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## Defining a Cluster Market: The Case of the Korean Internet Portal Service Market

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### Summary

In a cluster market, many related and unrelated products or services are sold. Examples of cluster markets are Tesco, Sears, Carrefour, Walmart, JCPenny, and Meijer. Because of certain unique characteristics of cluster markets, studies of cluster market definition have been very scant. This paper reviews the market definition issues of cluster markets, proposes a statistical market definition method for cluster markets, and applies the method to the Korean Internet portal service market. The results of analyses show that there is one market for the Korean Internet portals and confirm the concern that the a priori definition of the Internet portal service market using a representative group of services like 1S4C, which was used by the Korea Fair Trade Commission in 2008, did not reflect the actual structure of competition in the Korean Internet portal service market. According to the analyses, the third ranked player in the Korean Internet portal service market, Nate, is more akin to a specialty service provider, not a player competing in the cluster market with Naver and Daum.

Key Words: Cluster Market; Market Definition; Internet Portal; Click Data; Cluster Analysis; Republic of Korea

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## **1. Introduction**

In a cluster market, competing suppliers sell many related (substitutes or complements) and/or unrelated products or services to customers. Representative players in product cluster markets are big box stores (often also called super supermarkets) such as Tesco, Sears, Carrefour, Walmart, JCPenney, and Meijer, and those in service cluster markets are Internet portals and e-commerce businesses such as Google, Yahoo, Amazon, eBay, and Naver. Studies on cluster market definition have been very scarce even though numerous studies on the definition of the relevant market for competition policy purposes have been published on journals.

This lack of studies on cluster market definition stems from the intrinsic nature of a cluster market. The procedure of defining the relevant market starts with establishing the identity of a product or a service. The identity of a product is usually well known among consumers, so fixing the identity of a product is often not a difficult task. For example, a pencil is a tool to write on papers and it is easy to find substitutes. Ballpoint pen producers can be considered as belonging to the relevant market for pencils. A market in antitrust economics, then, can be defined as a set of products (or services) in which the hypothetical monopolist can increase price in order to raise its profit. This way of defining the relevant market is implemented with the SSNIP (small but significant non-transitory increase in price) test by competition authorities. Because many heterogeneous products are sold in cluster markets, however, we cannot choose the representative product of the hypothetical monopolist to begin with in defining the relevant market of the product. This means that the SSNIP test cannot be used to define a cluster market. In reality, however, courts or competition authorities have to define a cluster market because they need to determine whether or not mergers and acquisitions among firms in cluster markets have anticompetitive effects.

Even though there are several research papers on cluster market definition (Amel and Starr-McCluer, 2002; Ayres, 1985; Kwast, Starr-McCluer, & Wolken, 1997; Kim, Kwon, & Nam, 2013), there has not been, to the best of my knowledge, a research paper that provides a theoretical basis for cluster market definition and suggests an empirical methodology usable for defining cluster markets. The objective of this paper is to develop a method to define a cluster market, especially an Internet portal service market, and apply it to the Korean Internet portal market.

This paper focuses on Internet markets, especially the Korean Internet portal market, where multiple services such as search engines, dictionaries, news, blogs, and email are provided free of charge. In the past, the Korea Fair Trade Commission (KFTC) followed the traditional market definition procedure in judging if a Korean portal service provider unduly exercised its market power. The KFTC first fixed the identify (concept) of the Internet portal service as a mix of four services (1S4C: search, communication, community, commerce, and content); and it then calculated the market shares of players, providing all 1S4C services. However, this approach has been criticized by scholars and lawyers mainly because of the arbitrariness in defining the Internet portal service market.

This paper reviews the literature on cluster markets, explores key features of the Internet market that should be taken into account in defining the relevant market, and proposes a practical method for defining cluster markets. The structure of this paper is as follows. Section 2 introduces the concept of cluster market definition, reviews several previous studies on cluster market definition, and discusses the special issues associated with defining cluster markets. In discussing these special issues, the reasons why defining cluster markets is more difficult for Internet portal services than products are also explored. Section 3 develops an index, the revealed comparative preference, to measure the relative strength (competitiveness) of multiproduct sellers and introduces a statistical method to define a cluster market using the index. Section 4 reports the outcomes of analysis and presents dendrograms to illustrate a possible cluster market definition for the Korean Internet portal service market. Section 5 concludes the paper with a discussion of key research findings and limitations of this paper, and directions for further research.

