properly-defined competitive access pricing. Emphasis is also placed on conditions, rather than on the number of firms demanding access, or the market shares of those firms (as compared with the incumbents' market share).

## 2.2 Composite indicators

There exist a large number of CIs and their number has been growing.[23] By combining numerous, separate indicators, a well-constructed and communicated CI can help summarise and simplify potentially complex and multi-dimensional issues. These indicators can be used to compare performance across countries (i.e. by ranking) and also the performance of a country over time.

Existing CIs cover a wide range of topics, including competitiveness, corruption, poverty, innovation, human development, etc. However, they need to be both well-constructed and well communicated if they are not to be misleading and / or lead to simplistic (and potentially misguided) policy conclusions.

The Composite Indicators Research Group (COIN) of the European Commission's Joint Research Group (JRC) summarises CIs as follows: "*All things considered, composite indicators should be identified for what they are -- simplistic presentations and comparisons of performance in given areas to be used as starting points for further analysis.*"[24]

In the following, we review CIs relating to competitiveness and also identify sources of best practice in the development of CIs.

[23] Paruolo, Saisana and Saltelli (2012) refer to a five-fold increase in public interest in CIs from 2005 to 2010 – referencing the increase in the number of matches to a search for CIs in 2005 compared to 2010.
[24] https://composite-indicators.jrc.ec.europa.eu/?q=content/use-or-not-composite-indicators.

### 2.2.1. Indicators of competitiveness

#### *Energy related*

A relatively early CI, the Internal Market Index, was published by the European Commission in 2001. This index, revised in the following year, sought to measure the effects of the Internal Market policies on individual Member States. It comprised twelve indicators, including electricity prices and gas prices to households and industry which were proxies for market opening in those sectors.

Above we already noted some reports that calculated some forms of CI in the energy sector, e.g. Oxera (2007) and Forfas (2006). Another is the "Index of Liberalisations", from Istituto Bruno Leoni (2014), which ranks the degree of market openness of ten sectors of the fifteen Member States of the European Union, including natural gas markets and electricity markets.

The report considers several qualitative and quantitative indicators of market openness, such as the unbundling regulations for networks, market concentration indices, switching rates, the existence of retail price regulation, the extent of public participation in the ownership of the main market operators, and the adoption of capacity support schemes. The report states significant differences occur across switching rates and retail price regulation. Details on the methodology for construction of the index are relatively limited in the freely available public domain version.

#### *Other sectors*

A number of organisations publish national competitiveness indicators that are often used as benchmarks for national policy makers and interested parties to judge the relative success of their country in achieving various competitiveness milestones. One example is the World Economic Forum's (WEF's) Global Competitiveness Index, which seeks to measure the microeconomic and macroeconomic foundations of national competitiveness.

A common issue with these indicators, as with other types of CI, is the question of how to select the weights to be applied to the component indicators. This issue of aggregation is the focus of Bowen & Moesen (2009) which points out that the most popular aggregation procedure is to assign equal weights to each sub-indicator, reflecting a judgment that they are equally as important within the evaluation process. Alternatively, when the individual indicators clearly do not share the same relative importance, they can be given unequal weighting based on expert judgement or statistical methods.

The GCI measures country performance across nine indicators. Although all nine indicators matter to a certain extent for all countries, the relative importance of each one depends on a country's particular stage of development. To implement this concept, the indicators are organized into three sub-indicators (i.e. basic requirements, efficiency enhancers and innovation and sophistication factors), each critical to a particular stage of development. The basic requirements sub-index groups are those indicators most critical for countries in the factor-driven stage. The efficiency enhancers sub-index includes those indicators critical for countries in the efficiency-driven stage. Finally, the innovation and sophistication factors sub-index includes the indicators critical to countries in the innovation-driven stage. To obtain the weights, the GCI uses a maximum likelihood regression of gross domestic product (GDP) per capita run against each sub-index for previous years, allowing for

different coefficients for each stage of development. The rounding of these econometric estimates led to the choice of weights.

To a large extent, Dijkstra et. al. (2011) adopts and builds upon the methodology developed by the WEF for the GCI to create their Regional Competitiveness Index (RCI). The RCI is a CI made up of 11 indicators of territorial competitiveness covering the 27 EU Member States. The RCI takes into account the level of development of the region by emphasizing basic issues in less developed regions and emphasizing innovative capacity in more developed regions. Values of the weights for the different stages of development are based on the GCI approach, with some modifications to accommodate the specific economic performance of EU regions[25].

Construction of the RCI largely follows the best practice set out in by the OECD Handbook (2008). Firstly, univariate analysis is carried out separately for each indicator. The authors set a missing data inclusion limit of about 10-15% and use a Box-Cox transformation to adjust for outliers. They then use Principal Component Analysis (PCA) as a simple method of multivariate analysis to verify data consistency within each group. The score for each RCI category is computed as a simple arithmetic average of the transformed and normalised indicators that were deemed appropriate by the PCA. The second step involved computing the scores for the three categories - basic, efficiency and innovation - as arithmetic means of the individual category scores. The arithmetic mean was used for the sake of simplicity. The last step is to calculate the RCI score as the weighted average of the three sub-scores.

While they recognise that the GCI indicates "*the desire to adjust both the values and the pattern of weights to recognize differences among countries"*, Bowen & Moesen (2009) suggests that this weighting methodology does not go far enough. They develop an 'endogenous' weighting procedure that takes the recognition that countries may differ in both capabilities and policy priorities a step further by allowing the assignment of weight values to vary country by country[26]. Their aggregation methodology selects the most favourable weights for each country, where the most favourable weights are those that give the highest value of a country'sCI. Using a type of benefit-of-the-doubt (BOD) approach based on the work of Melyn & Moesen (1991), Bowen & Moesen interpret good relative performance in a particular category as "revealing" that a country sets a higher priority on that category.

### 2.2.2. Guidance and best practice

In 2008, the OECD published the Handbook on Constructing Composite Indicators. Jointly prepared by the OECD and the European Commission's Joint Research Centre (JRC), it provides a comprehensive guide to the construction and use of CIs, including a "toolbox" for those constructing the indicators.

In brief, the Handbook identified ten steps for constructing a CI. Subsequent to this publication, the Composite Index Research Group (COIN) of the JRC, added an additional "intermediate step", as well as slightly changing the order of the steps. The steps proposed by COIN are summarised in the below:

[25] For all three development stages, the same weight (50%) is assigned to the efficiency group. The importance of the basic group decreases as GDP per head goes up (40% for medium, 30% for intermediate and 20% for high). The innovation group progressively gains in importance as development goes up (10% for medium, 20% for intermediate and 30% for high).
[26] Bowen & Moesen describe their methodology as being inspired by data envelopment analysis (DEA) as developed by Charnes, Cooper and Rhodes (1978).

- *Step 1. Theoretical/Conceptual framework* – Develop a clear understanding and definition of the what you are trying to measure, identify any nested structure of the various sub-groups, and list of selection criteria for the underlying variables, e.g., input, output, process.
- *Step 2. Data selection* – Select a range of relevant indicators accounting for their analytical soundness, measurability, country coverage, and relationship to each other. Discuss strengths and weaknesses of each selected indicator.
- *Step 3. Data treatment* – Statistically treat the data to adjust for missing values and outliers and make any necessary scale adjustments e.g. taking logarithms of some indicators. *(Back to Step 2)*
- *Step 4. Multivariate analysis* – Assess the statistical and conceptual coherence of the structure of the dataset (e.g. by principal component analysis and correlation analysis) to guide subsequent methodological choices (e.g. weighting, aggregation). *(Back to Step 1 and Step 2)*
- *Step 5. Normalisation* – Select a suitable normalisation method (e.g., min-max, z-scores, and distance to best performer) to make the variables comparable.
- *Step 6. Weighting and aggregation* – Select a suitable weighting and aggregation method that respect the conceptual framework and the data properties. Popular weighting methods include equal weights, factor analysis derived weights, expert opinion, and data envelopment analysis. Popular aggregation methods include arithmetic average, geometric average, Borda, Copeland. Discuss whether correlation among indicators should be taken into account during the assignment of weights.
- *Internal coherence assessment (intermediate step)* **–** Conduct a brief sense check to further refine the CI structure. Determine whether the results are overly dominated by a small number of indicators and quantify the relative importance of the underlying components (e.g., by global sensitivity analysis, correlation ratios). Remove non-influential indicators to improve clarity. (Back to Step 1 and Step 2)
- *Step 7. Uncertainty and sensitivity analysis* – Assess the robustness of the CI scores/ranks to the underlying assumptions to identify which assumptions are more crucial in determining the final classification. Explain why certain countries notably improve or deteriorate their relative position given the assumptions.
- *Step 8. Relations to other indicators* – *Sense check* the results of your CI by testing whether it is correlated with other existing (simple or composite) indicators. Try to explain similarities or differences and develop a data-driven narrative on the results.
- *Step 9. Decomposition into the underlying indicators* – Break down the indicator into its component parts to reveal drivers for good/bad performance.
- *Step 10. Visualisation of the results* – Present the indicator in a manner that maximises its interpretability for the target audience.

Notwithstanding the above, it should be recognised that there remains elements of judgement to be applied in constructing an indicator, not least in relation to the indicators to include and the weighting to apply to them.

## 2.3 Quality of data

In order to evaluate the long-list of indicators for retail competition in energy markets, it is informative to consider the dimensions of the quality of data underlying the indicators.

Various quality assurance frameworks and templates have been developed by multi-lateral agencies and statistical bodies, including the United Nations, the International Monetary

Fund (IMF) and Eurostat.[27] These are intended to identify the various dimensions of the quality of data for statistical products. A common feature of these frameworks and templates is the broad definitions of quality, which capture the concept of quality in data as its fitness for use / purpose rather than simply accuracy. This recognises that quality in data is multi-dimensional and incorporates factors such as relevance, timeliness, accessibility, clarity, etc.

In 2012 the UN Statistical Commission approved a template for a generic National Quality Assurance Framework (NQAF) developed by an Expert Group comprising representatives from seventeen countries and nine UN agencies and other statistical agencies. This template comprises nineteen individual guidelines, grouped into four broad areas, which are: managing the statistical system; managing the institutional environment; managing statistical processes; and managing statistical outputs. Of these four areas, managing statistical outputs is most relevant to this study. This area comprises the following individual guidelines:

- *Assuring relevance* (NQAF 14). Data should meet the current and / or emerging needs of users. Assessment of relevance is subjective and the UN notes that it can be seen as having three components: completeness, user needs, and user satisfaction;
- *Assuring accuracy and reliability* (NQAF 15). Data should correctly describe what it is was created to measure (accuracy), and to do so consistently over time (reliability);
- *Assuring timeliness and punctuality* (NQAF 16). Data should be delivered as soon as possible after the reference period (timeliness) and be delivered on the promised dates (punctuality);
- *Assuring accessibility and clarity* (NQAF 17). Data that is produced should be readily available to all users on an equal and impartial basis at an affordable cost, if not free of charge (accessibility). Data should be presented clearly and in way that they are readily understood (clarity);
- *Assuring coherence and comparability* (NQAF 18). Data should be produced using common standards, and be consistent and comparable over time; and
- *Managing metadata* (NQAF 19). Information should be provided to enable the user to understand all attributes of the data (e.g. methodology, concepts, classifications, etc.)

Whilst the above has focused on the UN's generic template, as already noted, several other frameworks exist and, whilst there are differences, they have very many common characteristics. The UN provided a mapping of the individual generic NQAF guidelines to a range of other frameworks.[28]

The OECD's Handbook on Constructing Composite Indicators contains a quality framework (in Chapter 2) for CIs, including the quality dimensions of the "basic data" to be considered in selecting data for inclusion in a CI. The OECD references both the IMF's and Eurostat's frameworks regarding data quality, although not the UN's NQAF, which it predates. The quality framework identifies the following dimensions of data quality (which broadly align to Principles 11-15, which relate to statistical output, of the European Statistics Code of Practice, 2011, as well as the later UN NQAF), with specific reference to the application for CIs:[29]

- Relevance. "*… relevance has to be evaluated considering the overall purpose of the indicator. Careful evaluation and selection of basic data have to be carried out to ensure*

[27] UN (2012), Eurostat and European Statistical System (2011) and IMF (2006).
[28] Annex 1, UN (2012).
[29] Pgs 46 – 48, OECD (2008).

*that the right range of domains is covered in a balanced way. Given the actual availability of data, "proxy" series are often use, but in this case some evidence of their relationships with "target" series should be produced whenever possible*";

- Accuracy. "*… the issue of the credibility of the source becomes crucial. … One important aspect is trust in the objectivity of the data … data produced by "official sources" … should be preferred to other sources.*";
- Timeliness. "*… timeliness is especially important to minimise the need for the estimation of missing data or for revisions of previously published data. … data covering different domains are often released at different points in of time.*";
- Accessibility "*… accessibility of basic data can affect the overall cost of production and updating of an indicator over time. … the selection of the source should not always give preference to the most accessible source, but should also take other quality dimensions into account.*";
- Interpretability. "*… the availability of definitions and classifications used to produce basic data is essential to assess the comparability of data over time and across countries.*"; and
- Coherence. "…*two aspects of coherence are especially important: coherence over time and across countries. Coherence over time implies that the data are based on common concepts, definitions and methodology over time, or that any differences are explained and can be allowed for. … Coherence across countries implies that from country to country the data are based on common concepts, definitions, classifications and methodology, or that any differences are explained and can be allowed for.*"

## 2.4 Conclusions

Energy is an essential service and, since the increasing liberalisation and introduction of competition into the sector, there have been numerous studies seeking to establish and monitor the state and outcomes of competition. In the above we have summarised aspects of some of these studies, relevant to this project.

Across the studies of competitiveness in energy we have reviewed, numerous indicators have been used. However, there is a common core of indicators that relate to aspects of competition, including in relation to the structure of the market, the behaviour of market participants, and outcomes to consumers and suppliers. For example, looking at: outcomes from competition using measures of customer satisfaction, number and innovation of offers, and retail margins; behaviour in the market using entry and exit activity, and customer switching; and structural issues, including through measures of market concentration.

Most studies note that relying on a single indicator is mistaken, rather a number of indicators should be considered. This reflects the fact that competition is both multi-dimensional and a dynamic process, with outcomes in the market varying over time.

This suggests that there may be some benefit from developing a CI of retail energy market competitiveness; consolidating these various indicators into just one metric. CIs are widely used in other contexts and best practice guidance is available on their development and presentation, whilst still requiring subjective decisions to implement (and present).

Notwithstanding, CIs should be kept in appropriate context; the JRC COIN website states: "*All things considered, composite indicators should be identified for what they are --*

*simplistic presentations and comparisons of performance in given areas to be used as starting points for further analysis."* [30]

[30] https://composite-indicators.jrc.ec.europa.eu/?q=content/use-or-not-composite-indicators.

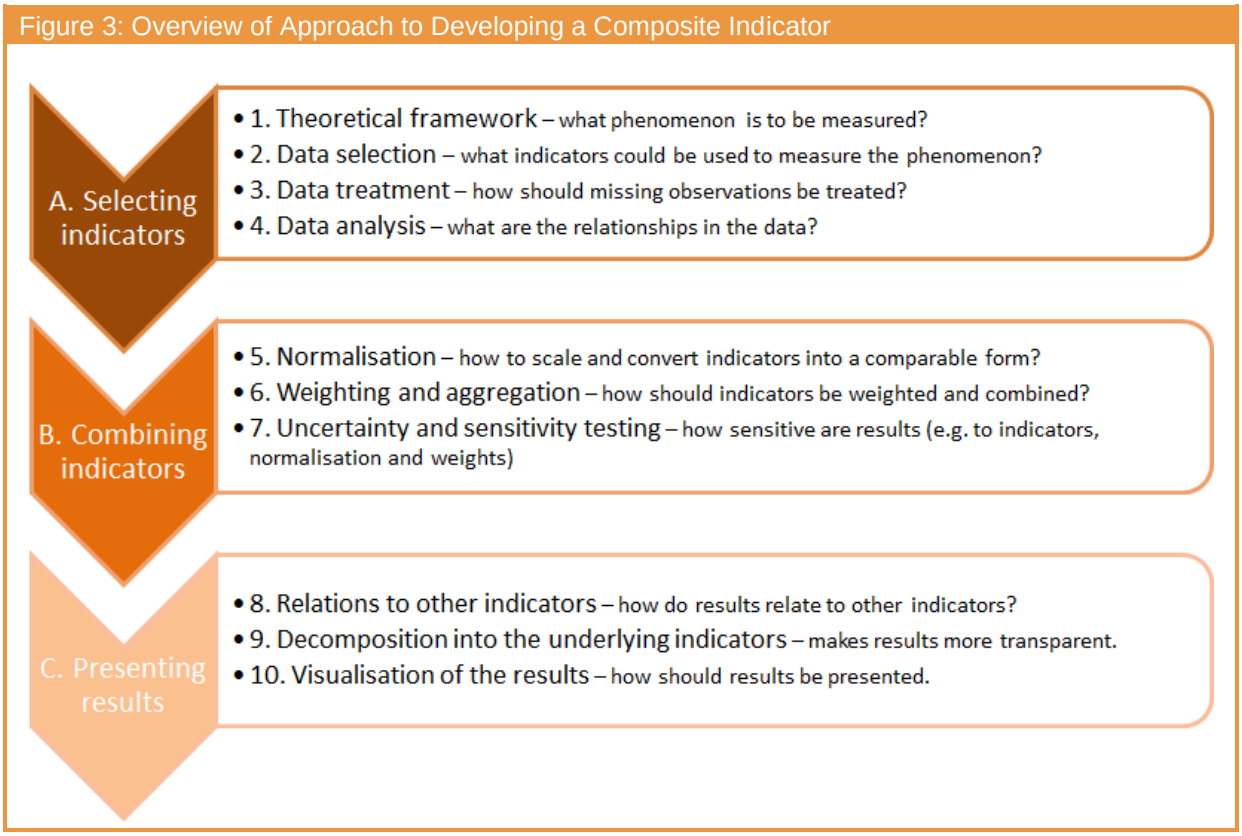
# 3. Overview of Methodology for Composite Indicator

Figure 3 summarises the overall approach adopted to the development of a CI, and which comprises the following three broad areas:

- identification and selection of the various indicators of retail energy market competitiveness;
- approach to combining the various indicators into a single CI; and
- approaches and considerations in presenting the results of a CI.

These three areas are considered further in each of the subsequent three chapters.

Figure 3: Overview of Approach to Developing a Composite Indicator




*Source: Adapted from OCED Handbook on Constructing Composite Indicators*

The scope of work for this study included developing a method for a CI and applying it to a Pilot Study of a few countries. However, we believe it is important to look at data for all countries, not least to understand potential gaps in the data series and how they can be normalised and combined. Therefore, rather than developing an approach and then conducting a Pilot Study on just a couple of countries, throughout the remainder of this Report, we describe the method and also apply it to all countries. This Pilot CI uses the data, largely made available by ACER, currently available to us. This includes 2014 data, as well as some 2013 data.

In applying the method summarised above, we developed an MS Excel based CI tool. This CI tool, subject to the inputs (i.e. indicator data), automates the process of combining the indicators and producing results of the CI, including enabling various uncertainty and sensitivity testing regarding the data and method. The intention of this tool is to enable the

production of the CI by ACER in future years. In producing a CI in future years, ACER will need to:

- keep under consideration the indicators that are available (e.g. are new indicators available, have current indicators become unavailable);
- collect and review new data;
- input data into the CI tool;
- review and interpret the results (including the uncertainty and sensitivity analysis); and
- present and describe the results.

# 4. Indicators of Competition in Retail Energy Markets

## 4.1 Approach for selecting indicators

There are four components in the approach to selecting indicators for a potential retail energy market competitiveness CI, as summarised in Figure 3, and as follows:

- *Theoretical framework* – the theoretical framework describes the phenomenon that is to be measured and enables an assessment of the relevance of indicators, as well as supporting the combination of indicators. We describe a framework in Section 4.2;
- *Data selection* – having described the phenomenon to be measured, it is then necessary to identify and select relevant indicators that can measure aspects of it. In selecting indicators, we focus on the relevance of the indicator (within the theoretical framework) and also consider data quality issues. In Section 4.3 we further describe and conduct an initial assessment and selection of indicators;
- *Data treatment* – for the selected indicators, it is necessary to review the completeness of the underlying data, and to decide how missing data should be treated. We address this in Section 4.4; and
- *Data analysis* – analysing indicators and the relationships between them can inform the combination of indicators and provide understanding of the final results. See Section4.5.

In each of the subsequent sections, we further describe and apply the approach for the above four components, before providing a final list of the indicators we propose to use in creating a retail energy market CI. Section 4.6 provides concluding remarks.

## 4.2 Theoretical framework for assessing relevance

For the purposes of this study, we are interested in ranking the competitiveness of retail gas and electricity markets in the EU28 and Norway. The indicators to be used in the CI, therefore, need to be relevant to some aspect of the competitiveness of retail electricity and / or gas markets. In evaluating an indicator's relevance, therefore, it is important to consider what is meant by competition.

Competition can be considered as a process, in which firms (supply-side) compete to provide goods or services to customers (demand-side). In idealised circumstances, in seeking to win customers, firms will compete across several dimensions including, most notably, price and quality. In doing this they have incentives to minimise costs and to innovate. Firms that are not successful will exit the market, whilst the persistence of high margins will attract new firms to enter the market. In terms of the demand side, customers who are well-informed, engaged in the market and able to change supplier will enhance the beneficial effects of competition between firms.

There are also factors which can hinder the competitive process. In particular: (i) dominant firms, with large market shares, may be able to exercise market power and have less of an incentive to compete; (ii) vertical relationships within or between firms may enable them to foreclose markets to competitors; and (iii) entry barriers, which in this context could include a supplier's ability to access wholesale power markets, may prevent new firms from entering and competing.

This process takes place within a context (which both influences the process and can change as a result of it) and delivers outcomes (which, likewise, can change the context and process).

The guidance suggests that the framework, and hence CI, should not conflate input, process and output measures, but rather focus on one. One might, mistakenly in our view, interpret the context, process and outcomes of competition as characterised above as being inputs, processes and outputs. Following from this, one approach to measuring competitiveness could be to focus solely on one aspect, with outcomes to consumers and firms the most likely, as it is these that most matter. Such a framework might, therefore, include indicators such as price, quality, cost and margin, but not indicators which could be associated with inputs and processes. These excluded indicators could measure structural features of the market (such as market power) or the (in)actions of agents, which are known to potentially impair competition or indicate that competition is not working well. The argument for the exclusion of these indicators is that their effect is already reflected in the outcomes.

In practice, however, competition cannot be simply characterised as comprising inputs, process and outputs, with a simple chain of causality in between; whilst imperfectly understood, competition, and the means by which it can be assessed, is complex, with lots of interdependencies between potential indicators. This reality is reflected in the frequent reference in the literature, looking at assessing competition in retail energy markets, to rely not on a single indicator, but a range of indicators considered in the round. In part, this is because competition is multi-dimensional – and hence the potential value of creating a CI. However, as importantly, it is also because of the complex and dynamic nature of competition, which means that potential indicators of competition are rarely unequivocal. For example, firms' margins may be low as a result of competition, but they may also be low where there is little competition and hence little pressure on a firm to reduce costs[31]. Similarly, a single firm in a market may be a sign of lack of competition, but, where there are no entry barriers or switching costs, the threat of entry may be sufficient to ensure outcomes are as they would be in a market with multiple competitors. With regard to the dynamic nature of competition, for example, whilst high margins that persist over time may be the result of the lack of competition, in the shorter term, they can exist within in a competitive environment, and may enhance competition in the longer term by attracting new entrants into the market.

Within this context, in defining a theoretical framework, we view it as appropriate to take a broad definition of competition, as above. We propose including indicators which are consistent with competition, or with constraints on competition, and categorising them into the following three areas:

- structure and features of the market (e.g. market power, entry barriers, other features);
- conduct and behaviour in the market (e.g. entry and exit activity, customer switching, innovation); and
- outcomes from and performance of the market (e.g. price, quality, and costs and margins).

This framework is summarised in Table 3 below.