## **2. Cluster market definition**

### *2.1 Concept of the cluster market definition*

Defining a cluster market is a process of identifying a boundary of the sellers of a similar mix of multiple products in an area. The method of cluster market definition, however, is not yet theoretically established. It was initially developed by courts for practical purposes to resolve legal disputes in mergers and acquisitions cases between competition authorities and firms selling multiple products or services (Ayres, 1985; Kwast et al., 1997). When a merger case among the firms selling multiple products arises, courts have to determine whether to allow that

merger or not. In order to make that decision, somehow they have to define a cluster market and assess whether the merger, if allowed, would substantially reduce competition in the market and hurt consumer welfare. Therefore, as Ayres put it, “the use of such cluster definitions has preceded the development of a theoretical framework.” Since Ayres’ paper was published in 1985, there has been almost no progress in research on cluster market analysis.

As noted in the Introduction, this lack of progress in research was caused, I believe, by the very nature of cluster market that prohibits competition authorities from using the traditional method of market definition. In a cluster market, sellers sell a cluster (collection) of related and unrelated goods and services at physical or virtual stores and buyers usually purchase both related and unrelated products during a visit. Therefore, the hypothetical monopolist test, often called the SSNIP test, which was developed to define markets starting from a specific good or service, cannot be used for the definition of a cluster market.

The method of traditional market definition can be deduced from the U.S. Horizontal Merger Guidelines (henceforth, the Guidelines):<sup>1</sup>

“A market is defined as a set of products and a geographic area in which it is produced or sold such that a hypothetical profit-maximizing firm, not subject to price regulation, that was the only present and future producer or seller of those products likely would impose at least a small but significant and non-transitory increase in price on at least one product in the market, including at least one product sold by one of the merging firms.

Simply put, the traditional market definition focuses on finding a group of substitute products around a specific product produced by a merging firm, and competition authorities often use the SSNIP test in order to find relevant markets, composed of substitutes.<sup>2</sup> As explained in the Guidelines, the FTC defines an antitrust market around a specific product. As shown in Fig. 1(a), product A is initially chosen, and competition authorities keep expanding the boundary of the market using the SSNIP test. As more substitute products, B, C, and D, are included in the same market, the total market revenue becomes greater and a firm’s market share smaller. However, as discussed above, multiproduct firms are selling many related and unrelated products together, so competition authorities cannot choose a specific product or a service to determine the identity of

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<sup>1</sup> U.S. Department of Justice and the Federal Trade Commission, Horizontal Merger Guidelines, August 19, 2010 (p. 9).

<sup>2</sup> The SSNIP test tries to find the smallest market in which a hypothetical monopolist could increase price by five percent for at least one year, and such a price increase turns out to be profitable to the monopolist (Massey, 2000; Shapiro, 2010).

multiproduct firms. This means that in a cluster market, a firm's identity is likely to be determined not by a product but by a cluster (collection) of products. In Fig. 1(b), firm 1 sells three products: A, B, and C, and firms 2 and 3 sell a cluster (subset) of substitutes of them. Firm 4, a specialty store, only sells A, a subset of products sold by firm 1. Even though, in Fig. 1(b), firm 2 is depicted as a firm competing more closely with firm 1 than firm 4, it does not always have to be perceived or determined such a way because, as discussed in section 3, the closeness between product mixes of firms in the cluster market varies with the method of measuring closeness.

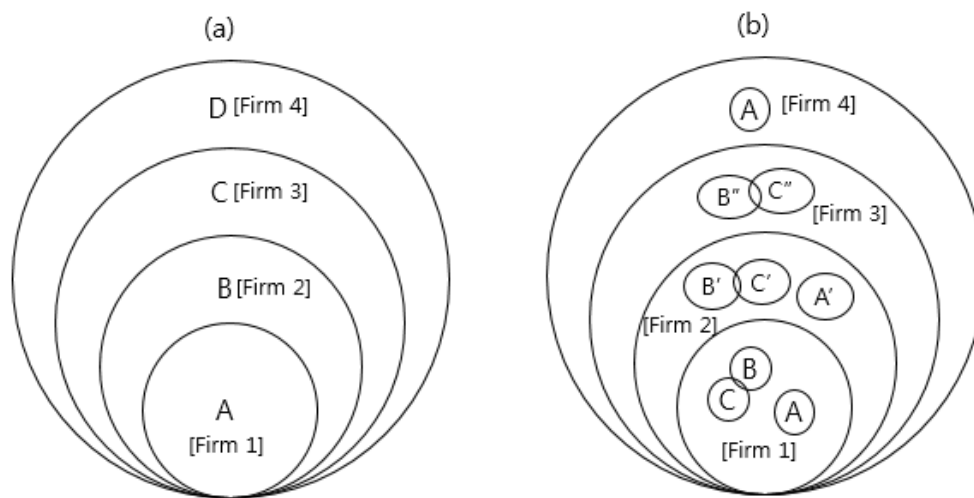


Fig. 1 Market definition: traditional market vs. cluster market

## 2.2 Several previous studies on cluster market definition

As stated above, research on the cluster market definition is scant. Ayres (1985) is the only theoretical study on cluster market definition, and Kwast et al. (1997) and Amel and Starr-McCluer (2002) are empirical studies on market definition for the banking service market. Ayres (1985) proposed the concept of transactional complementarity for determining whether products are clustered or not. According to his theory (p. 110), “Goods are transactional complements if buying them from a single seller reduces consumers’ transaction costs.” Ayres (1985) provides not only rationale for transactional complementarity criterion but also practical suggestions for finding transactional complementarity. He argued that “courts should investigate consumer behavior to see whether consumers’ purchases of a product group are tied to individual firms.” Kwast, et al. (1997) and Amel and Starr-McCluer (2002) investigated the Federal Reserve Board’s Surveys of Consumer Finances and found that consumers purchased a set of banking

services from a single primary financial institution, acknowledging that banking service markets were indeed cluster markets. They found that a majority of households, around 85 percent in 1998, used more than one banking service from their main banks and concluded that it was still effective to define the relevant market in bank mergers to be the full range of financial services.

In Korea, the KFTC decided in 2008 that the Internet portal service market was a cluster market in which users were assumed to use a mix of four representative services (1S4C: search, communication, community, commerce, and content); it then calculated market shares of Internet portal service providers by using their revenues (KFTC 2008a; 2008b). In defining markets for Internet portal service providers, the KFTC predetermined the identity of Internet portal service providers as 1S4C service providers without justifying the bases of such grouping of services. KISDI (2010; 2011; 2012) has also been using 1S4C grouping of Internet portal services in annually assessing competition in the Internet portal services market. Kim et al. (2013) viewed Internet portal service markets as cluster markets and tried to define the market in Korea using user survey data.

These previous studies do not provide theoretical or empirical methods of defining the boundary of the cluster market. Even though Ayres (1985) suggested the use of transactional complementarity in finding a product group, the transactional complementarity concept is not applicable to Internet services because switching to other substitute services can be completed instantaneously on the Internet. In other words, the cost saving from using multiple services at the same portal site is almost zero, meaning that transactional complementarity does not exist in using Internet portal services. In addition, the studies of Kwast, et al. (1997) and Amel and Starr-McCluer (2002) were based on simple descriptive statistics showing changes in the percentage of banking services consumed from main banks and they did not provide any methods of measuring the similarity and difference among a cluster of services or products offered by sellers in the market. Kim et al. (2013) criticized the KFTC's 1S4C clustering based on its arbitrariness in defining the Internet portal service market and proposed an alternative clustering of Internet portal services. Fundamentally, however, there is no difference between their approach and the KFTC's because they, like the KFTC, also predetermined a priori the components of an Internet portal service cluster.<sup>3</sup>

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<sup>3</sup> Kim et al. (2013) proposed GPS + 2C (Guide, Personal, Search, Consumption, Common) cluster instead of 1S4C.

### *2.3 Special issues of the cluster market definition*

In Fig. 1(a), in order to see if product C belongs to the market of A and B, competition authorities assume that A and B are produced by the same hypothetical monopolist and check whether the profit maximizing hypothetical monopolist has an incentive to raise the prices of products by, say, five to ten percent for a considerable length of time. If many consumers switch their consumption from A and B to C, then the price increase would reduce profit and the monopolist would have no incentive to raise prices. This means that C is a close substitute of A and B, and C would be included in the same market. If, however, only a small number of consumers to switch to C, the monopolist has an incentive to raise prices, implying that C is not a substitute for A and B and that C does not belong to the same market as A and B. In this case, only A and B constitute the same market. However, this traditional SSNIP test method is not applicable to cluster markets, even though Amel and Starr-McCluer (2002) mentioned indirectly the possibility of using the SSNIP test in a geographical cluster market definition, because a cluster market definition starts with a collection of products sold by a multiproduct firm, often a merging firm. Three issues are discussed below with regard to defining a cluster market.