[31] This is an example of so-called X-inefficiency, a principal-agent problem in which a firm's managers (agents) maximise their own utility rather than that of the owners (principals).

Table 3: Overview of framework and potential areas for indicators

| Structure / Features | Behaviour / Conduct | Outcomes / Performance |
|---|---|---|
| • **Market concentration:** market concentration, number of suppliers)<br>• **Entry barriers:** access to wholesale markets<br>• **Others**: end-user price regulation, price comparison websites, ombudsman | • **Entry / exit activity**<br>• **Customer switching**<br>• **Innovation**: product and pricing offers | • **Prices:** level, dispersion<br>• **Quality:** satisfaction, complaints<br>• **Costs & margin** |

## 4.3 Assessment and initial selection of indicators

In the following, we identify and assess indicators in the categories defined in Table 3, informed by the long-list of indicators we have developed through our literature review (see Annex B). The initial part of our assessment is focused on the relevance of the indicators as, in general, informed by having developed the long-list, the data and indicators referenced are likely accessible. These include data from Eurostat and CEER, and other data reported in ACER's MMR, which are also typically available in timely manner. The focus is on indicators and data in the household retail energy sector, rather than the whole retail market, which also incorporates supply of energy to micro-businesses. The supply of energy to small businesses is a market that is often considered distinct from the market for households. Accordingly, it could be argued that competition in these markets should be separately considered. For the purposes of this project, we have focused on the household sector as data are more readily available. However, the above framework and indicators are applicable to either.

In addition to relevance, described above, it is important to consider the quality of data underlying indicators, including:

- *Accessibility* – data should be readily available to users at little or no cost;
- *Timeliness* – data should be available in a timely manner and, ideally, available across jurisdictions in a similar time frame (see coherence);
- *Coherence* – data should be comparable across countries (and over time); and
- *Accuracy* – data should correctly describe what it is intended to measure.

We further consider the coherence of the indicators and, in particular, the availability of data across all countries in Section 4.4.

### 4.3.1. Structure and features of the market

#### *Market Concentration*

A market which has a high level of concentration or a small number of firms may afford the firms a degree of market power, which they could exercise to the detriment of competition and outcomes for consumers. Conversely, low levels of concentration and a large number of firms are less likely to afford firms market power and may constrain competition. In

general, therefore, measures of market concentration are relevant to an assessment of competition and candidates for inclusion in the CI.[32]

Key measures and indicators of market concentration are:

- HHI – calculated as the sum of the squares of the market shares;
- Concentration Ratios (CR(n)) - calculated as the sum of the market shares of the n largest firms; and
- number of suppliers.

HHI is probably the most widely used measure of market concentration, and it has been used, and recommended, in several of the studies in markets for power and gas reviewed in Chapter 2. It benefits over the CR by giving greater emphasis to firms with larger market shares. By contrast, the CR does not reflect the distribution of firm size.

An issue with the indicators discussed above is that when measured at the national level they may not reflect the competitive position at a regional level, i.e. low levels of regional concentration could be masked by higher concentration at a national level.

Previously, the MMR reported HHI and CR4 data. However, these data will not be available for the next edition, and initial investigation does not show them to be readily available on a consistent basis across the EU28 and Norway. In their place, ACER is proposing to report CR3 and the number of firms with a market share greater than 5%. Although not as good as HHI, or CR4, these are viable alternative indicators of market concentration.

In addition, the number of national suppliers provides a slightly different measure capturing not concentration, per se, but the number of competitors in the market. The number of suppliers can, therefore, be viewed as complementary to the available measures of concentration as it contains information on the tail of the distribution of suppliers.

### *Entry barriers*

Barriers to a firm entering a market reduce the contestability of the market and competition within it. There are a number of potential barriers to entry for energy suppliers in the EU.[33]

In order to supply customers, suppliers need to be able to purchase wholesale energy. However, where wholesale markets are illiquid, it is not always possible for a new entrant or independent supplier to access energy on the same terms as incumbents, particularly where vertically integrated. Therefore, measures or indicators of market liquidity could be good indicators of entry barriers. Most commonly, liquidity is measured as the traded volume of energy as a proportion of the consumption (the so-called churn rate). Wholesale price volatility can act as a proxy for liquidity (in that more liquid markets tend to have lower price volatility).

In practice, whilst we see merit in including an indicator of wholesale energy market liquidity, as an entry barrier, the availability of data on a consistent and timely basis for each of the EU28 and Norway is challenging. Some data are available on liquidity at hubs and power

[32] As already stated, this is an imperfect measure of competition in isolation, as highly concentrated markets may not afford market power if there are no (or low) barriers to entry, i.e. a contestable market.
[33] The 3rd edition of the MMR, through a survey of thirty suppliers in the EU, considered barriers to cross border entry.

exchanges (e.g. as presented in the European Commission's quarterly gas and electricity market reports). However, there are issues with these data in the context of creating a CI. In particular, these hubs and exchanges are not specific to a country, but are more typically regional, giving rise to the question as to how to measure liquidity for an individual country. Whilst one might align countries to a single hub and single exchange for the purposes of calculating a churn rate, this assumes away the role of transmission constraints. Also, liquidity at these hubs and exchanges exclude bilateral contracts, which are typically the majority of the trade within a country where such bilateral trades can occur (i.e in electricity, where there is no mandatory pool or market). The feasibility of developing wholesale liquidity indicators for electricity and gas from REMIT (wholesale energy market integrity and transparency) data would be worth ACER exploring.

In relation to wholesale markets, Oxera (2007) looked at the existence of price reporting services and of standardised contracts as measures of the transparency and of the ability of suppliers to access the wholesale market on non-discriminatory terms. In practice, however, as Oxera state, these are better measures for nascent markets as they largely measure the very existence of wholesale markets.

### *Others*

There are a number of other potential features or structures of retail energy markets that could have a bearing on competition, and which were identified through our literature review.

In a number of countries, end-user prices remain regulated. ACER/CEER (2014) noted that "*the existence of price regulation seems to be a cause of lower market entry and may be exacerbating rather than facilitating competition*".[34] End user price regulation is often justified on the basis of a lack of competition. To the extent this is the case, then the number of competitors will be fewer and entry lower, both of which are indicators considered elsewhere.

In discussion with ACER and NRAs, during the course of this project, it was suggested that end-user price regulation be included in the CI, as it acts as an entry barrier by suppressing suppliers' margins. Whilst this might be the case (at least where the regulated price is at or below the level that would prevail in a competitive market) we propose to separately include prices and margins as indicators. In doing so, where end prices are regulated, prices and margins do not accurately reflect the effects of competition. Accordingly, we propose adjustments to these data, in the normalisation process, which take into account the proportion of households on regulated tariffs. We do not, therefore, propose that end user price regulation (either its presence or the percentage of households on regulated prices) is included as an additional, separate indicator (see sections 4.3.2 and 5.1 for further discussion).

There are a number of other indicators in our long-list that relate to features of the market that have been or could be used to make inferences about the competitiveness of markets, including:

- the existence of price comparison websites (which make it easier for customers to switch) and, closely related to this, the ability to compare prices easily (as measured by DG Justice);
- degree of foreign ownership (as an indicator of the openness of a market);
- the existence of a compensation route and / or energy supply ombudsmen; and

[34] Pg 50.

- the extent of smart metering (which may indicate the degree of engagement of customers).

Of these, the ability of consumers to compare prices and services is a relevant indicator as, without this, consumers cannot make informed decisions about changing supplier, to the detriment of competition. This could potentially be measured through the existence of price comparison websites. This is one feature of most retail energy markets which inform consumers and facilitate their switching. However, simply identifying the existence of price comparison websites says nothing about whether they are helpful in informing consumers and facilitating switching, and features other than price comparison websites may be used by consumers in switching. An alternative is the measure of the ability of consumers to compare price compiled by DJ Justice. It can be viewed as a barrier to consumers effectively participating in the market. Our preference is for this latter measure, given its broader scope.

### 4.3.2. Conduct and behaviour in the market

The conduct and behaviour of suppliers and consumers in the market are potentially important indicators of the existence of competition. In the case of suppliers this includes whether they are entering (or exiting) the market and whether they are innovating in response to competition; in the case of consumers this includes whether they are switching suppliers.

***Supplier behaviour***

***Entry / exit***

In a competitive market, new firms are free to enter if they see an opportunity to be profitable and existing firms leave if they cannot compete effectively. If there are barriers to entry, which are constraints on competition, then entry will be lower than otherwise. Entry and exit activity, therefore, is an important indicator of how active the competitive process is.

The MMR assesses entry and exit activity as the percentage of net new suppliers in the market (i.e. number of firms entering, net of firms exiting) in a given year in comparison with the total number of existing suppliers. It looks at entry and exit as an average over a five year period. Data for this indicator comes from the CEER National Indicators Database (2014).

For the purposes of the CI, our preference is to use as an indicator of net entry activity in an individual year, rather than over a longer period. The reason for this being that over a long period the net entry position is equivalent to the number of suppliers in the market, which is separately considered as one of the proposed market structure indicators. This annual net entry indicator can be calculated from the change in the number of (national) suppliers from the previous year.

More generally, however, net entry activity (measured as the change in the number of suppliers from one year to the next) is not necessarily a good measure of competition. For example, net entry could be zero because no firms either entered or exited, or because the same number of firms entered as exited. The latter is consistent with competition, but the former may not be. Net entry is, therefore, not straightforward to interpret. To further illustrate, whilst net entry could be considered a sign of competition (i.e. firms are entering the market and competing) it could also result from a growing market or, particularly where

net entry persist over time, it could be the result of high margins, more typically associated with a lack of competition. There is, therefore, an argument for using some measures of gross entry and exit, rather than net entry; however, we are not aware that such data are available. In practice, in more recently liberalised markets, which were previously served by monopolies, positive net entry is a sign of increasing competition.

### *Innovation*

The relationship between product innovation and competition has been widely studied in Industrial Organisation. In some sectors innovation is often measured by the level of spend on research and development (R&D) and reviewed in terms of the market structure e.g. whether it is driven by monopoly or competitive markets. In retail energy markets, we can evaluate 'innovation' in terms of the number of new supply products that are being offered to customers. In this context, that is without the need for large spend on R&D, we would expect greater competition to stimulate innovation, resulting in an increase in the number of new product offerings.

In relation to product innovation, data are available on the following indicators (with the first two reported in the MMR):

- number of electricity, gas and dual-fuel offers available to households in capital cities;
- 'type of energy pricing', i.e. the proportion of offers for which the energy component is (in electricity: fixed; variable; spot-based; or regulated – in gas: fixed; variable; or regulated); and
- type of products (e.g. % made up of innovative products such as fixed price deals, green tariffs, and on-line deals).

Ofgem concluded in its Retail Market Review (RMR)[35] that too many offers could make it hard for consumers to compare products. This led to Ofgem limiting the number of offers by suppliers to four.[36] To the extent this is correct, the relationship between offers and competition may be parabolic, with an increase in offers first giving customers a wider set of options, but at higher levels leading to difficulties of comparison. However, in general, more offers indicates more variety and innovation in suppliers' offerings and, for the purposes of the CI, to the extent more offerings make it difficult to compare offers, this is captured under other indicators (i.e. ability to compare price offerings).

As well as the aggregate number of offers available (in capital cities), data are available that categorise the different type of offers, including type of pricing and product innovation. These categorisations are helpful in understanding what is happening in the market.

For the purposes of the CI, we are interested in how competition promotes innovation in offerings, whether it is in pricing structure (e.g. fixed, variable, contract duration, etc) or product (e.g. green electricity). For this reason, our preference for an indicator of innovation is the total number of offers available (which covers both of the aforementioned areas) per supplier.

[35] Ofgem (2013) 'The Retail Market Review – Implementation of Simpler Tariff Choices and Clearer Information', 27 August 2013.
[36] The UK's CMA, following a year-long review of competition in the energy market, observes that this rule "*limits the ability of suppliers to innovate and provide products which may be beneficial to customers and competition.*" Para 143, CMA Energy market investigation: Summary of provisional findings report, 7 July 2015.

## *Customer behaviour*

### *Customer switching*

As described in our framework, customers who are well-informed, engaged in the market and able to change supplier enhance the beneficial effects of competition between firms, as firms compete to win their custom. Customer switching, therefore, is an often used indicator of competition; capturing, as it does, aspects such as customer awareness, marketing activities by suppliers and the innovativeness of the contracts they are offering.

Of the range of different metrics used to capture switching behaviour, annual switching rates are the simplest and most commonly used. However, it should be noted that annual switching rates may be an underestimate of the effect of competition and customer awareness, as some consumers may use the threat of switching to negotiate a better deal with their existing supplier, rather than actually switching. In practice, however, these data are not easy to come by. Moreover, in the context of comparing countries, this underestimate is only potentially significant if there are systematic differences between countries.

High switching rates can be interpreted as a sign of competition. Conversely, however, low switching rate are not necessarily a sign of limited competition. It could simply be that switching suppliers does not offer the consumers a significant saving. In general, the smaller gain to the consumer from switching the less is his or her incentive to switch.

Other related and frequently observed metrics include:

- proportion of consumers who have switched supplier (i.e. % with non-incumbent);
- rate of net loss of customers by electricity incumbents;
- savings available on incumbent's standard offer; and
- number of renegotiated contracts for household customers as a percentage of customer numbers.

Of the above, for the purposes of the CI, we believe there is merit in including the number of consumers who have not switched supplier. Whilst switching rates are a useful measure, it may be the case that switching is restricted to a relatively small group, who switch repeatedly, but that there are other consumers who do not engage with the market and stay with the incumbent supplier, thereby diminishing the incentive of suppliers to compete.[37]

The 3rd Edition of the MMR reported both switching rates and the proportion of customers with a different supplier than their incumbent based on data from the CEER National Indicators Database. Annual switching rates are also historically available from DG Justice (although we understand that in future these data will only be available every other year), along with the percentage of customers who have switched to a new tariff with their existing supplier. Our preference for a switching indicator is to use these two elements (i.e. switching supplier and switching tariff with the existing supplier) in a single indicator, and we therefore propose combining the CEER data on switching supplier with the DG Justice data on switching tariff with the existing supplier.

[37] Ideally the indicator would be of the percentage of customers who have not switched. In practice, this data is not typically available. Rather, the percentage of customers who are with the incumbent is often used as a proxy. This is imprecise because some of the incumbent's customers could have previously switched away from them, before switching back. It also does not account for those who may have used the threat of switching to negotiate a better deal.

### 4.3.3. Outcomes from and performance of the market

Where competition is effective, it puts downward pressure on the prices consumers pay and the margins suppliers make, while incentivising improved quality of service. Price, margins and quality are, therefore, valuable measures of whether competition is working effectively. However, as noted in Section 4.2, the dynamic and complex nature of competition means that indicators are rarely unequivocal, and this is true for both price and margin (e.g. higher margins may exist in a relatively competitive environment).

#### *Price*

In appropriately defined markets, price levels are a very useful part of understanding competition. However, in the case retail energy markets, it is challenging to draw inferences about competition between countries based on price levels alone. This is because end-user prices are made up of several components, most of which suppliers have no control over and which can be legitimately different between countries, regardless of competition. For example, end-user prices are comprised of wholesale costs, network costs, retail costs, and taxes, with wholesale and network costs typically much larger than retail costs. The network element is subject to regulation, rather than competition, and these costs will reflect specific network characteristics of the country. In this case, differences between end-user prices across countries may be due solely to legitimate cost differences, rather than differences in competition.

Where data are available, excluding taxes and network costs (the non-contestable components) from price reduces this problem somewhat, although relies on the data reported being accurate. Notwithstanding, the wholesale component of energy price can still be reasonably expected to vary across countries based on generating technologies and renewables subsidies (although greater interconnection could reduce these differences).

Our preference for a price based indicator of retail competition is to use price dispersion, rather than price levels. Energy supply is a relatively homogenous good/service. As a result, competition can be expected to result in relatively small differences between supplier prices within each country. Moreover, by looking at a measure of dispersion, rather than levels, per se, the above challenges with using price as a measure of competition are avoided. For the purposes of the Pilot CI, we are proposing to use the spread between the $10^{th}$ and $90^{th}$ percentiles expressed as a percentage of the average price.

#### *Cost and Margin*

Suppliers' margins, i.e. the spread between wholesale and retail prices, is a good indicator of the state of competition. In a competitive market, high retail margins will not persist for long, as they will attract new entrants into the market. In a perfectly competitive market, suppliers would be pushed down to marginal cost (including their risk adjusted rate of return for their investors).

The major weakness of using mark-up as an indicator of competition is that it is typically estimated, as suppliers' actual margins are difficult to obtain and, as further discussed below, some countries regulate end-user prices for retail energy. In the MMR, mark-ups are calculated as the average over a period of time (in the latest MMR these periods are 2008-2013 for electricity and 2012-2013 for gas). This calculation includes a mix of spot and forward prices, recognising that suppliers don't simply buy on the spot market, but hedge their exposure to spot prices.

For the purposes of the CI, which is seeking to measure the competitiveness of markets within a particular year, it is appropriate to use a margin for that year, rather than a longer period. To estimate this mark-up, the difference between the retail prices and the wholesale component can be used.

Beyond the level of the mark-ups in a given year, the evolution of mark-ups over time indicates 'responsiveness' of retail to wholesale prices over time. One way to capture this might be to include as an indicator a measure of the change, say over the previous year, or perhaps over a longer time, say a 5-year rolling average of supplier margin. Alternatively, a more direct measure would be to use the % change in retail price for a given % change in the wholesale price.

The existence of retail price regulation in some countries further complicates the issue. As discussed above, the existence of regulated prices feed through into a number of other indicators so we do not expect to include it as a separate binary indicator. However, it also, arguably, distorts both prices and margins as measures of competition. In particular, low (or even negative margins) may be the result of end-user price regulation, as highlighted in the MMR, rather than competition. Within this context, we believe it appropriate to make adjustment to margins and prices, where used as indicators of competition, if end-prices are regulated (details of this adjustment are presented in Section 5.1.3).

#### *Quality*

As well as competing on price, suppliers can compete on quality. Although electricity and natural gas are effectively homogeneous goods, customer service is not, and would therefore be expected to be an area in which suppliers compete in a competitive market.

All round customer satisfaction can most effectively be measured by surveys that include questions on customers' experiences. The MMR includes an indicator called 'Expectations', based on data from DG Justice (2014), that broadly captures this sentiment. The expectations indicator is based on a survey that asks consumers to rate the degree to which services and providers lived up to their expectations in the previous year on a scale of 0 to 10. Data from both the electricity and gas markets appears largely complete.

The number of customer complaints is another informative, easily comparable (once scaled), and readily available metric of consumer satisfaction with the quality of their service. In addition to indicating quality, number of complains is also a measure of customer engagement with the market. However, typically, complaints data will also capture network problems, as well as retail problems.

### 4.3.4. Initial list for further analysis

Table 4 summarises the outcome from the above assessment of indicators. For each of the three categories established in our framework, we identify our preferred indicators. We also identify some potential alternatives that we include in the analysis reported below, as well as other indicators that are not, to our knowledge, readily accessible in a comparable form across countries, but which could provide good indicators if appropriate data can be collected in future.

Table 4: Initial list of indicators

| | Structure / Features | Behaviour / Conduct | Outcomes / Performance |
|---|---|---|---|
| **Preferred** | **Market concentration**<br>• CR3<br>• Number of suppliers<br>**Barriers to entry / participation**<br>• Ability to compare price easily | **Entry Exit Activity**<br>• Annual entry/exit<br>**Customer switching**<br>• Switching rates (supplier + tariff)<br>• Percentage who have not switched<br>**Innovation**<br>• Average offers per supplier | **Price**<br>• Price dispersion<br>**Quality**<br>• Does the market meet expectation<br>**Cost / margin**<br>• Average mark-up as % |
| **Potential alternatives** | • Suppliers with market share greater than 5%<br>• Ease of switching | | • Energy component of price<br>• Satisfied with choice of supplier |
| **Future indicators** | • HHI<br>• Market liquidity | • Gross entry and exit activity | |

## 4.4 Treatment of data

As already noted, the above preferred and potential alternative indicators are ones which we expected to be available. However, for each indicator, data are not always going to be available for all the EU-28 and Norway for the relevant year. The next steps, therefore, are to:

- identify the gaps in the data; and
- consider whether and how to fill gaps in the data.

### 4.4.1. Identify gaps in the data

By way of illustration, in Table 5 we show the completeness of data for each of the indicators across the EU-28 and Norway in 2013 and 2014.

| Table 5: Number of observations for each indicator – 2013 and 2014 | | | | |
|---|---|---|---|---|
| | **2013 data only** | | **2014 data** | |
| | **Electricity** | **Gas** | **Electricity** | **Gas** |
| **Preferred indicators** | | | | |
| CR3 | 20 | 16 | 26 | 20 |
| Number of suppliers | 26 | 23 | 27 | 25 |
| Ease of comparing price | 29 | 24 | - | - |
| Entry / Exit activity | 25 | 22 | 26 | 26 |
| Switching rates | 25 | 25 | 24 | 22 |
| % of Non-switchers | 17 | 16 | 19 | 15 |
| Average number of offers per supplier | 29 | 26 | 29 | 26 |
| Price dispersion | 29 | 25 | 29 | 26 |
| Does market meet expectations | 29 | 24 | - | - |
| Mark-up | 25 | 26 | 23 | 25 |
| **Potential alternative indicators** | | | | |
| Main suppliers (market share > 5%) | 19 | 17 | 28 | 25 |
| Ease of switching | 26 | 22 | - | - |
| Energy component of price | 29 | 29 | 29 | 26 |
| Satisfied with the choice of suppliers | 26 | 23 | - | - |
| | | | | |
| **Number of countries** (see comments in text below) | **29** | **24** | **29** | **24** |

For 2013 and 2014, complete sets of data are available for only a few indicators.[38] In general, data for electricity are more complete than for gas (although it should be noted that there is no gas supply in Cyprus or Malta, and retail gas supply in some other countries (e.g. Norway, Finland and Sweden) is limited and data not always reported, so fewer observations are expected for gas). However, in both gas and electricity, the indicators with the most 2013 data missing are the percentage of non-switchers and the CR3.

For 2014, a number of the proposed indicators are missing completely; these are the data from DG Justice. Whilst these data have been produced annually from 2010 to 2013, during the course of this study, we understand that these series will only be available every other year in future.

### 4.4.2. Treat gaps in the data

There are several potential ways in which gaps in the data can be filled. These range from relatively simple approaches to more complex statistical models, and include filling data gaps by using:

- *Data from alternatives sources* – whilst a complete set of data may not be available from a single source, there may be other sources for the same indicator that could be used as a substitute. For example, in the case of switching rates, CEER data are arguably more accurate than DG Justice (the latter are from survey data), and therefore preferred, but DG Justice data on switching rates are more complete for 2013. To create a more complete data set, DG Justice data could be used where CEER data are missing. In doing so, it is important to recognise that the data across countries may not now be

[38] Most of the data have been provided by ACER and as used in the MMR.

consistent and to identify and describe these differences (in this case that DG Justice data are survey based).

- *Proxies for the missing data* – where data for a particular indicator are missing, data from a "proxy" indicator could be used to replace it. For example, in the case of CR3 measures for the household retail market are not always available, but CR3 for the whole retail market may be available. Where a proxy is used, the relationship between it and the real measure needs to be considered, to establish whether it is a good proxy. For example, in the case of CR3, as described, where the non-household section of the market is relatively small, or the same suppliers are known to be active in the household and non-household segments, the whole retail market will be a good proxy.
- *Data from previous years* – here missing data are replaced with data from previous years, where available. Consideration should be given to how much the market in a particular has changed from when data was last available to the prevailing market conditions. When using this approach, the more recent the data and the less dynamic the market the better.
- *Data from other countries with similar characteristics* – where data for a country is missing, this approach involves replacing it with data from a country which has similar characteristics, i.e. a proxy country. Where this is done, the similarities (and differences) between the countries need to be understood in order to assess whether it is appropriate to use a proxy country.
- *Average values from the available data* – under this approach, missing values are replaced with average values for the indicator across the countries for which data are available.
- *Values imputed from regression analysis* – under this approach, in broad terms, regression analysis is conducted on available indicators to estimate relationships between indicators that are then used to impute the missing values.