First, in order to apply the SSNIP test, competition authorities need to develop a price index of a basket of products, e.g., an average price of products, and then increase the index and observe how consumers change their consumption behavior. In a cluster market, however, even though consumers purchase multiple products on a visit, they are aware of the individual price of products and make choices by comparing each individual product price, not the average price of a basket. In reality, it has never been observed that multiproduct firms such as Walmart, Tesco, and Sears, advertise average prices of a basket of products (even though it is certain that they offer price discounts for some related goods). Moreover, applying the SSNIP test for each product in a cluster market is meaningless because the question at issue is to define a market for multiproduct firms.

Second, in some Internet cluster markets like web portal services, prices for many services such as email, search engines, and blogs, do not exist. Web portals provide services for free to users and earn most of their revenue from advertising (Evans, 2003; Kim et al., 2013). Therefore, even though Internet firms provide only one service in a market, it is not feasible to apply the SSNIP test to define the market simply because there is no price for services.



Third, even though Ayres' transactional complementarity criterion is based on firm economic theory, this rationale cannot be applied to Internet portal service markets because, as discussed in the previous subsection, transaction cost saving stemming from using a cluster of services is virtually non-existent on the Internet.

### **3. A new approach to define cluster markets**

#### *3.1 Theoretical basis of new approach*

Basically, as the Guidelines (2010, p. 7) states that “market definition focuses solely on demand substitution factors...,” defining a market requires the determination of the boundary of substitutes around a product or a service. Substitutes are goods or services with a similar function or usage, and whether goods are substitutes or not depends on many factors, such as customers' preference and income and prices of goods. For example, coffee and tea may be substitutes for some people, but not for others. As income grows, people may increase their consumption of steaks and stop having hamburgers. Customers also tend to change consumption of goods or services as relative prices of substitutes vary. Therefore, setting the boundary of substitutes is not a simple task, and competition authorities and economists have tried to develop tools to define markets objectively and scientifically. Examples include the cross-price elasticity of demand, price correlations, and product flows (Massey, 2000). A popular and theoretically sound method to define markets has been the cross-price elasticity of demand, but it is not easy to choose a threshold value of the elasticity in determining whether or not one good is a substitute for another specific good. The SSNIP test was developed to overcome the ambiguity in defining markets, and it determines the boundary of substitutes by checking whether the hypothetical profit maximizing monopolist has an incentive to increase the price of a product or a group of products in the same market.

Nor is the cross price elasticity of demand applicable to the cluster market because it cannot be defined when customers purchase multiple unrelated goods. Therefore, this paper proposes a new way to define the cluster market by focusing on revealed consumer preference. The substitutability between goods intrinsically depends on consumers' preference, described by the curvature of indifference curves. Customers reveal their different preference by making different choices in real life; thus their revealed preference can be observed by the choices they

actually made.<sup>4</sup>

By aggregating customers' actual choices (quantities purchased) for each multiproduct seller, this paper determines the location of each multiproduct seller in multi-dimensional space. Then the distance between multiproduct sellers is calculated to compare the similarity (substitutability) among the sellers. The distance based on revealed preference can be used to set the boundary of a cluster market as illustrated in section 4.

### 3.2 Measuring the intensity of revealed consumer preference

Customers purchase a product or a group of products from sellers such as big-box stores, specialty stores, and mom and pop stores. Customers reveal their preference by choosing products or using services from a multiple product or service set. Assume that the product set has  $N$  goods (or services), and sellers sell one good or only related (substitutes or complements)  $n$  ( $< N$ ) goods. Then these sellers are called specialty stores. If they sell related and unrelated goods, they are called multiproduct sellers. Let  $i$  ( $= 1, \dots, N$ ) be the index for product items and  $j$  ( $= 1, \dots, M$ ) be the index for sellers.

The revealed comparative preference (RCP) can be defined as shown in Eq. (1), where  $E_{ij}$  is a consumer's expenditure on item  $i$  of a firm  $j$  for a certain period. For Internet portal services,  $E_{ij}$  is the number of user visits to a specific web site of an Internet portal service provider during a certain period.

$$RCP_{ij} = \frac{E_{ij} / \sum_{i=1}^N E_{ij}}{\sum_{j=1}^M E_{ij} / \sum_{i=1}^N \sum_{j=1}^M E_{ij}} \quad (1)$$

As shown in Eq. (1), the RCP is equal to a product item's revenue share of a seller divided by the item's total revenue share in the cluster market and measures the relative strength of a seller with respect to the sale of a product in the cluster market.<sup>5</sup> The RCP, greater than unity, means that an item's revenue share of a firm's total revenue is greater than the item's revenue share of all firms' total revenue in the cluster market. Accordingly, if a firm has an item whose RCP is greater than unity, it can be said that the firm has relative strength (competitiveness) in selling the item in the market. If a firm has an RCP less than unity, it means that customers prefer buying a product from other firms. An RCP of unity implies that a firm is selling a product just as much as the average revenue share of the product in the market. If a

<sup>4</sup> Refer to Hanemann (1984) for a discrete choice model of consumer demand.