Across the above, our preference is for the simpler approaches (in particular, other sources, proxy data, and data from previous years), largely on grounds that they provide a transparent means of addressing gaps, but also because their simplicity allows them to be easily and readily applied. In addition, we note the comment in the OECD Guidance that some of these simpler methods might be more appropriate than regression imputation.[39]

Regardless of the approach that is applied, it is important to acknowledge the imputation of data where it is done, as it will have a bearing on the confidence that can be placed in the eventual results. For the purposes of the proposed retail energy market CI, we propose that missing data and data imputation form part of the assessment of uncertainty, which we consider further in Section 5.3.

In practice, if alternative data are available only from one source (e.g. from a proxy, or from an earlier year) then there is no choice to be made over the appropriate approach to apply. However, if data are available that enables more than one approach to be applied then, as there are no "hard-and-fast" rules that can be applied which guarantee the right approach is selected, judgment is required in how best to fill gaps in the data. Ultimately this will depend on the details of the specific circumstances.

Table 6 presents the number of observations for the proposed indicators for 2014, pre-imputation and post-imputation. For the purposes of developing the Pilot CI, gaps in the data have filled as follows:

[39] Pg 57.

- For CR3 and suppliers with a market share greater than 5%, data for the whole retail market are used (where available), when data for the household portion of the market are not available;
- For the % of non-switchers in Belgium, data for either for Flanders or Wallonia and Brussels are used, as whole country data are not available);
- Where switching data are not available from the CEER database, switching data from DG Justice are used instead (again, where these are available);
- For a number of other indicators, previous years values are used. These include all DG Justice data used for all countries, as well as several other indicators (entry/exit activity, CR3, % of non-switchers, and mark-up) for specific countries.

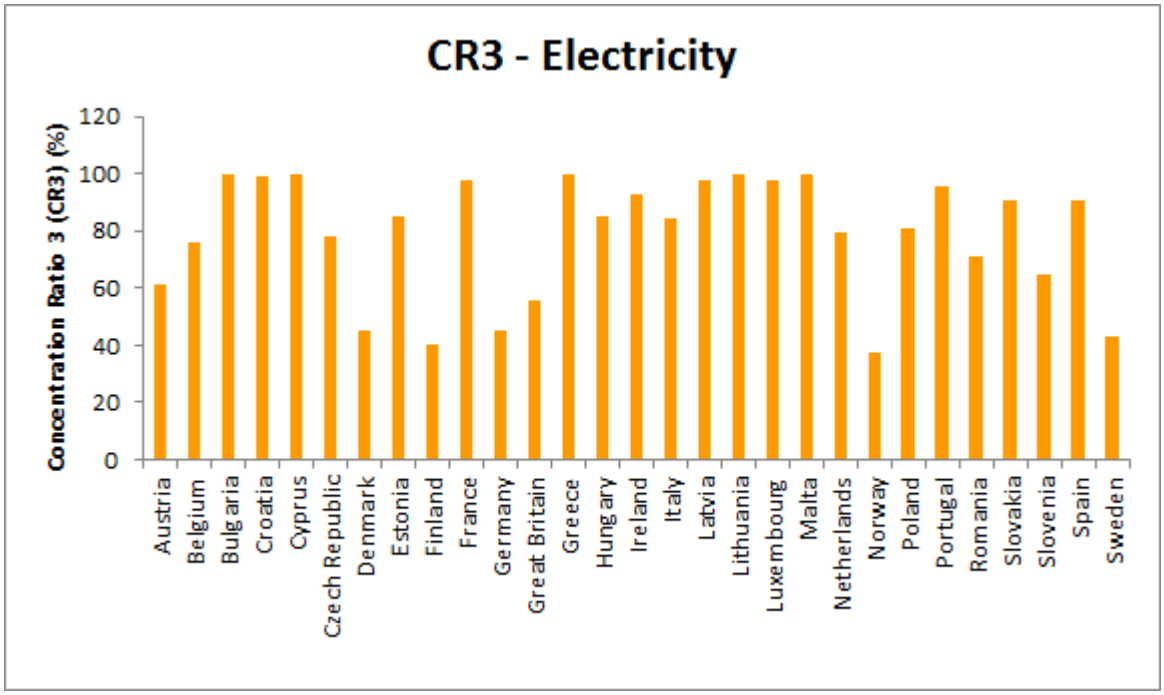
This process has filled some, but not all, of the gaps in the data. In particular, the percentage of non-switchers has a relatively large amount of missing data. We consider the implications of not being able to impute missing data in Section 5.2 (in relation to the weighting of the indicators).

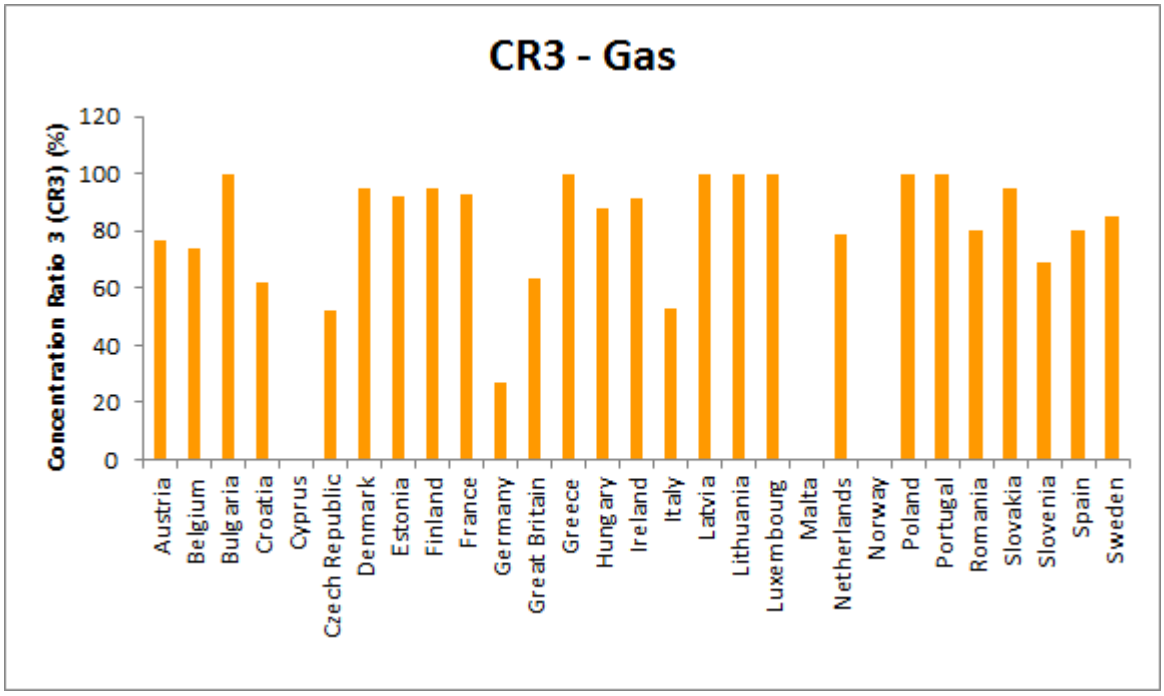
Table 6: Number of observations for each indicator for 2014 pre- and post-imputation

| | 2014 pre-imputation | | 2014 post-imputation | |
|---|---|---|---|---|
| | **Electricity** | **Gas** | **Electricity** | **Gas** |
| **Preferred indicators** | | | | |
| CR3 | 26 | 20 | 29 | 26 |
| Number of suppliers | 27 | 25 | 29 | 26 |
| Ease of comparing price | - | - | 29 | 24 |
| Entry / Exit activity | 26 | 26 | 28 | 26 |
| Switching rates | 24 | 22 | 29 | 25 |
| % of Non-switchers | 19 | 15 | 21 | 18 |
| Number of offers per supplier | 29 | 26 | 29 | 26 |
| Price dispersion | 29 | 26 | 29 | 26 |
| Does market meet expectations | - | - | 29 | 24 |
| Mark-up | 23 | 25 | 25 | 26 |
| **Potential alternative indicators** | | | | |
| Main suppliers (market share > 5%) | 28 | 25 | 29 | 26 |
| Ease of switching | - | - | 26 | 22 |
| Energy component of price | 29 | 26 | 29 | 26 |
| Satisfied with the choice of suppliers | - | - | 26 | 23 |

Data for the indicators (post-imputation) are presented in graphical form in Annex D. By way of illustration, Figure 4 shows indicator data for CR3 for electricity and gas.

Figure 4: CR3 - Electricity and Gas - 2014




## 4.5 Data analysis

The purpose of the analysis is to better understand the data underlying the indicators, prior to constructing the CI. This analysis involves consideration both of the indicators individually (which is potentially helpful in understanding the impacts they may have on the CI, as well

as identifying problems with the data) and the relationships between them (which may inform both the inclusion, or otherwise, of the indicators and the methodological choices, e.g. weighting and aggregation).

### 4.5.1. Individual indicators

Examining the data underlying the indicators, and in particular identifying the range of potential values and the presence of outliers, helps develop an understanding of the factors influencing the results of the CI, as well as informing the approach to normalising indicators (see Section 5.1).

Most of the indicators identified above are already identified and described in the retail section of the MMR. However, it is important to check consistency of indicators for a country to highlight potential concerns over data quality. Where inconsistencies are noted, the data should be investigated to see if they are accurate. If this investigation reveals nothing new, then a judgement is required on how to treat them. This may involve removing the observation and / or replacing it with a proxy.

### 4.5.2. Relationships between indicators

We propose that the relationship between indicators is examined using a correlation analysis. There are two uses of this correlation analysis:

- Where indicators are highly correlated and are included so as to measure similar aspects of competition, then there may be a case for removing one or other of the indicators or adjusting the weights attached to them (to avoid "double counting"). Removal of an indicator can simplify the construction of the CI, making it easier to produce and more readily understood. Within the above theoretical framework, and in the discussion on relevance, we have generally included just one indicator in each area of competition considered important. The exceptions to this are market structure (where we propose using CR3 and number of suppliers) and switching (where we propose using switching rates and the number of non-switchers). In both these cases the two proposed indicators are intended (and expected) to capture two slightly different aspects of competition. Notwithstanding, the correlation between these should be considered to inform the weighting.
- More generally, in understanding the data, the direction of correlations between pairs of indicators should be examined to see whether it is as anticipated (particularly where correlations are stronger, and confidence in the direction is, therefore, higher).

In the following Figure 5 and Figure 6 we present correlation coefficients of the electricity and gas indicators (respectively) for the indicators listed in Table 6, which combines 2014 data, with some proxies and data from earlier years to provide a more complete data set. Within each of the Figures, indicators highlighted in bold are the preferred indicators, whilst more highly correlated indicators are highlighted (in yellow or orange, depending on the strength of correlation).

With regard to the two market structure indicators, there is relatively high (negative) correlation, for both electricity and gas, between CR3 and the number of suppliers. Notwithstanding, as these capture different aspects of market structure, as described in Section 4.3.1, we would recommend that they are both retained but that the weighting takes this correlation into account. In the case of the switching indicators, in electricity and gas, switching rates and the number of non-switchers is highly (negatively) correlated, as is to be

expected. Again, as these capture different aspects of competition there is in principle a strong case for retaining both, but considering the weighting that is attached to each.

In general, where there is a higher degree of correlation between our preferred indicators, the direction of correlation is as we would expect. A possible exception is in electricity where there is a strong positive correlation between the number of suppliers and price dispersion. There is also a positive correlation between these two indicators in gas, but the correlation is much weaker.

Where the correlations are less strong, in some cases, the direction of correlation is not necessarily as might be expected. For example, we note that for both electricity and gas there is negative correlation between CR3 and mark-up, i.e. the greater the market share of the largest three suppliers the lower the mark up, on average. This might be explained by end-user price regulation, i.e. more concentrated markets are more likely to have end-user price regulation which, in turn, will result in lower margins.

Figure 5: Electricity retail market indicators - correlation coefficients

| | CR3 | Number of suppliers | Main suppliers | Entry / Exit activity | Switching rates | Non-switchers | Ease of comparing price | Ease of switching | Number of offers | Energy component of price | Price dispersion | Does mkt meet expectations | Satisfied with the choice | Mark-up |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CR3** | 1.00 | -0.75 | -0.67 | -0.50 | -0.25 | 0.51 | -0.10 | -0.53 | -0.54 | 0.34 | -0.72 | -0.51 | -0.62 | -0.30 |
| **Number of suppliers** | | 1.00 | 0.41 | 0.72 | 0.34 | -0.28 | -0.04 | 0.45 | 0.60 | -0.34 | 0.60 | 0.31 | 0.55 | 0.20 |
| Main suppliers | | | 1.00 | 0.24 | 0.20 | -0.46 | 0.39 | 0.36 | 0.36 | -0.24 | 0.37 | 0.33 | 0.41 | 0.11 |
| **Entry / Exit activity** | | | | 1.00 | 0.19 | -0.22 | -0.02 | 0.25 | 0.16 | -0.25 | 0.29 | -0.03 | 0.22 | 0.15 |
| **Switching rates** | | | | | 1.00 | -0.76 | -0.01 | 0.37 | 0.46 | -0.01 | 0.36 | 0.15 | 0.33 | 0.14 |
| **Non-switchers** | | | | | | 1.00 | -0.11 | -0.60 | -0.41 | -0.09 | -0.53 | -0.25 | -0.55 | -0.45 |
| **Ease of comparing price** | | | | | | | 1.00 | 0.49 | 0.02 | 0.05 | 0.15 | 0.47 | 0.55 | 0.15 |
| Ease of switching | | | | | | | | 1.00 | 0.48 | 0.32 | 0.58 | 0.63 | 0.93 | 0.62 |
| **Number of offers** | | | | | | | | | 1.00 | -0.15 | 0.46 | 0.39 | 0.52 | 0.29 |
| Energy component of price | | | | | | | | | | 1.00 | -0.13 | -0.17 | 0.15 | 0.44 |
| **Price dispersion** | | | | | | | | | | | 1.00 | 0.42 | 0.59 | 0.50 |
| **Does mkt meet expectations** | | | | | | | | | | | | 1.00 | 0.69 | 0.32 |
| Satisfied with the choice | | | | | | | | | | | | | 1.00 | 0.64 |
| **Mark-up** | | | | | | | | | | | | | | 1.00 |

| Key: | |
|---|---|
| | -0.8 > correl > 0.8 |
| | -0.5 > correl > 0.5 |

Figure 6: Gas retail market indicators - correlation coefficients

| | CR3 | Number of suppliers | Main suppliers | Entry / Exit activity | Switching rates | Non-switchers | Ease of comparing price | Ease of switching | Number of offers | Energy component of price | Price dispersion | Does mkt meet expectations | Satisfied with the choice | Mark-up |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CR3** | 1.00 | -0.59 | -0.56 | -0.22 | -0.23 | 0.13 | 0.13 | -0.33 | -0.22 | 0.05 | -0.52 | 0.21 | -0.31 | -0.20 |
| **Number of suppliers** | | 1.00 | 0.33 | 0.51 | 0.27 | 0.02 | -0.05 | 0.17 | 0.32 | -0.31 | 0.24 | -0.13 | 0.28 | -0.10 |
| Main suppliers | | | 1.00 | 0.02 | 0.45 | -0.60 | -0.18 | 0.52 | 0.37 | 0.04 | 0.33 | -0.09 | 0.55 | 0.33 |
| **Entry / Exit activity** | | | | 1.00 | 0.44 | -0.36 | -0.21 | 0.13 | 0.50 | 0.00 | 0.19 | 0.12 | 0.09 | 0.06 |
| **Switching rates** | | | | | 1.00 | -0.86 | -0.25 | 0.46 | 0.49 | 0.27 | 0.31 | 0.10 | 0.46 | 0.34 |
| **Non-switchers** | | | | | | 1.00 | 0.08 | -0.49 | -0.46 | -0.47 | -0.44 | -0.07 | -0.45 | -0.36 |
| **Ease of comparing price** | | | | | | | 1.00 | 0.38 | -0.30 | 0.02 | -0.03 | 0.48 | 0.35 | -0.12 |
| Ease of switching | | | | | | | | 1.00 | 0.50 | 0.51 | 0.53 | 0.35 | 0.88 | 0.65 |
| **Number of offers** | | | | | | | | | 1.00 | 0.19 | 0.61 | 0.07 | 0.50 | 0.35 |
| Energy component of price | | | | | | | | | | 1.00 | 0.32 | -0.07 | 0.33 | 0.75 |
| **Price dispersion** | | | | | | | | | | | 1.00 | 0.00 | 0.62 | 0.47 |
| **Does mkt meet expectations** | | | | | | | | | | | | 1.00 | 0.31 | 0.07 |
| Satisfied with the choice | | | | | | | | | | | | | 1.00 | 0.60 |
| **Mark-up** | | | | | | | | | | | | | | 1.00 |

| Key: | |
|---|---|
| | -0.8 > correl > 0.8 |
| | -0.5 > correl > 0.5 |

## 4.6 Concluding remarks

The proposed final list of indicators for creating a Pilot CI is shown in Table 7. These are the same as the preferred initial list (Table 4).

Table 7: Overview of framework and potential areas for indicators

| Structure / Features | Behaviour / Conduct | Outcomes / Performance |
|---|---|---|
| **Market concentration**<br>• CR3<br>• Number of suppliers<br><br>**Barriers to entry / participation**<br>• Ability to compare price easily | **Entry / exit activity**<br>• Annual entry/exit<br><br>**Customer switching**<br>• Switching rates (supplier + tariff)<br>• % of non-switchers<br><br>**Innovation: product and pricing offers**<br>• Number of offers per supplier | **Prices**<br>• Price dispersion<br><br>**Quality**<br>• Does the market meet expectations<br><br>**Costs / margin**<br>• Average mark-up (%) |

The choice of the above indicators was pragmatic, balancing the availability of potential indicators against the various aspects of competition that are relevant. In practice, some indicators more closely capture the aspects of competition of interest than others. In particular, we note that:

- net entry / exit is not necessarily a good measure of competition for the reasons describe above (Section 4.3.2);
- numerous of the indicators are affected by the existence of end-user price regulation. In the case of price dispersion and mark-ups the effect is perverse (i.e. the presence of regulation will likely reduce price dispersion and mark-ups, which are outcomes that are also consistent with competition). Adjustments to these indicators for the end-user price regulation is necessary (see Section 5.1); and
- whilst market liquidity has been identified as a potential barrier to entry, we have not currently identified an appropriate country level measure that is robust and complete.

Given the above choice of indicators, compiling and reviewing the data for them highlighted some of the challenges in creating a robust and consistent data set, including:

- previously available data no longer being produced, e.g. HHI;
- data not being available annually (e.g. DG Justice data on ability to compare process, whether the market meets expectation, and switching of tariffs with an existing supplier);[40]
- data are from different sources and are not always consistent (e.g. data on switching from CEER and DG Justice are different, and, for a couple of countries, there are more national suppliers (using CEER data) than offers in capital cities); and

[40] Although previously available annually, towards the end of our study, we understood that these will only be available every other year in future.

- gaps in the data series (complete data were only available for a couple of series, most but not all, gaps can be filled either by using proxies or past years' data, but this reduces the quality of the data and eventual results).

If ACER is to produce a CI, it will need to continue to identify the completeness and quality of the indicators in order to understand the robustness of the resulting CI, as well as to potentially improve it. We believe this assessment of data quality needs to be made transparent as part of the presentation of the CI so that users can appropriately interpret the results (see Section 5.3).

# 5. Construction of Composite Indicator

In this Chapter, we describe the approach to combining the above indicators into a single CI. This involves three main components, as summarised in Figure 3, and as follows:

- *Normalisation* – the various indicators are expressed in different measurement units. Prior to them being combined, therefore, they need to be converted to a common unit of measure. We consider normalisation in Section 5.1;
- *Weighting and aggregation* – the individual indicators need to be weighted and aggregated to produce the CI, as described in Section 5.2; and
- *Uncertainty and sensitivity testing* – with the CI created, the sensitivity of results to the data and methodological choices should be assessed, see Section 5.3.

## 5.1 Normalisation

The data underlying the indicators have different measurement units. For example, some are expressed as percentages (CR3, switching rates), some as scores from 1-10 (DG Justice data on ease of comparing prices and whether the market meets expectations), and some as numbers in the more general sense (e.g. number of suppliers and offers per supplier). In order to aggregate the various indicators into a single CI, they first need to be normalised.

There are several alternative methods of transforming indicators into a comparable scale, of which ranking, standardisation, min-max normalisation, distance to a relative measure, and categorical scales are the most simple and transparent methods:[41]

1. *Ranking.* This is the simplest normalisation technique. This method is not affected by outliers in the data, but country performance in absolute terms is lost.
2. *Standardisation (or z-scores).* This involves converting indicators to a common scale with a mean of zero and standard deviation of one. Extreme values or outliers can affect the CI.
3. *Min-Max normalisation.* This method involves standardising indicators to have an identical range (0, 1) by subtracting the minimum value and dividing by the range of the indicator values. Again, extreme values or outliers can affect the CI, although OECD (2008) notes that compared to the z-score approach, min-max normalisation could widen the range of indicators within a small interval.
4. *Distance to a reference measures.* This involves evaluating the position of a given indicator relative to a reference point. In terms of benchmarking countries, the reference point could be a national target to be reached, an external benchmark country, the average country of the group, or the group leader.
5. *Categorical scale assigns a score for each indicator.* Under this method, scores are attributed to indicators according to a scale. For example, scores might be attributed based on the percentile of the distribution of the indicator across countries. A country with an indicator of 95% might score 10, another with a value 85% might score 9. Within this normalisation approach, qualitative indicators can be readily incorporated, e.g. for "yes" or "no" indicators scores of 10 and 0 might be attributed. Defining the ranges for scores is important; for example, large ranges may mean significant improvements lead

[41] These are described more fully in OECD (2008), pgs 27-31 and 83-88.

to no change in score, while, if scores are assigned by ranges, small changes near a threshold can lead to an increase in score.

Our preference is to use a categorical scale in which country performance in cardinal variables is converted to a score from 0 to 10. Our preference for this approach is based on several factors:

- The scores can be set such that they will not be distorted by outliers, as can be the case with z-score, min-max and distance to a reference measure;
- Some measure of comparative performance between countries is retained, unlike with ranking;
- The categories can be set for each indicator so that the scores more closely reflect the implications for competition (e.g. there may be thresholds on, say switching rates or market concentration, above or below which there is no discernible difference for competition); and
- The approach is relatively simple to implement, supporting transparency.

Whilst our preference is for categorical scales, we have incorporated into the CI tool we have developed the flexibility to apply alternative normalisation approaches (see Section 5.3).

In the following, we consider for each of the preferred indicators details of the approach to normalisation, with the exception of the DG Justice data, which is already on a 1-10 scale. Our choices on the categorisation are variously informed by economic theory, expert judgement and the details of the data (Annex D graphs the data used for the purposes of creating the Pilot CI). In general, to avoid the discontinuity that can occur by applying scores to defined ranges, we apply linear relationships between the indicator and the score.

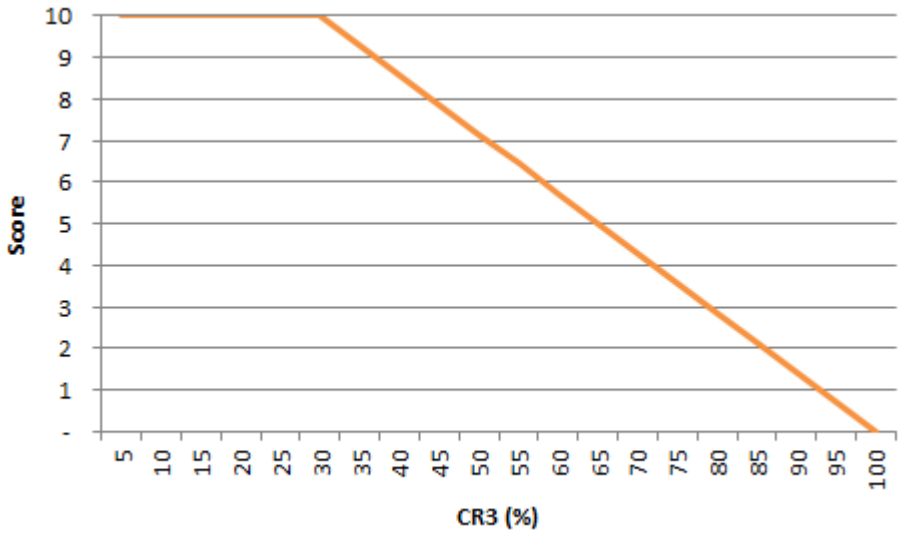
### 5.1.1. Structure / feature indicators

#### *Concentration Ratio 3 (CR3)*

CR3 is the market share of the three largest suppliers. The higher CR3, then the greater is the market power, to the potential detriment of competition.

There is no definitive guidance on what levels of CR3 constitute a concentrated market, or a market that is competitive. However, at a level of around 30% to 40% market are likely to be competitive. For the purposes of normalisation, we assume that a CR3 of 30% or below constitutes a competitive market and attracts a maximum score of ten. This is the same lower threshold as used in Oxera (2007). Above this level, we assume a linear relationship between CR3 and the score to zero at a CR3 of 100%. This is illustrated in Figure 7.

Figure 7: Scoring of CR3




### *Number of suppliers*

Other things equal, the more active suppliers in a market, the greater the competition. Accordingly, for the purposes of normalising the number of suppliers, we assume that the score increases linearly with the number of firms; starting with a score of zero, where there is a monopoly, and rising to a maximum score of ten in a market when there are twenty firms. NordReg (2010) had applied a threshold of ten firms. As well as preventing outliers from distorting scores, this threshold is a recognition that the impact on competition of an additional firm is likely to be less the more firms there are in the market.

## 5.1.2. Behaviour / conduct indicators

### *Annual entry / exit*

In general, higher entry and exit activity can be a sign of competition. As discussed in Section 4.3.2, data on annual net entry is available. For the purposes of creating the CI, using the currently available data, we assume that higher positive net entry is a sign of greater competition. Accordingly, for the purposes of normalisation, we attribute a score of zero where net entry is zero, with the score rising linearly, up to ten, with net entry of five suppliers.

### *Switching rates*

Higher switching rates are consistent with greater competition, but we assume that once switching reaches a certain level the impact on competition is no greater. Oxera (2007) put this point at 5% (implying that, on average, a consumer switches once every twenty years), whilst NordReg (2010) set it at 12% (implying that, on average, a consumer switches around once every eight years). Our view is that these values are relatively low. We attribute a score that increases linearly with the switching rate up to a maximum of ten for a switching rate of 20%. This switching rate implies that, on average, a consumer switches once every five years.

For the percentage of non-switchers, we allocate a score of ten where all have switched and a score of zero where none have switched, with a linear relationship in-between.

#### *Offers per supplier*

The offers per supplier indicator is intended to measure innovation, which is associated with competition. In deciding on the normalisation of this indicator, we reviewed the values it takes (ranging from 1 to just over eight in gas and just over five in electricity) – see Figure 21. We propose that scores are attributed from zero for one offer per supplier, through to ten for five or more offers per supplier.

### 5.1.3. Outcome / performance indicators

#### *Price dispersion*

With a homogenous product, such as energy, competition will tend to result in a relatively low dispersion of prices. However, in the case of retail energy, price dispersion as an indicator of competition is complicated by the presence of end-user price regulation. In particular, low (or no) price dispersion could be the result of prices being regulated, rather than of competition. Accordingly, we make an adjustment to price dispersion as part of the normalisation process.

First, we attribute a score of zero for a dispersion of 100% (or more), with the score rising linearly to ten for a dispersion of zero. We then multiply the score by the number of people who are *not* subject to a regulated tariff. In other words, a country with no price dispersion and no end user price regulation will score ten, however, if there is no price dispersion but half of consumers are subject to a regulated tariff, then a score of five will result. The calculation is as follows:

*Score = (1 – price dispersion %) * (% of customers not on a regulated tariff)*

#### *Average mark-ups*

We use the difference between the retail price and the wholesale component (expressed as a % of the retail price), as a proxy for mark-up. Other things equal, the more competitive a market, the lower the mark-up will be. However, similar to the measure of price dispersion, mark-ups may be affected by end-user price regulation, with low mark-ups potentially reflecting regulation, rather than competition. Accordingly, we adopt a similar approach to normalising average mark-up as for price dispersion, i.e. by adjusting the initial score by the percentage of customers not on a regulated tariff. We also subject mark-up to a non-negativity constraint. The initial score is determined by ascribing a score of ten to an average mark-up of zero, or below, with the score decreasingly linearly to zero with a 100% mark-up.

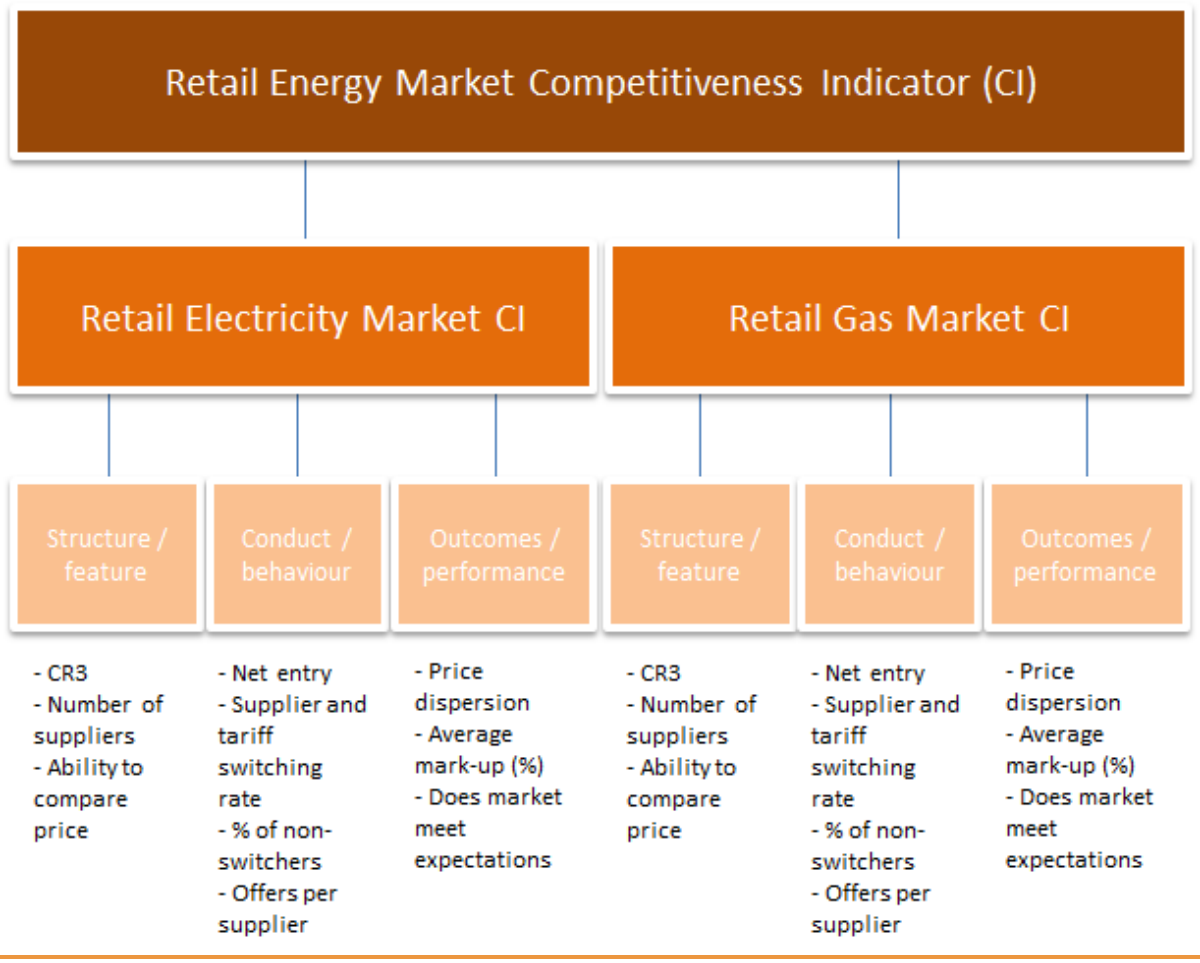
## 5.2 Weighting and aggregation

To create the CI, the normalised indicators need to be combined. This involves weighting the indicators and then aggregating them.

### 5.2.1. Structure of composite indicator(s)

In light of our review of the literature, we propose the creation of two CIs; one for gas and one for electricity. For each of these two CIs, countries will be scored based on indicators that fall into the three areas summarised in Table 3, i.e structure of the market, conduct of market participants, and outcomes in the market. It is also possible to combine these two CIs into a single retail energy market competitiveness index, as illustrated in Figure 8, although there are potential problems in doing so (see Section 5.2.3).

Figure 8: Overview of main components of composite indicator




### 5.2.2. Approaches to weighting indicators

There is no objective way to determine the weights to apply to the indicators in creating the CIs for retail electricity and retail gas market competitiveness; rather subjective judgement needs to be applied.

There are three broad approaches to determining weights for a CI:

- *Equal weights* – this is the most commonly applied approach. Equal weighting implies that all indicators are equally important in explaining the phenomenon to be measured. This approach is both simple to apply and easily understood. However, it does not take into account the theoretical importance of individual indicators, the statistical quality of

the data, or the degree of correlation (and potential for double counting) across indicators. Also, if indicators are seen as representing different categories that explain competitiveness (as we have suggested in our theoretical framework) then applying equal weights to the indicators will result in an unequal weighting of these categories if there are different numbers of indicators across them

- *Participatory approaches* – these involve stakeholders (e.g. experts, politicians, the public) determining weights There are a number of different ways in which this can be done, ranging from relying on the judgement of an expert, through to more involved techniques (involving engagement with multiple stakeholders) such as budget allocation processes, conjoint analysis and analytical hierarchy processes.[42] These approaches all benefit from being based on the views and opinions of experts and are likely to reflect the theoretical importance of each of the indicators. However, both conjoint analysis and the analytical hierarchical process are relatively complex and costly to implement - requiring, as they do, large numbers of preferences and pairwise comparisons. Budget allocation processes or simple expert judgement are easier and less costly to implement. Reliance on expert judgement also benefits from being informed by the extent of correlation between indicators and the potential to adjust weights to avoid double counting.
- *Statistical approaches* – these include the application of techniques such as data envelopment analysis or factor analysis to determine weights. Whilst these approaches determine weights, they are not more objective than participatory approaches as the choice of the method in the first instance, as well as in how it is applied, remain subjective. These approaches may be more complex to implement and less transparent, with answers being produced by a "black box". Also, these approaches do not account for data quality or the theoretical importance of indicators.

For the purposes of determining the weights in creating retail electricity and gas market CIs, we consider it appropriate to rely on expert judgement. This is informed by several factors:

- The theoretical importance of the different indicators, and groups of indicators, can be taken into account in determining the weights, in contrast to the statistical based approaches and equal weighting;
- The basis *and* rationale for the weighting can be made transparent. Again, this is in contrast to the statistical approaches and also, to an extent, some of the more complicated participatory approaches;
- The approach is relatively simple to implement and update (compared to most other approaches); and
- Concerns over data quality can be taken into account in determining weights. Although, ideally, in the use of expert judgement, weights would be based on the relevance of the indicator and not the quality of the underlying data, we believe it important to recognise that some data series are more complete than others and more closely align to the phenomenon of interest relevant to competition (see comments in Section 4.6). In this context, we believe it pragmatic to retain the ability to adjust weights for data quality.

[42] These are described in OECD (2008), pg 96-99. In brief: the budget allocation process involves stakeholders attributing a "budget" of 100 points across indicators; the analytical hierarchy process involves determining weights from the results of an ordinal pairwise comparison of attributes (defined through a hierarchy) by stakeholders; and conjoint analysis involves determining weights from stakeholders' stated preferences for sets of values of the individual indicators.

### 5.2.3. Proposed indicator weightings

Our proposed weightings of the indicators are shown in Table 8. Across the three main areas of structure, conduct and performance, greater emphasis is placed on performance (40%), compared to the others (30% each), on grounds that it is the outcomes of competition that matter most. The three indicators within the performance area (price dispersion, quality and mark-up) are of equal importance and, therefore, given equal weights. Of the indicators within the structure area, greater emphasis is placed on market concentration (20%), as an important influence on competition, than on the ability to compare price (10%). Market concentration is measured by two indicators (CR3 and number of suppliers) which are given equal weights.

Of the indicators within the behaviour area, greater emphasis is placed on customer switching (15%), as it is a key factor in enhancing the beneficial effects of competition. Customer switching is comprised of two indicators (customer switching rates (both supplier switching and tariff switching with existing supplier) and the proportion of customers with the incumbent supplier, as a proxy for non-switchers) which are given equal weights. A lesser emphasis is placed on the number of offers per supplier (5%), which is a proxy for innovation, within the behaviour area.

Table 8: Proposed indicator weighting

| | **Proposed Weights** |
|---|---|
| **Structure / Features**, comprising: | **30%** |
| *Market concentration (CR3 and number of suppliers, equal weights)* | *20%* |
| *Ability to compare price easily* | *10%* |
| **Behaviour / Conduct**, comprising: | **30%** |
| *Annual net entry* | *10%* |
| *Customer switching (switching rates and non-switchers, equal weights)* | *15%* |
| *Number of offers per supplier* | *5%* |
| **Outcomes / performance**, comprising: | **40%** |
| *Price dispersion* | *13.3%* |
| *Does the market meet expectations* | *13.3%* |
| *Average mark-up* | *13.3%* |

As shown in Table 6, data series are not complete for all the indicators, even after imputation of missing data. Where this is the case for a particular country, we increase the weights of the other indicators in the same category (i.e. structure, conduct or performance) for that country, such that the weights of the remaining indicators in the category sum to the proposed category weights above (i.e. 30% for structure and conduct, and 40% for performance).[43] Where data are missing, the robustness of the results is diminished. As already noted, the imputation of data and remaining missing data informs part of the assessment of uncertainty (see Section 5.3). Once the indicator weights have been

[43] As an example, say that CR3 is missing for country A. CR3 has a proposed weighting of 10% in the index and is part of the structure category which has a weighting of 30%. For country A, the weight of CR3 is set to zero and the weights of the other two indicators in the structure category (number of suppliers and ability to compare price easily) are increased to 15% each, so that the weighting of the structure category remains at 30%. Weighting for countries where data are not missing would be unchanged.

adjusted for any missing data, the individually weighted indicators are then added together to provide the CI.

More generally, the choice of weighting on the final CI values is potentially significant. Accordingly, the CI tool we have developed allows for testing of the impact of alternative weights on the final indicator (see Section 5.3 for more details).

***Combining the retail electricity and retail gas market competitiveness indicators into a single retail energy market indictor***

The most intuitive and transparent way to combine the separate electricity and gas CIs into one indicator is to weight the two based on the relative sizes of the gas and electricity markets in each country. This means that a country with a small but uncompetitive gas market will not be unfairly penalised if it has a large, competitive electricity market and vice versa. The size could be measured using million tonne oils equivalent of consumption.

A potential problem with creating a single CI in this way is that it is possible for a country with lower individual electricity and gas market scores than another country, to achieve a higher overall energy market score than that country depending on the relative electricity and gas market sizes. An aggregation methodology where such an outcome is possible may not be robust, since intuitively a country with the most competitive electricity and gas markets when taken separately should have the most competitive energy market overall. If this issue is encountered then one solution may be to rebase the electricity and gas market scores such that the score of the most competitive country is converted to the maximum possible score of 10, while the scores of other countries are changed in proportion to the scores of the most competitive country. This method, known as the 'Rebased Cardinal Approach', is determined to be the most suitable of a number of alternative aggregation methodologies described in Oxera (2007) to solve this problem.

## 5.3 Robustness

In constructing a CI, a number of judgements, which are ultimately subjective, are required. Most notably, these include the selection of indicators, data normalisation, and weighting. Choices over these components will, most likely, have consequences for the final CI for a country and, potentially, its ranking. It is important to understand how sensitive the results are to these choices, as well as the consequences of data quality.

In the following, we describe ways in which the robustness of the result can be assessed and apply these to the currently available data. There are two main considerations, first, the recognition that data quality will affect the confidence in the results for individual countries, and second the sensitivity of the results to the method adopted.

### 5.3.1. Data completeness

There are likely to be gaps in the data underlying the individual indicators, as identified in Section 4.4.1 for 2013 and (currently available) 2014 data. Some can be filled with proxies or previous years' values (as we've done for 2014 data, Section 4.4.2), whilst others may not be filled in this way. In either case, the confidence that can be placed in the final results of the CI is reduced.

As part of the method, we propose that the extent of data imputation and missing data is made explicit, and converted into a confidence ranking per country.

For the purposes of this report, using the data currently available to us, we identify in Table 9 the data that have been imputed or remain missing for each country. We then convert these into a relative assessment of confidence in the resulting value for each country based solely on data completeness. This ranking attributes one point for each indicator which is imputed and two points for each indicator that is missing. Ranking of high, medium, or low are then attributed based on the following points:

- *High: 2 points or less* - this is equivalent to missing data for one indicator, or two indicators for which data are imputed;
- *Medium: 2-4 points*; and
- *Low: 5 points or more* - this is equivalent to data for half of all indicators being imputed.

The data gaps for 2014 were greater than for 2013. The main reason for this is that two of the proposed indicators from DG Justice (on ease of comparing price and whether the market meets expectations) have been available annually but, during the course of this study, we understand that these will only be available every other year. For the purposes of this report, we have used 2013 values to fill the gaps.

| Table 9: Imputed and missing data by country, 2014 data (10 indicators) | | | | | | |
|---|---|---|---|---|---|---|
| | Electricity | | | Gas | | |
| | Imputed | Missing | Score (Confidence) | Imputed | Missing | Score (Confidence) |
| **Austria** | 2 | 1 | 4 (Medium) | 2 | 1 | 4 (Medium) |
| **Belgium** | 5 | 0 | 5 (Low) | 3 | 0 | 3 (Medium) |
| **Bulgaria** | 2 | 1 | 4 (Medium) | 2 | 0 | 2 (High) |
| **Croatia** | 2 | 1 | 4 (Medium) | 2 | 0 | 2 (High) |
| **Cyprus** | 2 | 1 | 4 (Medium) | n.a. | n.a. | n.a. |
| **Czech Rep.** | 4 | 0 | 4 (Medium) | 3 | 0 | 3 (Medium) |
| **Denmark** | 3 | 1 | 6 (Low) | 4 | 0 | 4 (Medium) |
| **Estonia** | 3 | 1 | 5 (Low) | 3 | 1 | 5 (Low) |
| **Finland** | 3 | 1 | 5 (Low) | n.a. | n.a. | n.a. |
| **France** | 2 | 0 | 2 (High) | 2 | 0 | 2 (High) |
| **Germany** | 3 | 0 | 3 (Medium) | 5 | 0 | 5 (Low) |
| **Great Britain** | 2 | 0 | 2 (High) | 2 | 0 | 2 (High) |
| **Greece** | 2 | 0 | 2 (High) | 2 | 0 | 2 (High) |
| **Hungary** | 3 | 0 | 3 (Medium) | 4 | 0 | 4 (Medium) |
| **Ireland** | 2 | 1 | 4 (Medium) | 2 | 0 | 2 (High) |
| **Italy** | 2 | 1 | 4 (Medium) | 2 | 1 | 4 (Medium) |
| **Latvia** | 3 | 0 | 3 (Medium) | 2 | 0 | 2 (High) |
| **Lithuania** | 2 | 0 | 2 (High) | 2 | 0 | 2 (High) |
| **Luxembourg** | 2 | 1 | 4 (Medium) | 2 | 1 | 4 (Medium) |
| **Malta** | 2 | 1 | 4 (Medium) | n.a. | n.a. | n.a. |
| **Netherlands** | 3 | 1 | 5 (Low) | 2 | 1 | 4 (Medium) |
| **Norway** | 2 | 0 | 2 (High) | n.a. | n.a. | n.a. |
| **Poland** | 2 | 0 | 2 (High) | 3 | 0 | 3 (Medium) |
| **Portugal** | 2 | 0 | 2 (High) | 3 | 0 | 3 (Medium) |
| **Romania** | 2 | 0 | 2 (High) | 2 | 0 | 2 (High) |
| **Slovakia** | 2 | 0 | 2 (High) | 2 | 0 | 2 (High) |
| **Slovenia** | 2 | 0 | 2 (High) | 3 | 1 | 5 (Low) |
| **Spain** | 3 | 0 | 3 (Medium) | 2 | 0 | 2 (High) |
| **Sweden** | 4 | 1 | 6 (Low) | n.a. | n.a. | n.a. |

Note: n.a. = not applicable.