<sup>5</sup> The RCP concept is similar to the relative comparative advantage concept used in international economics.

multiproduct firm does not sell a product or customers do not purchase the product at all from the firm, then the firm's RCP of that product becomes zero because the numerator of Eq. (1) is zero. In addition, if a firm sells only one product, i.e., a specialty store, its RCP is always greater than unity because the numerator is one and the denominator of Eq. (1) is less than unity as long as more than one firm sells the same product in the market. Fig. 2 shows a few iso-RCP (equal RCP) lines illustrating various combinations of numerator and denominator.

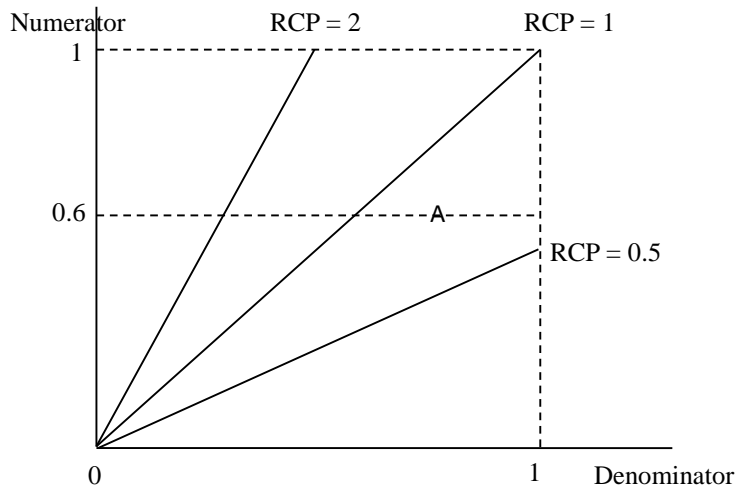


Fig. 2 Iso-RCP lines

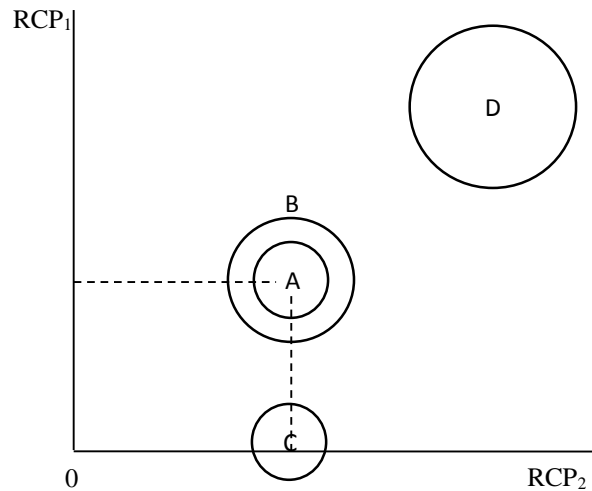


Fig. 3 RCP combinations with different revenues

Two or more multiproduct firms with different revenues can have the same RCP vector,  $\mathbf{RCP} = [RCP_{1j}, RCP_{2j}, \dots, RCP_{nj}, \dots, RCP_{Nj}]$ . Sharing the same RCP is a case in which

customers' relative revealed preference over two or more firms is the same even though the firms are of different size in sales. Fig. 3 shows firms with the same or different RCPs and the size of the circle depicts firms' different revenue sizes. Firms A and B have the same RCP but different revenues. Firm D has a larger revenue and RCPs than others and firm C is a specialty store with zero RCP<sub>1</sub>.

The reason why this paper describes sellers using the RCP, not the simple revenue shares shown in the numerator of Eq. (1), is that simple revenue share data do not show the relative strength of a multiproduct firm in the cluster market. For example, a multiproduct firm with  $\frac{E_{1j}}{\sum_{i=1}^N E_{ij}} = 0.6$  does not necessarily imply that the firm has the relative strength in selling the first product because the RCP becomes less than one if the numerator of the first product is greater than 0.6. An example is shown as point A in Fig. 2.