### 5.3.2. Sensitivity to Method

#### *Normalisation*

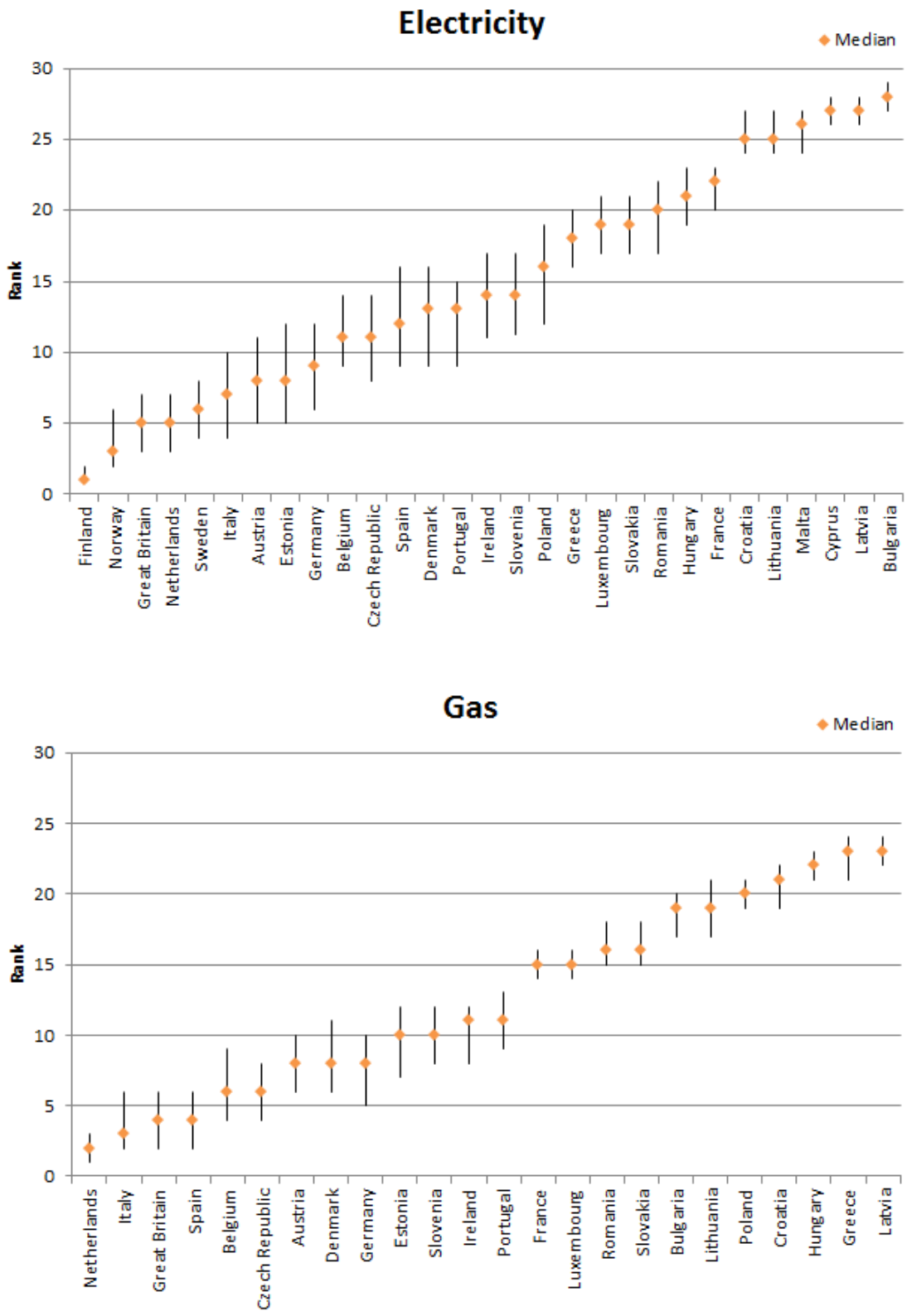
The impact of different normalisation approaches on rankings can be identified using a simple comparison, as shown in Table 10. Based on the data used for this report, it is clear that the choice of normalisation is significant to the final ranking. For the reasons described in Section 5.1, our preference is for a categorical scale.

| Table 10: Country ranks by normalisation approaches | | | | | | |
|---|---|---|---|---|---|---|
| | Electricity | | | Gas | | |
| | Z-score | Min-max | Categorical | Z-score | Min-max | Categorical |
| **Austria** | 14 | 11 | 6 | 17 | 13 | 6 |
| **Belgium** | 9 | 8 | 12 | 3 | 3 | 7 |
| **Bulgaria** | 29 | 29 | 29 | 18 | 19 | 18 |
| **Croatia** | 26 | 26 | 24 | 22 | 22 | 21 |
| **Cyprus** | 28 | 27 | 27 | n.a. | n.a. | n.a. |
| **Czech Rep.** | 4 | 4 | 9 | 2 | 2 | 5 |
| **Denmark** | 8 | 16 | 15 | 10 | 9 | 8 |
| **Estonia** | 13 | 9 | 8 | 4 | 4 | 9 |
| **Finland** | 2 | 2 | 1 | n.a. | n.a. | n.a. |
| **France** | 16 | 20 | 23 | 16 | 15 | 15 |
| **Germany** | 17 | 10 | 10 | 8 | 6 | 10 |
| **Great Britain** | 10 | 7 | 4 | 13 | 7 | 3 |
| **Greece** | 27 | 21 | 19 | 20 | 21 | 23 |
| **Hungary** | 23 | 24 | 22 | 24 | 24 | 22 |
| **Ireland** | 20 | 14 | 14 | 15 | 12 | 12 |
| **Italy** | 21 | 12 | 5 | 12 | 11 | 2 |
| **Latvia** | 25 | 28 | 28 | 21 | 23 | 24 |
| **Lithuania** | 19 | 23 | 25 | 11 | 17 | 20 |
| **Luxembourg** | 22 | 15 | 18 | 23 | 16 | 14 |
| **Malta** | 24 | 25 | 26 | n.a. | n.a. | n.a. |
| **Netherlands** | 5 | 5 | 3 | 1 | 1 | 1 |
| **Norway** | 1 | 1 | 2 | n.a. | n.a. | n.a. |
| **Poland** | 12 | 18 | 17 | 19 | 20 | 19 |
| **Portugal** | 7 | 13 | 16 | 7 | 10 | 13 |
| **Romania** | 15 | 22 | 21 | 14 | 18 | 16 |
| **Slovakia** | 11 | 19 | 20 | 9 | 14 | 17 |
| **Slovenia** | 6 | 6 | 11 | 6 | 5 | 11 |
| **Spain** | 18 | 17 | 13 | 5 | 8 | 4 |
| **Sweden** | 3 | 3 | 7 | n.a. | n.a. | n.a. |

### *Weights*

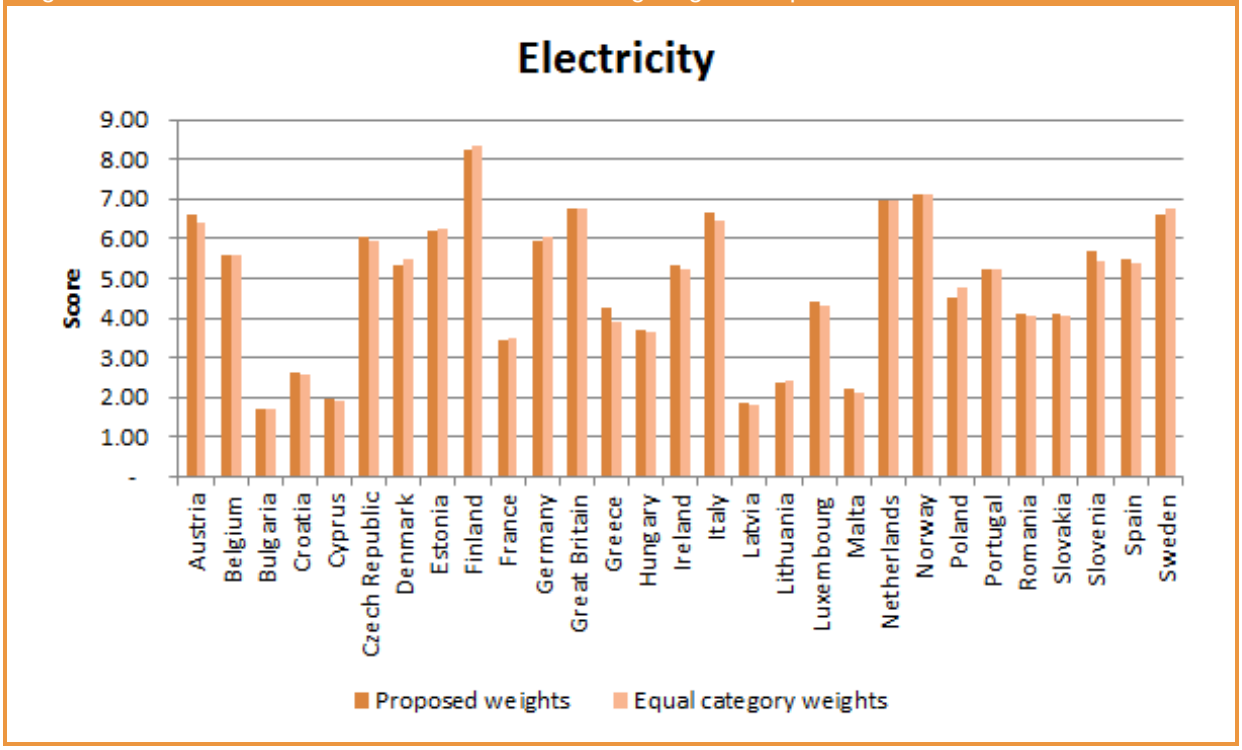
The weights attributed to indicators can have a material impact on the final score and ranking of a country's CI. Figure 9, shows the upper to lower quartile range of rankings of countries based on a Monte Carlo simulation of the weights. This simulation, included in the CI tool, assumes equal weighting of indicators (where data are not missing) as the starting point. The extent of variation in the rankings of countries shows the significance (or otherwise) of the decision regarding the weights attached to indicators.

Figure 9: Ranking results (upper quartile to lower quartile) of Monte Carlo on weights



More generally, the CI tool developed allows for different weights to be assigned to indicators (and the areas of structure, conduct and performance) so that the sensitivity of results to individual weights can be established. For example, Figure 10 compares our proposed weightings (and approach) to that of an equal weighting for each of structure, conduct and performance (adjusted for any missing data) and then equal weights of indicators *within* each category (i.e. categories with more indicators have lower weights). Scores are slightly changed and some ranking change as a result.

Figure 10: Bar chart of CI scores under different weighting assumptions



# 6. Presenting Results

There are a number of ways in which a CI can be presented and, in this Chapter, we propose some of the main options, along with a consideration of the advantages and disadvantages of each. For all of these options, we believe it important to present the CI in a context and manner that minimises the scope for misinterpretation and is transparent. This includes acknowledging that the CI is not a definitive picture of the competitiveness of retail energy markets; rather it is a simplification of a complex situation. Notwithstanding, a CI can provide for easier interpretation of complex issues and attract public interest (both through easier interpretation and the ability to compare countries). In this context, CIs are a potential complement to, not replacement of, more detailed analysis of the component indicators.

Our understanding is that if ACER presents the CI it will do so at the end of the retail chapter of the MMR. Doing this has the benefit that many, if not all, of the indicators that comprise the CI will have already been presented and discussed. The CI will, therefore, build on these, and act as a complement to the preceding analysis.

The results presented here are the outcome of our proposed methodology and the data utilised. For the definitive results reference is made to the 2014 Market Monitoring Report published by ACER.

## 6.1 Ordinal ranking

The simplest way to present the results of the CI is in tabular form showing the ranking of the countries; see Table 11 for an example. Such an ordinal ranking provides no information about the relative distances between the countries (or progress over time, where a time series is available). Whether this is an advantage or disadvantage could depend on the context. For example, if stakeholders are sensitive to their outcomes of the CI, a simple ordinal ranking may be more acceptable than a cardinal ranking if that shows large distances between some countries.

Another option for presenting the results of the CI as an ordinal ranking is to put the countries into groups, e.g. those in the top five, those in sixth to tenth, etc. This is illustrated in Table 12. By not revealing the position of countries within the groups, this approach presents less information than a simple ordinal ranking of all countries. Again, this may be appropriate depending on how sensitive stakeholders are to outcomes.

Table 11: Ordinal Ranking of Retail Electricity and Gas Market Competitiveness

| Country | Electricity rank | Country | Gas rank |
|---|---|---|---|
| Finland | 1 | Netherlands | 1 |
| Norway | 2 | Italy | 2 |
| Netherlands | 3 | Great Britain | 3 |
| Great Britain | 4 | Spain | 4 |
| Italy | 5 | Czech Republic | 5 |
| Austria | 6 | Austria | 6 |
| Sweden | 7 | Belgium | 7 |
| Estonia | 8 | Denmark | 8 |
| Czech Republic | 9 | Estonia | 9 |
| Germany | 10 | Germany | 10 |
| Slovenia | 11 | Slovenia | 11 |
| Belgium | 12 | Ireland | 12 |
| Spain | 13 | Portugal | 13 |
| Ireland | 14 | Luxembourg | 14 |
| Denmark | 15 | France | 15 |
| Portugal | 16 | Romania | 16 |
| Poland | 17 | Slovakia | 17 |
| Luxembourg | 18 | Bulgaria | 18 |
| Greece | 19 | Poland | 19 |
| Slovakia | 20 | Lithuania | 20 |
| Romania | 21 | Croatia | 21 |
| Hungary | 22 | Hungary | 22 |
| France | 23 | Greece | 23 |
| Croatia | 24 | Latvia | 24 |
| Lithuania | 25 | | |
| Malta | 26 | | |
| Cyprus | 27 | | |
| Latvia | 28 | | |
| Bulgaria | 29 | | |

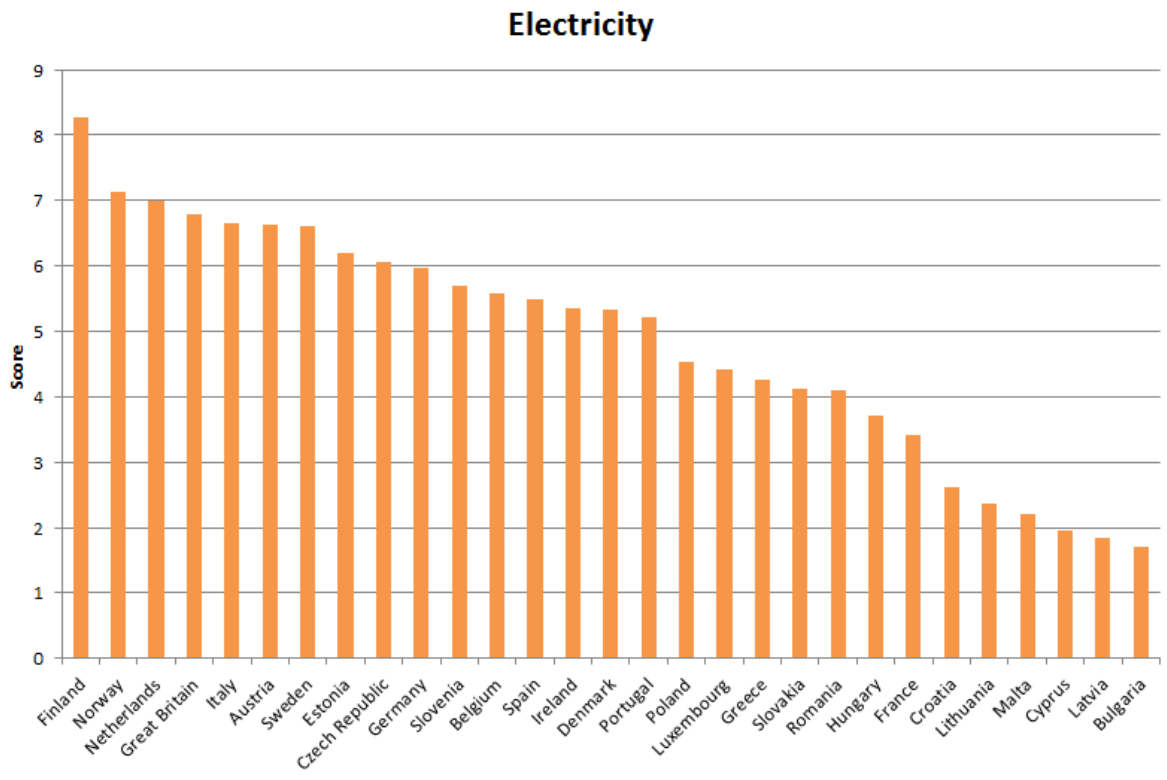
Table 12: Ordinal Ranking of Retail Electricity and Gas Market Competitiveness by Grouping

| Rank group | Electricity | Gas |
|---|---|---|
| 1 – 5 | Finland, Great Britain, Italy, Netherlands, Norway | Czech Republic, Great Britain, Italy, Netherlands, Spain |
| 6 – 10 | Austria, Czech Republic, Estonia, Germany, Sweden | Austria, Belgium, Denmark, Estonia, Germany |
| 11-15 | Belgium, Denmark, Ireland, Slovenia, Spain | France, Ireland, Luxembourg, Portugal, Slovenia |
| 16 – 20 | Portugal, Poland, Luxembourg, Greece, Slovakia | Bulgaria, Lithuania, Poland, Romania, Slovakia |
| 21 – 25 | Croatia, France, Hungary, Lithuania, Romania | Croatia, Greece, Hungary, Latvia |
| 26 – 29 | Bulgaria, Cyprus, Latvia, Malta | |

## 6.2 Cardinal results

The CI scores of each country can be presented, showing both the ranking of the countries and the relative distances between the countries in the scores. This could be done in tabular form (see Table 13) or in graphical form (see Figure 11). This presentation may prove more contentious than simply presenting an ordinal ranking, as it also conveys relative gaps between countries. Where a time series of the CI are available, presenting the score can show trends (e.g. even if ordinal rankings show no change, scores may illustrate that there is improvement over time).

Figure 11: Bar chart of CI scores



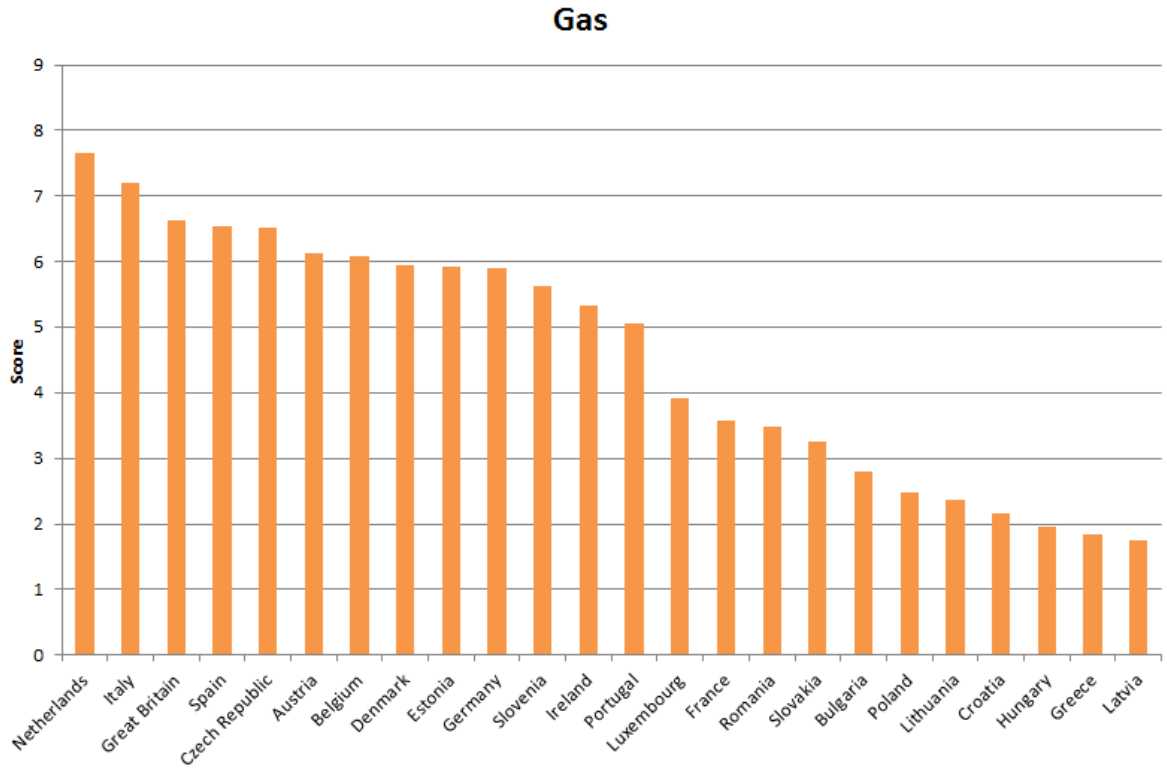



Table 13: Ranking and Scores of Retail Electricity and Gas Market Competitiveness

| Country | Electricity score | Country | Gas score |
|---|---|---|---|
| Finland | 8.3 | Netherlands | 7.7 |
| Norway | 7.1 | Italy | 7.2 |
| Netherlands | 7.0 | Great Britain | 6.6 |
| Great Britain | 6.8 | Spain | 6.5 |
| Italy | 6.7 | Czech Republic | 6.5 |
| Austria | 6.6 | Austria | 6.1 |
| Sweden | 6.6 | Belgium | 6.1 |
| Estonia | 6.2 | Denmark | 6.0 |
| Czech Republic | 6.1 | Estonia | 5.9 |
| Germany | 6.0 | Germany | 5.9 |
| Slovenia | 5.7 | Slovenia | 5.6 |
| Belgium | 5.6 | Ireland | 5.3 |
| Spain | 5.5 | Portugal | 5.1 |
| Ireland | 5.3 | Luxembourg | 3.9 |
| Denmark | 5.3 | France | 3.6 |
| Portugal | 5.2 | Romania | 3.5 |
| Poland | 4.5 | Slovakia | 3.3 |
| Luxembourg | 4.4 | Bulgaria | 2.8 |
| Greece | 4.3 | Poland | 2.5 |
| Slovakia | 4.1 | Lithuania | 2.4 |
| Romania | 4.1 | Croatia | 2.2 |
| Hungary | 3.7 | Hungary | 2.0 |
| France | 3.4 | Greece | 1.8 |
| Croatia | 2.6 | Latvia | 1.8 |
| Lithuania | 2.4 | | |
| Malta | 2.2 | | |
| Cyprus | 2.0 | | |
| Latvia | 1.8 | | |
| Bulgaria | 1.7 | | |

In addition, the CI can be presented as a stacked bar chart (as illustrated in Figure 12 and Figure 13). In these charts the confidence in the results based on data completeness can also be included (shown as L = Low; M = Medium; and H = High). These stacked bar charts show the contribution of each of the normalised and weighted indicators to the CI. This will make clear the areas which are driving the final scores and ranking. Before results are presented publicly, these need to be reviewed in detail and tied back to the original data to reduce the chances of an erroneous ranking based on poor data.

Figure 12: Stacked bar chart of CI scores - Electricity

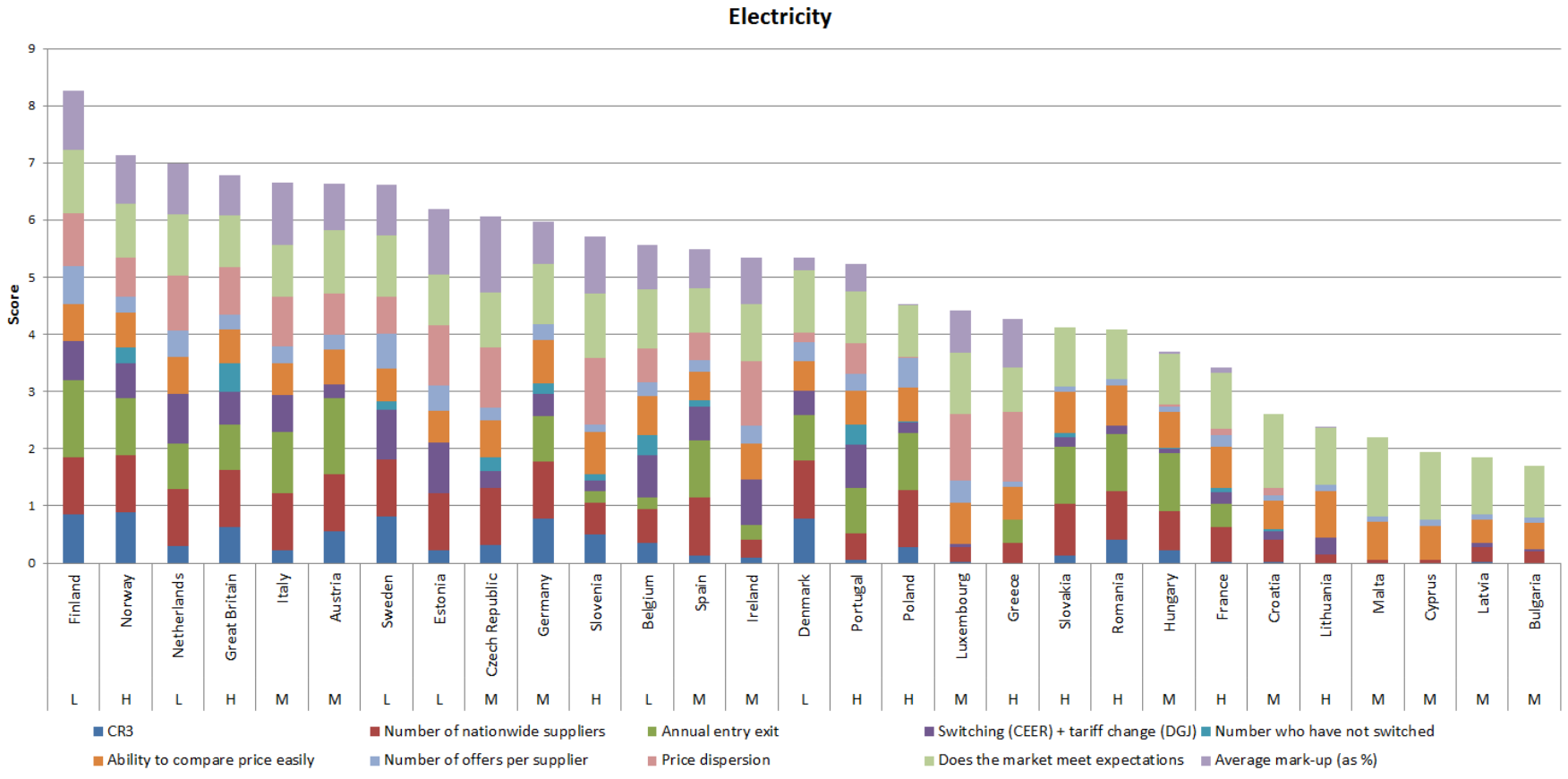


Figure 13: Stacked bar chart of CI scores - Gas

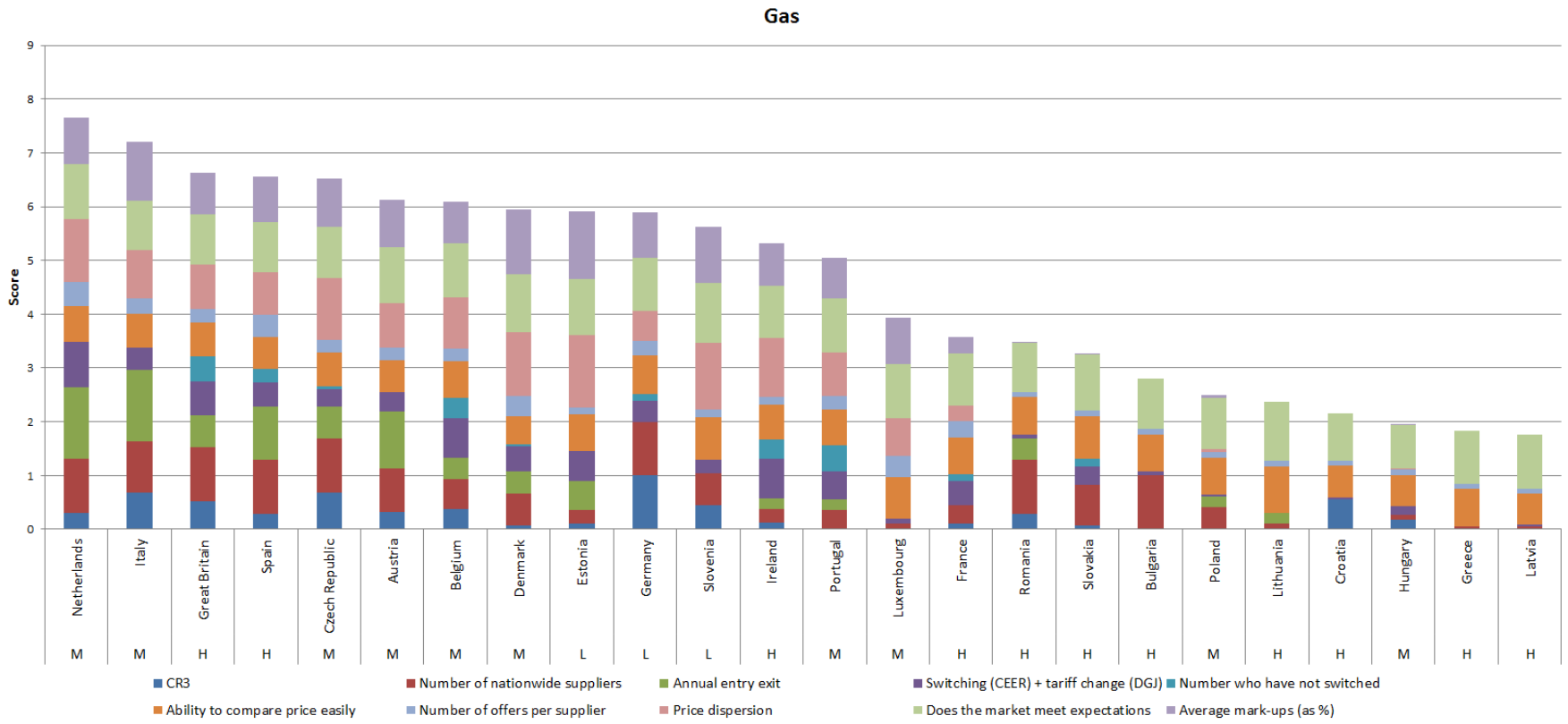
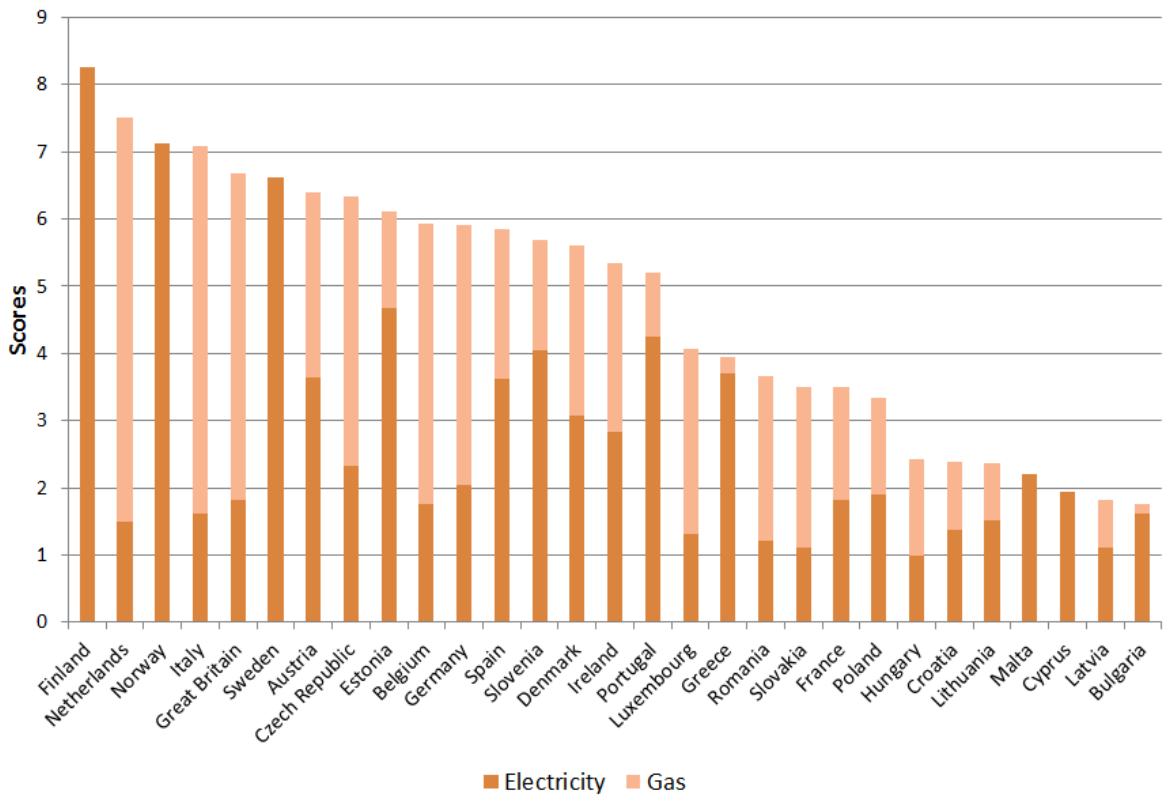


Figure 14 shows a consolidated energy retail market CI, with the separate contributions of electricity and gas.[44]

Figure 14: Illustration of stacked bar chart for a consolidated retail energy market indicator

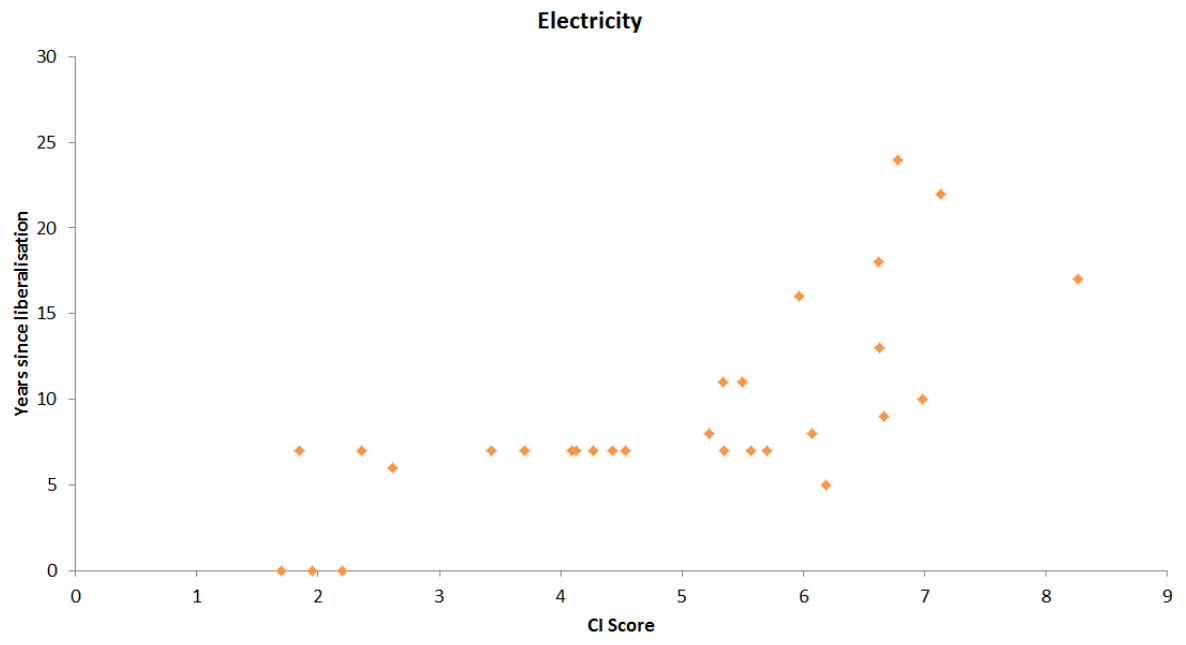



## 6.3 Links to other data

Relating the CI to other data can also be informative. For example, the extent of competition in retail energy markets may be explained, in part, by the time since market liberalisation. Presenting a scatter graph of the CI against the date of liberalisation, similar to the scatter graphs presented 3rd edition of the MMR, may help inform this (whilst recognising that correlation does not imply causation).

[44] As previously noted, weights for the electricity and gas CIs are based on the respective proportion of household consumption (in Million Tonne Oil Equivalents). In addition, where we have not calculated a gas CI, the weight is set to zero.

Figure 15: Illustration of scatter chart of Electricity CI against years since liberalisation



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# Annex B: Long-list of Indicators

In this Annex we detail a long list of potential indicators of competition in retail energy markets. This list (Table 14) has been constructed mainly from the indicators used in the various studies and reports reviewed in Chapter 2, in particular:

- indicators used in the retail chapter from the 3rd Edition of the MMR (these indicators are highlighted in the Table);
- other potential indicators from 3rd edition of the MMR, including in relation to:
  - wholesale competition; and
  - consumer protection.
- other indicators as identified in our literature review.

We have not, for the purposes of this long-list, been selective about the additional indicators included. Rather, we have included those used in literature we have reviewed, some of which are, arguably, not necessarily strong indicators. Our selection of indicators is described further in Chapter 4.

We are advised by ACER that a number of the indicators previously presented in the MMR will not be available for the next edition. In particular, these include the following:

- Herfindhal-Hirschman Index (HHI);
- Concentration Ratio of top 4 suppliers (CR4);
- Market consolidation on European level; and
- Market shares of cross border electricity supplier entrants in Europe.

Table 14: Long list of indicators

| Category | Indicator |
|---|---|
| Market Concentration | Herfindhal - Hirschman Index (HHI) of electricity and gas markets at the national level |
| | Market shares of the four largest suppliers in the electricity and gas retail markets (CR4) |
| | Number of nationwide household suppliers of electricity and gas |
| | European market share of major electricity suppliers and gas suppliers |
| | Market share of largest three suppliers (C3) |
| | Number of suppliers with market shares > 5% |
| Entry Barriers | Existence of barriers to entry (ACER ad-hoc survey) |
| | Existence of price reporting |
| | Liquidity (Traded volume as % of physical consumption) |
| | Wholesale price volatility |
| | Existence of standardised contracts |
| Others structures / features | Existence of end-user price regulation in a country |
| | Ability to compare price easily |
| | Percentage of customers eligible to receive a regulated end-user price |
| | Percentage of eligible customers supplied under regulated end-user prices |
| | Existence of a route to compensation and complaint resolution for customers who cannot resolve a complaint with their supplier (e.g. Energy Supply Ombudsman) |
| | Percentage of foreign ownership |
| | Degree of technical openness of the market (the ratio of interconnection to installed capacity) |
| | Existence of price comparison websites |
| | Share of households with smart meters |
| Entry / exit activity | 5 year average annual entry/exit activity in the household electricity and gas retail markets. |
| | Market shares of cross border electricity supplier entrants in Europe |
| | Number of suppliers that are not vertically integrated. |
| Customer Switching | Switching rates for electricity and gas household consumers |
| | Proportion of consumers who have switched supplier (i.e. proportion of consumers with non-incumbent supplier) |
| | Factors influencing consumer switching (various published sources) |
| | Savings available on incumbent's standard offer |
| | Rate of net loss of customers by electricity incumbents |
| | Number of renegotiated contracts for household customers as a percentage of customer numbers |
| | Ease of switching |
| Innovation | Number of electricity, gas and dual-fuel offers available to households in capital cities |
| | 'Type of energy pricing', i.e. the proportion of offers for which the energy component is (in electricity: fixed; variable; spot-based; or regulated – in gas: fixed; variable; or regulated) |
| | Product innovation (% of all gas and electricity accounts made up of 'innovative' products such as fixed price deals, green tariffs and online deals) |
| Retail prices | Post-tax Total Prices (POTP) and Pre-tax Total Prices (PTP) of electricity and gas for households and industry |

| | |
|---|---|
| | Compound Annual Growth Rate (CAGR) in POTP of electricity and gas for households and industry, including separately for the energy and non-contestable components (for electricity only) |
| | Breakdown of incumbent electricity and gas POTP offers in capital cities (by energy, network, tax and renewable charge (electricity only)) |
| | Household and industrial electricity prices by consumption band |
| | Dispersion in energy component of retail electricity and gas prices of households in capital cities |
| | Energy (i.e. contestable) component of price |
| | Spread between the most expensive and cheapest supplier |
| | Price spread on comparable products for typical household customer |
| | Inclusive of tax prices, using PPP exchange rates |
| | Inclusive of tax prices, using average annual market exchange rates |
| | Ratio of industrial to residential price |
| | Ratio of retail price to CPI |
| | Ratio of retail price to wages |
| | Price volatility |
| Quality | Rating of consumer experience of the electricity and gas markets (covering expectations, choice, comparability, and ease of switching) |
| | Number of customer complaints by category |
| | Number of delayed switches |
| | Number of failures in relation to the total switching rate |
| | Average time between a connection being requested by a customer and completed |
| | Average time until repair |
| | Relative number of disconnections |
| | Is there a charge for execution of maintenance services? Average time taken for execution of maintenance services. Average charge for execution of maintenance services |
| Costs and Margin | Average annual electricity mark-ups for electricity (2008-2013) and gas (2012-2013) |
| | Relation between wholesale and retail prices |
| | Weighted EBIT margin for main electricity and gas suppliers |
| | Cost per customer |

# Annex C: Indicator Sheets

The following Annex provides further details for each of the final proposed indicators presented in Section 4.6, and as listed in Table 15 below. In these indicator sheets, where we discuss data completeness, we are referring to data for 2013, which is the year we have used for this purposes of our study.

Table 15: Retail Market Competitiveness Indicators

| Category | Indicator | Reference |
|---|---|---|
| Structure / features | CR3 | Table 16 |
| Structure / features | Number of suppliers | Table 17 |
| Structure / features | Ability to compare prices | Table 18 |
| Behaviour / conduct | Annual entry / exit ratio | Table 19 |
| Behaviour / conduct | Switching rates (supplier and tariff) | Table 20 |
| Behaviour / conduct | % of non-switchers | Table 21 |
| Behaviour / conduct | Number of offers | Table 22 |
| Outcomes / performance | Price dispersion | Table 23 |
| Outcomes / performance | Does the market meet expectations | Table 24 |
| Outcomes / performance | Average mark-up | Table 25 |

**Table 16: CR3**

| | |
|---|---|
| **Indicator** | **Concentration Ratio (CR) 3** |
| **Description** | The CR3 is the percentage market share of the largest 3 firms in the industry. |
| **Source of data** | CEER Database (2.4 and 2.5) |
| **Quantification** | N.A. |
| **Unit of measure** | % |
| **Data completeness** | For 2013, there were 20 observations for electricity and 16 for gas.<br>For 2014 data were more complete, with 24 observations for electricity and 20 for gas. |
| **Evaluation** | Concentration ratios are a traditional structural measure of market concentration that is often used alongside the HHI. The definition of the concentration ratio does not use the market shares of all the firms in the industry and does not provide the distribution of firm size (as HHI does). However, CR3 is a useful indicator of market power. |
| **Normalisation** | We assume that at and below 30% a market is competitive and receives the maximum score (of 10). Between CR3 of 30% and 100%, the score reduces (linearly) to zero. |

| Table 17: Number of suppliers | |
|---|---|
| **Indicator** | **Number of suppliers** |
| **Description** | The number of *national* retail suppliers of electricity in a country. |
| **Source of data** | CEER Database (1.1.2) |
| **Quantification** | N.A. |
| **Unit of measure** | # |
| **Data completeness** | Data are relatively complete. For 2013, there were 26 observations in electricity and 23 in gas. In 2014, there were 26 observations in electricity and 25 in gas. |
| **Evaluation** | The number of suppliers can be viewed as complementary to CR3 as it contains information on the tail of the distribution of suppliers. As a national measure, it may not reflect the competitive position at a local or regional level. |
| **Normalisation** | We assume a score of zero for a monopoly, rising to a maximum score of 10, for 10 national suppliers. |

| Table 18: Ability to compare price easily | |
|---|---|
| **Indicator** | **Ability to compare price easily** |
| **Description** | View of consumers on ability to compare price, based on survey |
| **Source of data** | DG Justice |
| **Quantification** | This topic was assessed with one question: "*On a scale from 0 to 10, how difficult or easy was it to compare the products/services sold by different retailers/offered by different service providers?*" |
| **Unit of measure** | Scale from 0 to 10 |
| **Data completeness** | 2013 data are complete for electricity, and with 24 observations for gas. Although available annually in recent years, we understand this will only be available every other year, in future. |
| **Evaluation** | Comparability' reflects the ability of consumers to compare between products or services as they are offered by different suppliers or providers in the market, and implicitly includes a price and quality comparison. It is a measure of how easy it is for consumers to participate in the market. Although subjective in nature, the measure is broader than, say, a measure based on the number of price comparison websites (which says nothing about how good those websites are, or whether they are used). |
| **Normalisation** | No normalisation required, data are expressed from 1-10. |

| Table 19: Annual entry / exit ratio | |
|---|---|
| **Indicator** | **Annual entry / exit ratio** |
| **Description** | Entry exit activity in the household retail market |
| **Source of data** | CEER Database (1.1.1) |
| **Quantification** | Calculated as the change in the number of national suppliers from last year to this year |
| **Unit of measure** | # |
| **Data completeness** | For electricity, in 2013 and 2014, 25 observations were available. In gas 22 observations were available in 2013 and 21 in 2014. |
| **Evaluation** | Entry and exit activity is a potentially important indicator of competition. This proposed measure is essentially a measure of net entry (i.e. entry minus exit). This is not necessarily a good measure. Net entry could be zero because no firms either entered or exited, or because the same number of firms entered as exited. The latter is consistent with competition, but the former may not be. A measure based on gross entry (and/or exit) would not suffer from this. Notwithstanding, in more recently liberalised markets, which were previously served by monopolies, positive net entry is a sign of increasing competition. Moreover, data for net entry are available, unlike gross entry (and exit). |
| **Normalisation** | We assume a score of zero where net entry is zero, with the score rising linearly, up to ten, with net entry of five suppliers. |

| Table 20: Switching rates | |
|---|---|
| **Indicator** | **Switching rates (supplier and tariff)** |
| **Description** | Annual switching rate between suppliers in the household retail market (by number of eligible meter points) and switching between tariffs with existing supplier. |
| **Source of data** | CEER Database (3.2) – supplier switching<br>DG Justice – tariff switching |
| **Quantification** | Calculated as the percentage of supplier switching (from CEER) plus switching of tariff with an existing supplier (from DG Justice) |
| **Unit of measure** | % |
| **Data completeness** | In 2013, 25 observations were available for both electricity and gas. In 2014, 24 observations and 21 observations were available for electricity and gas respectively from CEER. DG Justice was available annually in recent years, but we understand will only be available every other year, in future. 2014 data are not available. |
| **Evaluation** | Higher switching rates are consistent with greater competition, although, conversely, low switching rates are not necessarily a sign of limited competition. While switching rates tend not to include those consumers who have switched tariff with an existing supplier, this proposed measure combines supplier switching and tariff switching, as both exert an influence on competition. |
| **Normalisation** | We assume that at switching rates above 20% or more, there is no additional impact on competition (this implies that consumers switch every five year, on average). Accordingly we attribute a score that increases linearly with the switching rate up to a maximum of ten for a switching rate of 20%. |

| Table 21: Percentage of non-switchers | |
|---|---|
| **Indicator** | **% of non-switchers** |
| **Description** | The market share of the incumbent supplier |
| **Source of data** | CEER Database (100 - % switchers) |
| **Quantification** | N.A. |
| **Unit of measure** | % |
| **Data completeness** | Data availability is limited. For 2013, there are 17 observations for gas and 16 observations for gas. We do not currently have 2014 data. |
| **Evaluation** | Where consumers do not switch, they exert no pressure on suppliers and there is less incentive for suppliers to compete. This is, therefore, a useful indicator. However, the data underlying the indicator is a proxy, based on the market share of the incumbent supplier. This measure, therefore, includes those who may have switched away from, but back to the incumbent, as well as those who may have switched tariff with the incumbent. |
| **Normalisation** | For the percentage of non-switchers, we allocate a score of ten where all have switched and a score of zero where none have switched, with a linear relationship in-between. |

| Table 22: Number of offers | |
|---|---|
| **Indicator** | **Number of offers per supplier** |
| **Description** | The number of offers per supplier |
| **Source of data** | ACER retail database (and NRAs) for both number of offers and suppliers |
| **Quantification** | Calculated as the number of offers divided by the number of suppliers |
| **Unit of measure** | # per supplier |
| **Data completeness** | For 2013, 29 observations are available for electricity and 26 for gas. For 2014, we currently have number of offers, but not the number of suppliers from the same source. |
| **Evaluation** | Innovation is promoted by, and is an indicator of, competition. In this context, innovation can include in pricing structure (e.g. fixed, variable, contract duration, etc) or product (e.g. green electricity). Using the total number of offers covers both of these aforementioned areas, while using the total number per supplier controls for the size of the market. |
| **Normalisation** | We attribute scores linearly, from zero for one offer per supplier, through to ten for five or more offers per supplier. |

| Table 23: Price dispersion | |
|---|---|
| **Indicator** | **Price dispersion** |
| **Description** | A measure of the extent to which the energy component of the retail price varies. |
| **Source of data** | ACER Database |
| **Quantification** | For the energy component of prices, the difference between the 10th percentile and the 90th percentile, divided by the average price. |
| **Unit of measure** | % |
| **Data completeness** | Data availability is good. 29 observations are available in electricity for both 2013 and 2014. In gas 25 observations are available in 2013 and 26 in 2014. |
| **Evaluation** | Prices are a key measure of competition. In retail energy markets, however, there are challenges in using prices, as they comprise several components, most of which suppliers have no control over and which can be legitimately different between countries, regardless of competition.<br>Price dispersion, however, does not suffer from these problems. As energy supply is a relatively homogenous good/service competition can be expected to result in relatively small differences between supplier prices within each country.<br>One challenge with this measure is that in countries with end-user price regulation, price dispersion will be low as a result of regulation rather than competition. Before including this measure in the CI, adjustment is made for this (see normalisation below) |
| **Normalisation** | We attribute a score as follows:<br>Score = (1 – price dispersion %) * (% of customers not on a regulated tariff) |

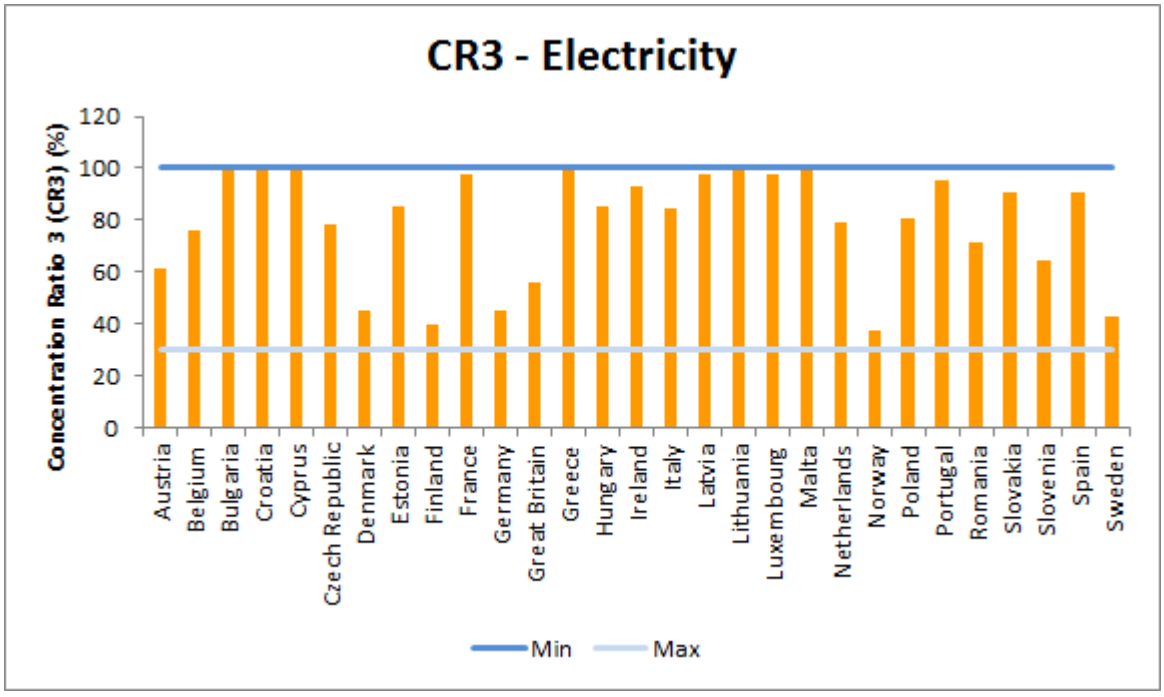
| Table 24: Does the market meet expectations? | |
|---|---|
| **Indicator** | **Does the market meet expectations?** |
| **Description** | A measure of the extent to which the market generally lives up to what consumers want, based on survey. |
| **Source of data** | DG Justice |
| **Quantification** | This topic is assessed with the question: "*On a scale from 0 to 10, to what extent did the products/services on offer from different retailers/providers live up to what you wanted within the past year?*" |
| **Unit of measure** | Scale from 0 to 10 |
| **Data completeness** | For 2013, 29 observations are available for electricity and 24 for gas. DG Justice was available annually in recent years, but we understand will only be available every other year, in future (2014 data are not available). |
| **Evaluation** | Suppliers can compete on quality (e.g. in customer service) as well as price. The measure of whether the market meets expectation is used as a proxy for quality and satisfaction with the services consumers receive. Although subjective, based on survey responses, we believe this is a preferable measure to, say customer complaints, which can relate to network issues as well as retail. |
| **Normalisation** | No normalisation required, data are expressed from 1-10. |

| Table 25: Average mark-up | |
|---|---|
| **Indicator** | **Average mark-up** |
| **Description** | Difference between the retail price and the estimated wholesale price, expressed as a % of the retail price. |
| **Source of data** | Eurostat and ACER Database |
| **Quantification** | Calculated as the retail price minus the wholesale price, expressed as a percentage of the retail price. |
| **Unit of measure** | % |
| **Data completeness** | In 2013 25 electricity and 26 gas observations were available. In 2014, 23 electricity and 25 gas observations were available. |
| **Evaluation** | Suppliers' margins, i.e. the spread between wholesale and retail prices, is a good indicator of the state of competition. Ideally this measure would be based on suppliers' actual margin data however, this is not typically available. This proposed measure is a proxy, using the difference between the average retail price and the energy component of retail prices.<br>As with price dispersion, average mark-ups could be low as the result of end-user price regulation, rather than competition, and this needs to be taken into account before it is included in the CI (see normalisation below). |
| **Normalisation** | For the purposes of normalisation all negative margins are set to zero. We attribute a score as follows:<br>Score = (1 – average mark-up %) * (% of customers not on a regulated tariff) |

# Annex D: Data Graphs

This Annex graphs the various indicator data (using data series where gaps have been filled as described in Section 4.4) for 2014, unless otherwise stated. The ‘min’ and ‘max’ lines show the threshold at which minimum and maximum scores are attributed in the categorical normalisation approach (see Section 5.1).

Figure 16: CR3 - Electricity and Gas



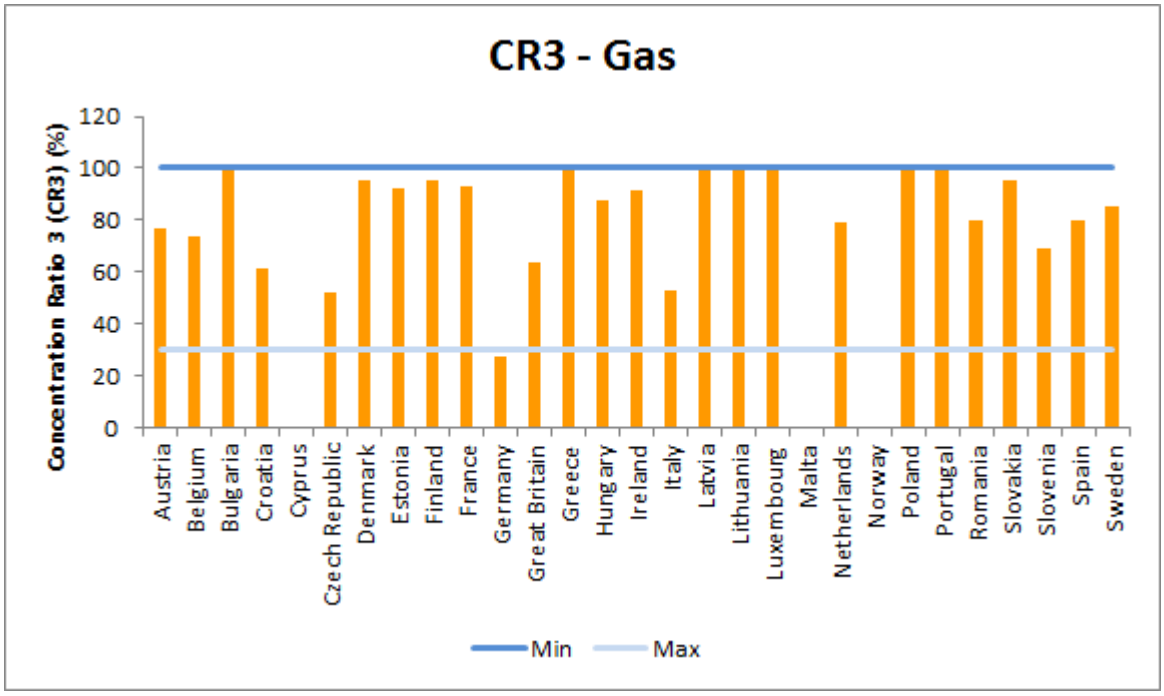
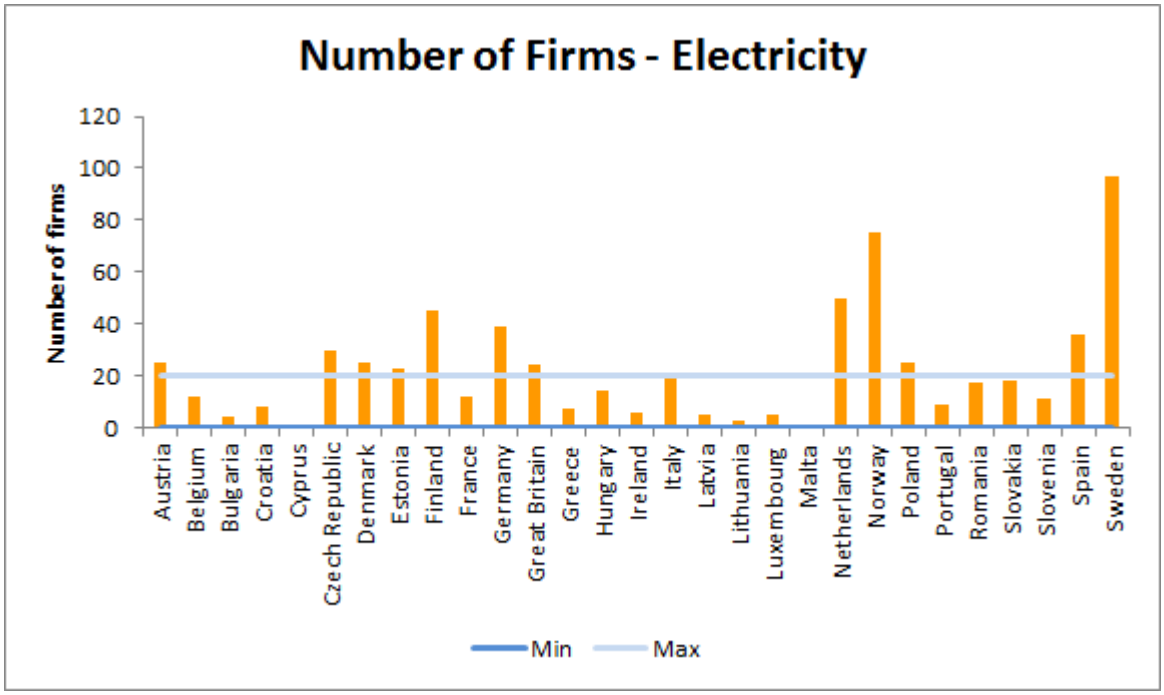



Figure 17: Number of national suppliers - Electricity and Gas



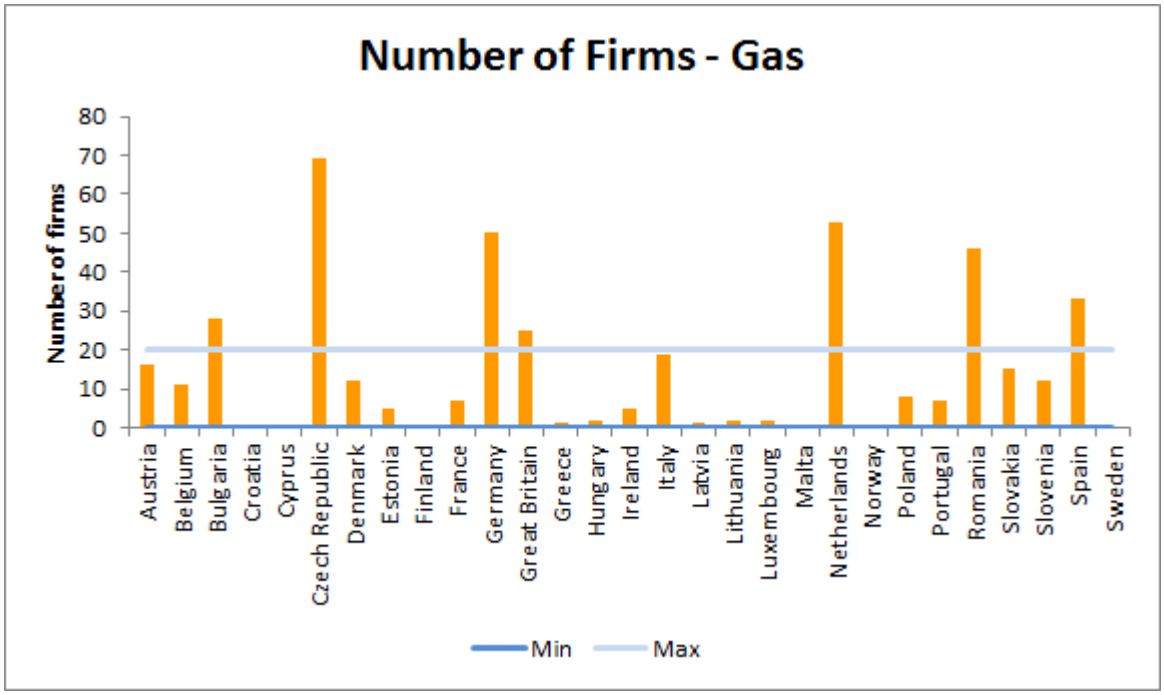
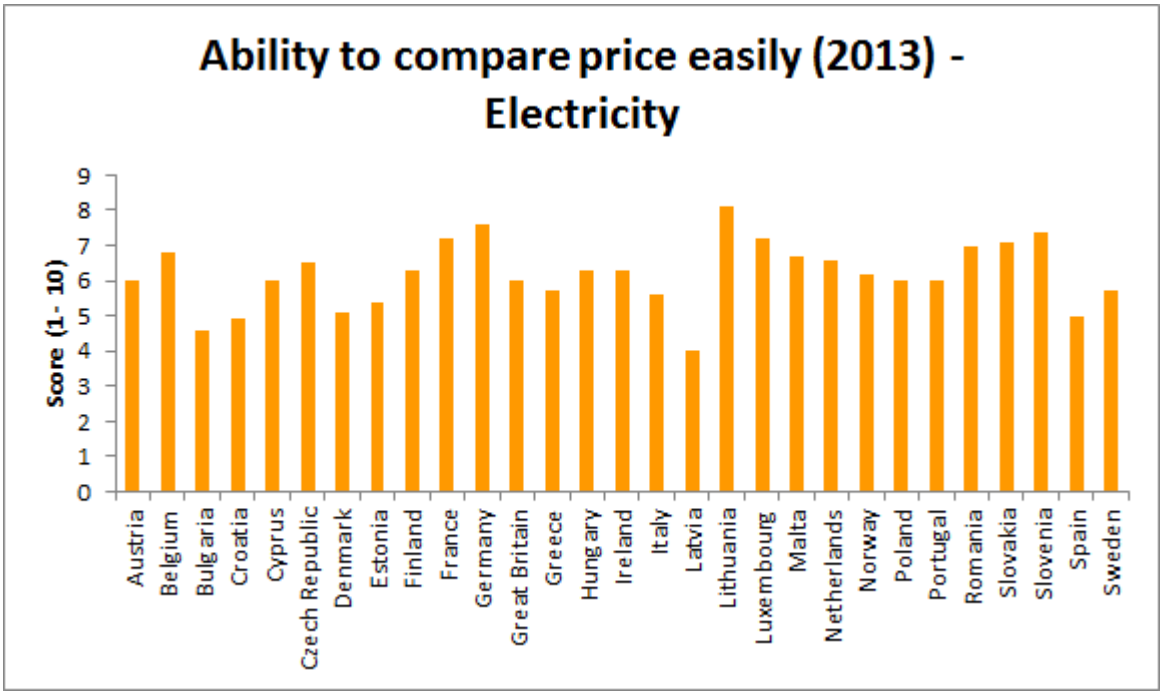



Figure 18: Ability to compare price easily - Electricity and Gas



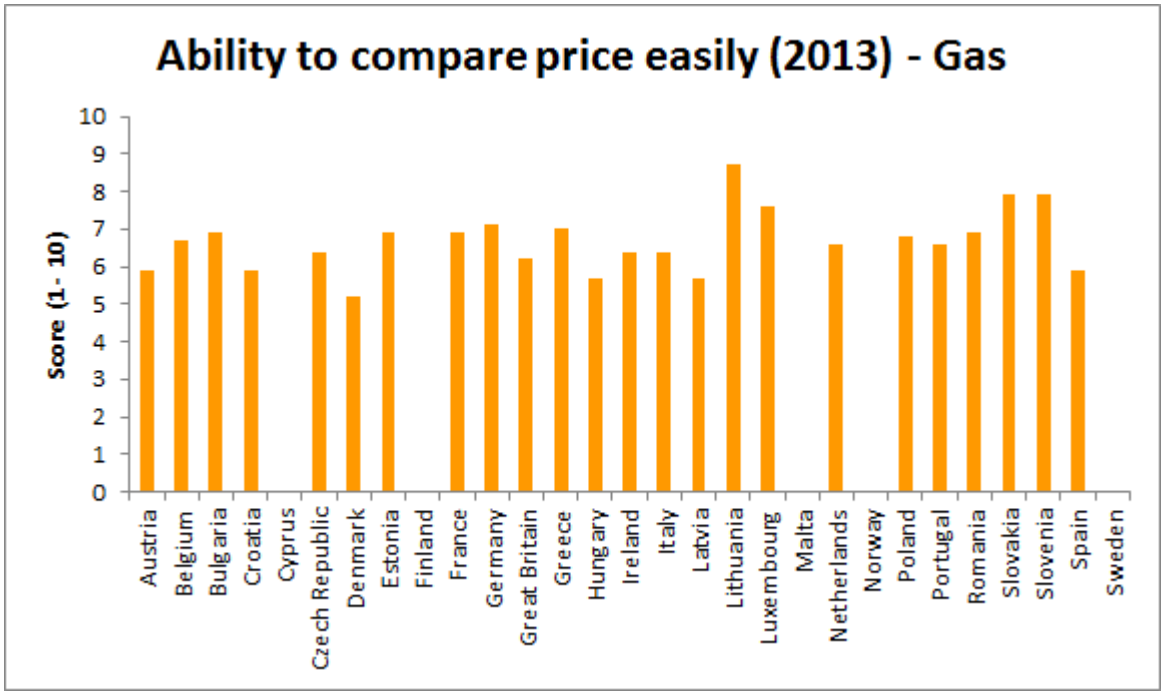
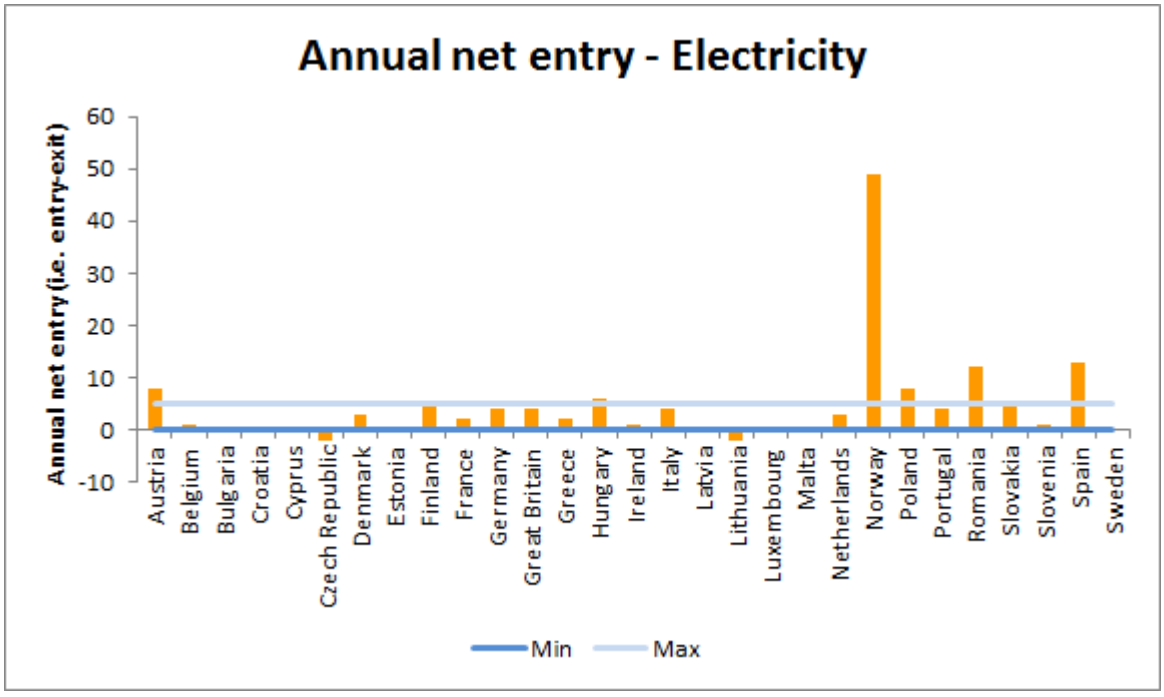



Figure 19: Annual net entry - Electricity and Gas



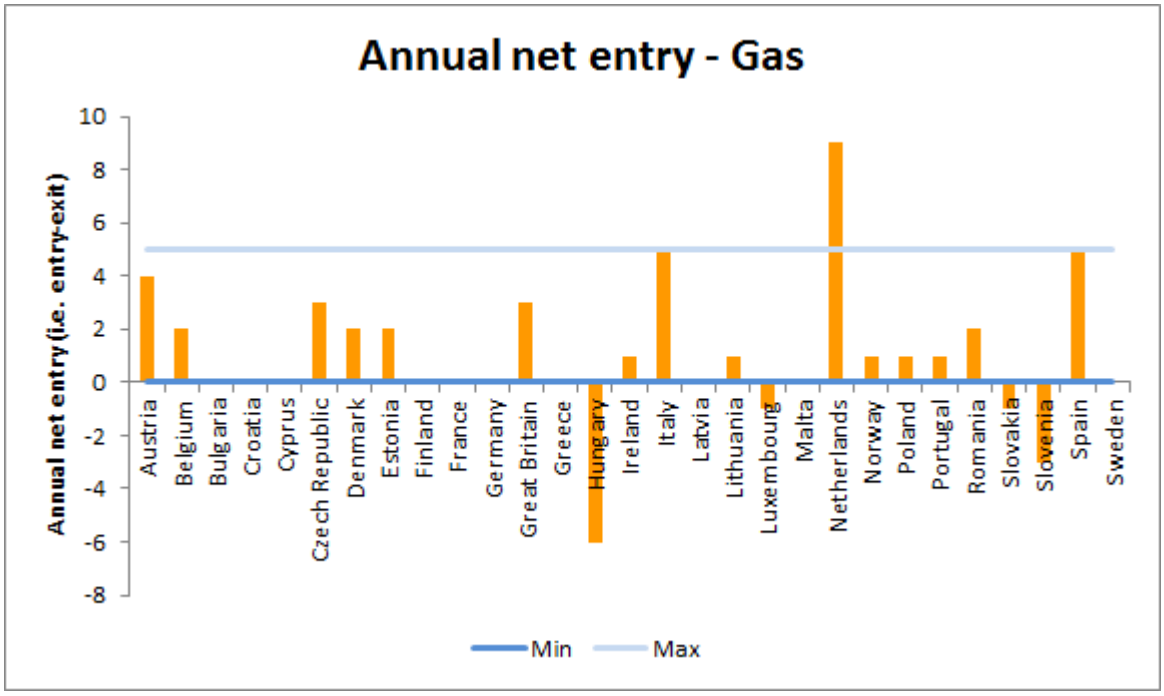
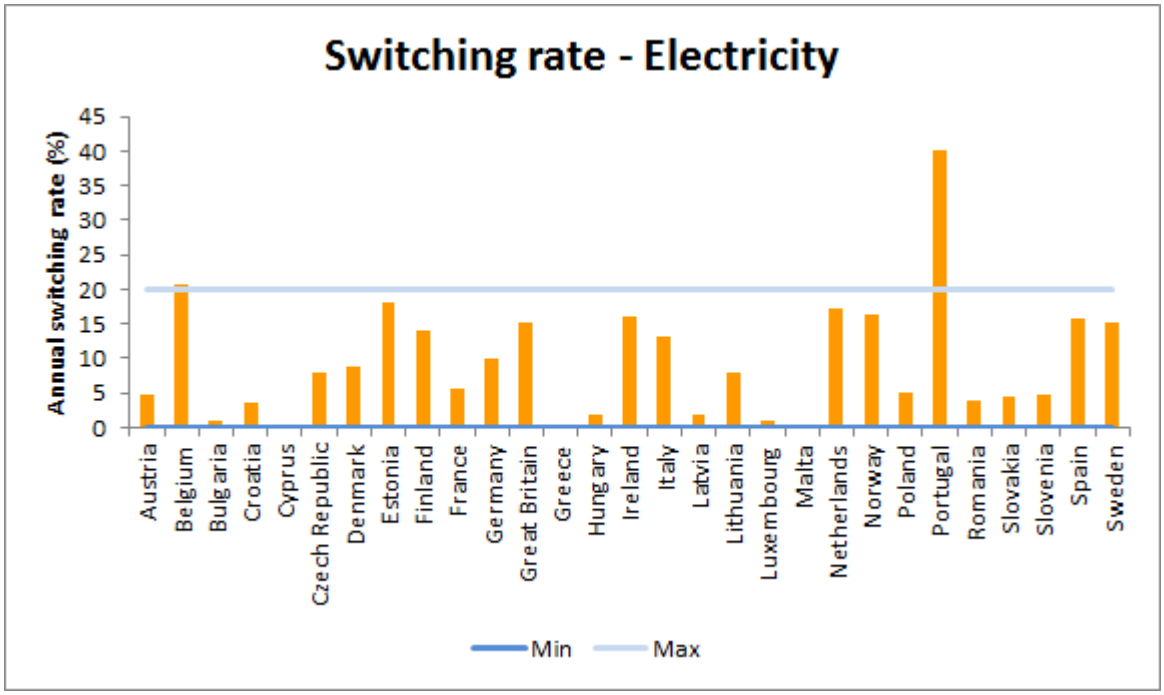



Figure 20: Switching rates - Electricity and Gas



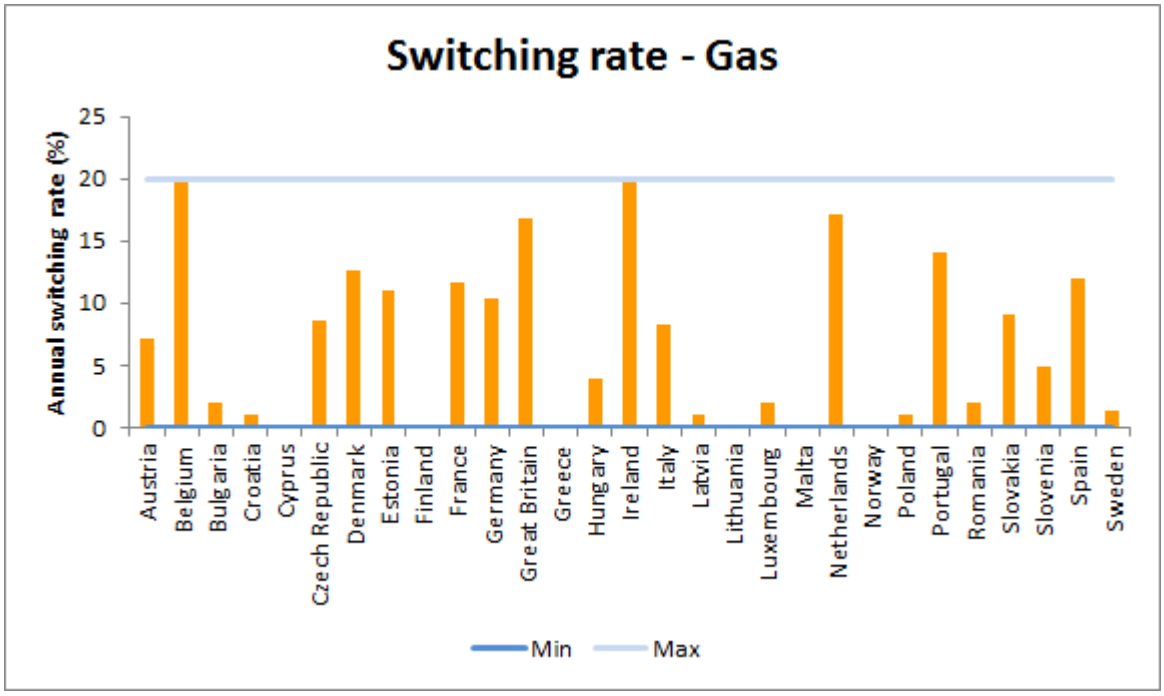
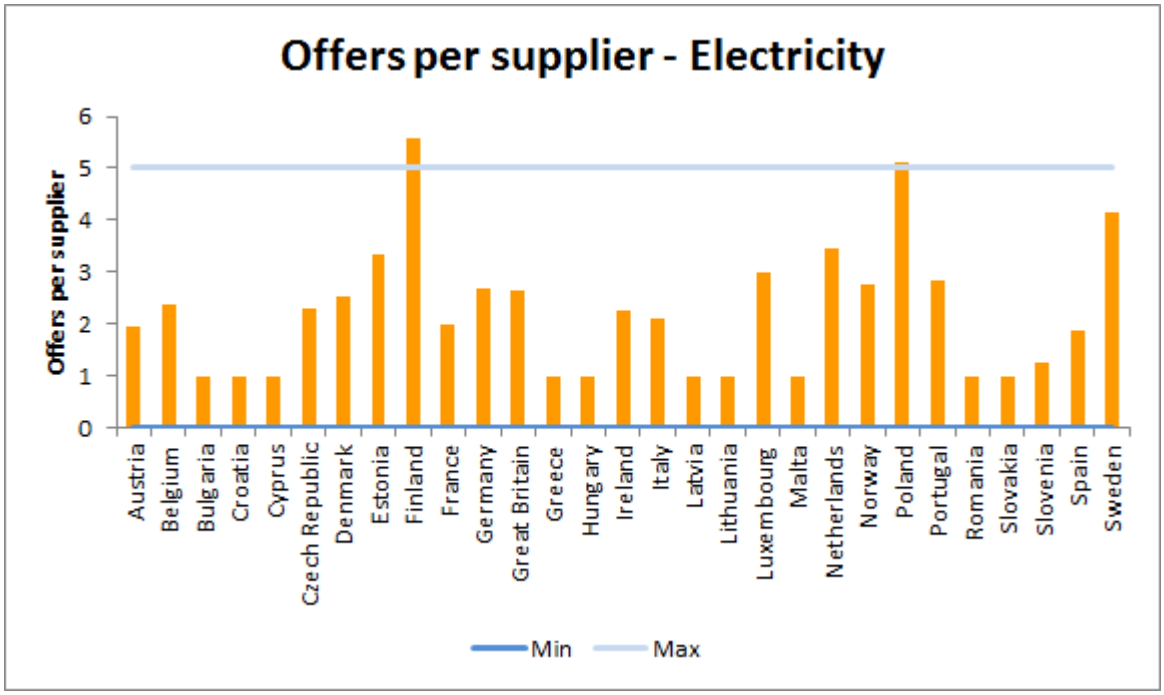



Figure 21: Offers per supplier - Electricity and Gas



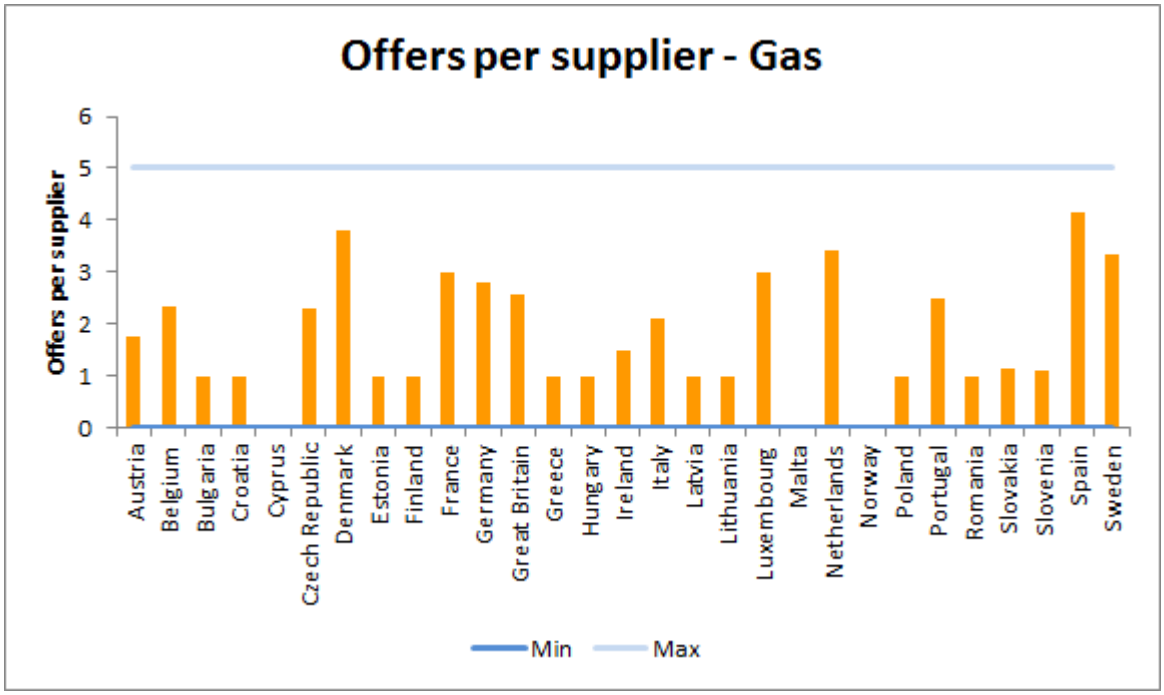
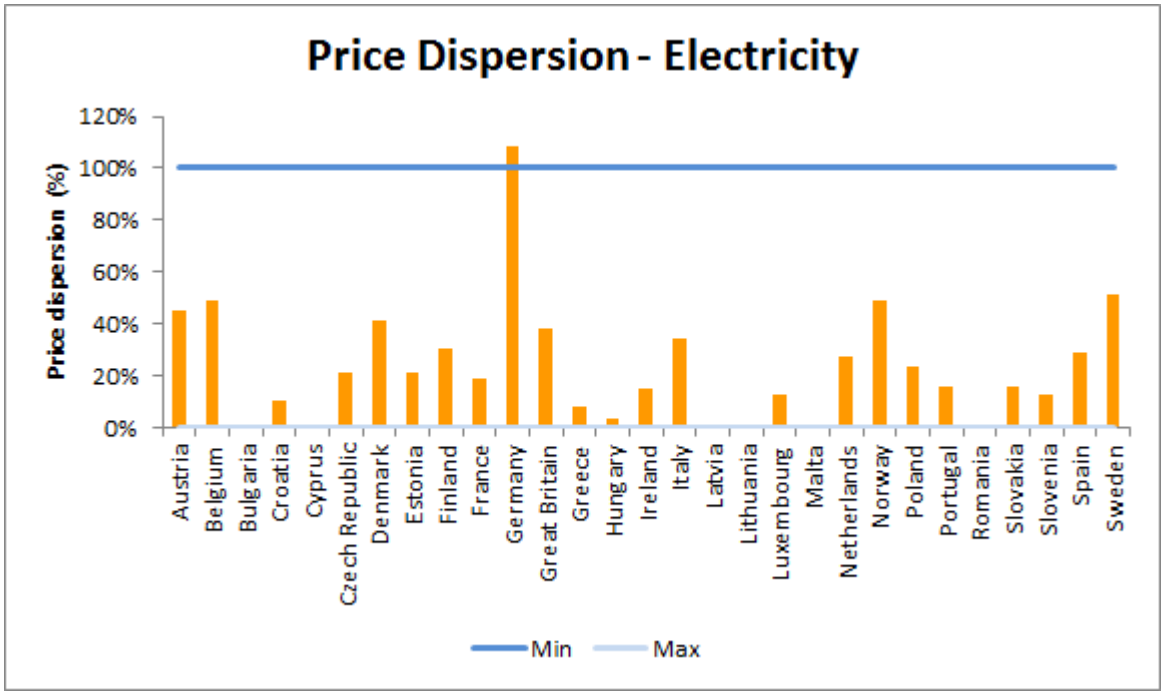



Figure 22: Price dispersion - Electricity and Gas



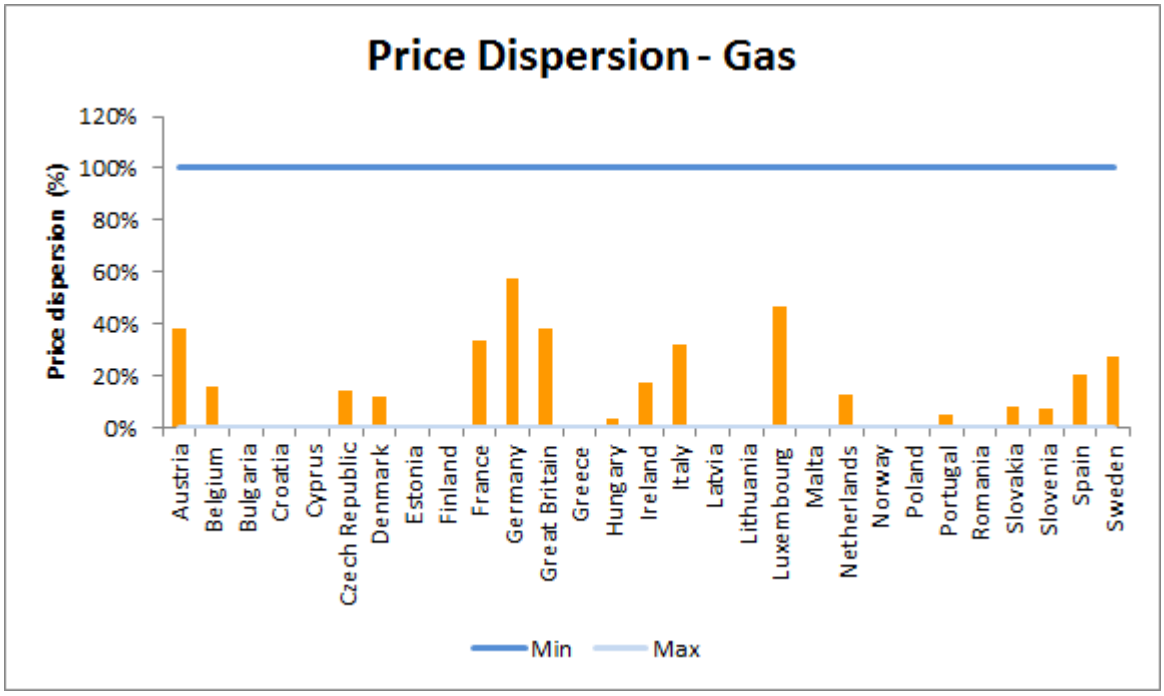
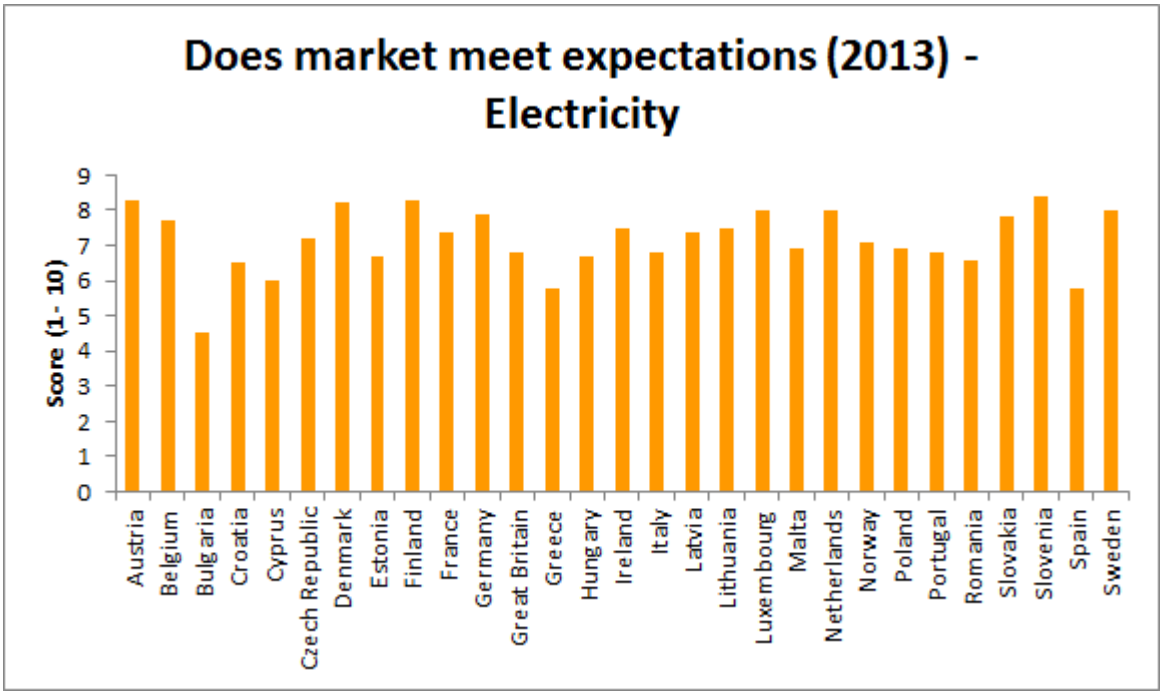



Figure 23: Does the market meet expectations - Electricity and Gas



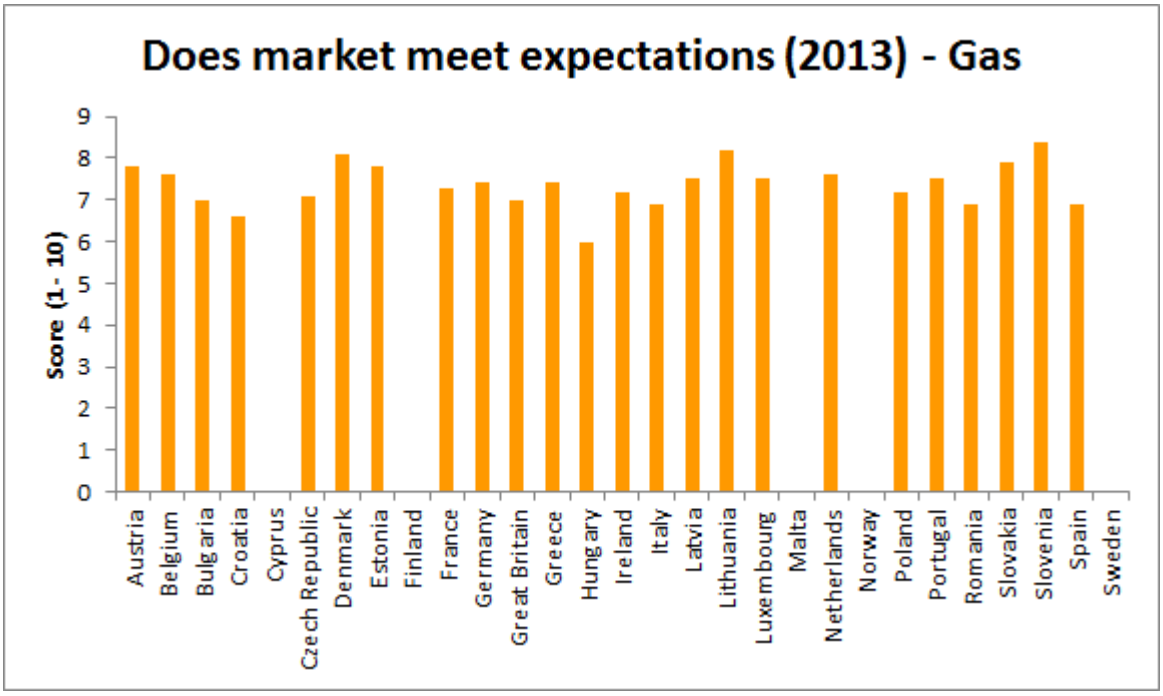
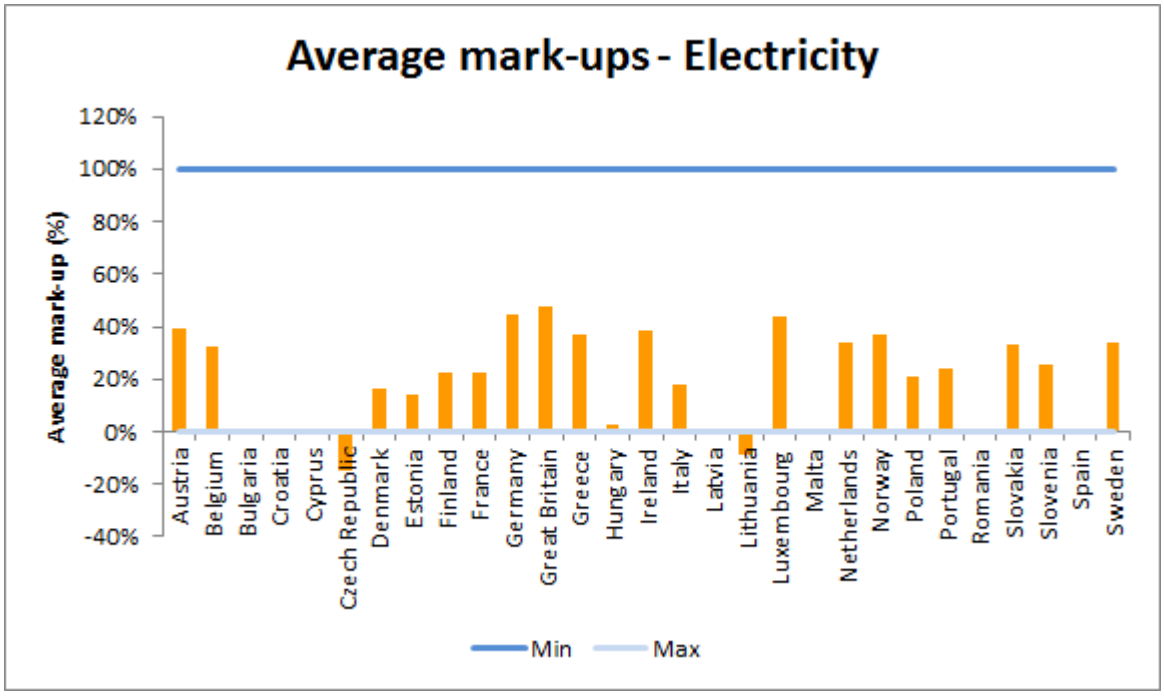
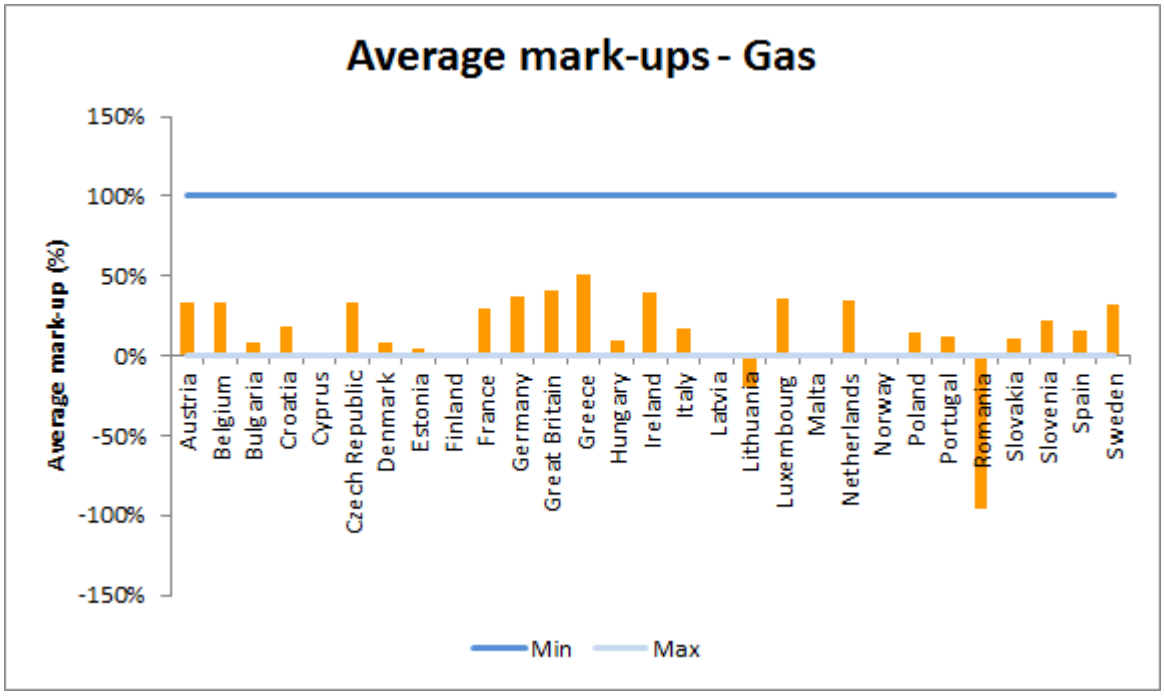



Figure 24: Average mark-ups - Electricity and Gas



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