### 3.3 Data and analytical method

This paper first calculates RCP indexes using user click data for 16 Internet portal service providers; of the sixteen, fifteen are Korean Internet portal service providers providing multiple content services on the Internet and the remaining one is YouTube. YouTube is included in the RCP calculation to explore how the existence of a specialty service provider affects clustering of multiproduct firms in the cluster market. Monthly click data is generously provided by Nielsen KoreanClick for research, and RCP indexes are calculated over 17 services for two different time periods: December 2009 and December 2010.<sup>6</sup> In the calculation of the RCP indexes, page view (PV) data, counting the number of users' total visits to a site for a month are used.<sup>7</sup> Table 1 presents descriptive statistics of RCP indexes for the two month data. As shown in Table 1, not all Internet portals provide all services, so the minimum values are zero. The maximum RCP is as high as 209.0.

After obtaining the  $M$  by  $N$  RCP data, this paper implemented a cluster analysis to see how Korean Internet portal service providers cluster in the cluster market. Cluster analysis is to group objects (Internet portal service providers here) into clusters based on similarity among them (Mooi & Sarstedt, 2011). As shown in Table 1, an extremely high RCP and standard errors

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<sup>6</sup> Refer to Appendix 1 for the 17 service descriptions.

<sup>7</sup> Nielsen KoreanClick provided unique visitor data, page view data, and total time of stay, and page view data are often assumed to reflect the degree of user preference in the Internet marketing field.

are observed in the cases of Video, Mobile, PDS, and Game. A very high RCP can arise when an Internet portal's click data are concentrated on a few services. This paper, however, does not standardize variables because they are measured on the same scale and the degree of skewness in RCP is also important information in identifying the characteristics of service groups. In cluster analysis, Euclidean distance is often used to measure the similarity between objects and this measurement is also used in this study. For cluster analysis and clustering objects, SPSS 20.0 is utilized.

Table 1. Descriptive statics for RCP indexes across 17 services

Services	Min. Value		Max. Value		Average		Standard Error	
	2009	2010	2009	2010	2009	2010	2009	2010
Search	.000	.000	4.384	3.696	.7790	.6874	1.254	1.106
Community	.000	.000	2.239	2.52	.5889	.5582	.7123	.8142
Communication	.000	.000	5.865	8.256	1.887	2.242	1.615	2.702
News Media	.000	.000	4.844	5.407	1.230	1.460	1.482	1.638
Life	.000	.000	4.986	7.040	.9370	1.412	1.300	2.320
Commerce	.000	.000	1.695	1.433	.5581	.3558	.5697	.4788
Entertainment	.000	.000	7.834	13.64	1.473	1.756	2.157	3.800
Biz-Finance	.000	.000	1.015	1.329	.2489	.233	.3774	.4298
Education-Job	.000	.000	.666	1.504	.1264	.1664	.2322	.4165
Event	.000	.000	18.62	33.63	1.960	2.497	5.269	8.963
Game	.000	.000	90.57	64.84	7.597	6.233	23.91	17.32
Homepage	.000	.000	.285	.470	.023	.0367	.0757	.1252
Kids	.000	.000	6.845	9.119	.650	.7929	1.855	2.428
Mobile	.000	.000	51.47	165.8	9.918	13.81	16.62	44.11
PDS	.000	.000	206.4	11.76	20.61	1.252	56.16	3.100
Personalized	.000	.000	18.87	5.723	2.444	.8154	5.095	1.544
Video	.000	.000	196.2	209.0	18.28	18.37	53.02	56.06

#### 4. Results

Using SPSS 20.0, this paper implemented cluster analyses utilizing hierarchical clustering procedures, and the outcomes of which are presented in Figs. 4 and 5.<sup>8</sup> Fig. 4 is a

<sup>8</sup> In the analysis, the RCP data of December 2007 was used for Empas because as of February 2009 it merged with Nate.

dendrogram, utilizing the data of December 2009 and showing the clustering of 14 Internet portal service providers. The dendrogram implies that there is only one cluster in the market and the most essential question is where to choose the boundary of the cluster. According to the cluster analysis, there is no doubt that first nine Internet portals (from the top) are forming a cluster market. Nate can be included in the market depending on competition authorities' judgment. The variance ratio criterion (VRC), which is the ratio between the sum of the squares between clusters and the sum of the squares within the cluster including Nate, can be used in order to determine whether Nate should be added to the cluster (Mooi & Sarstedt, 2011).

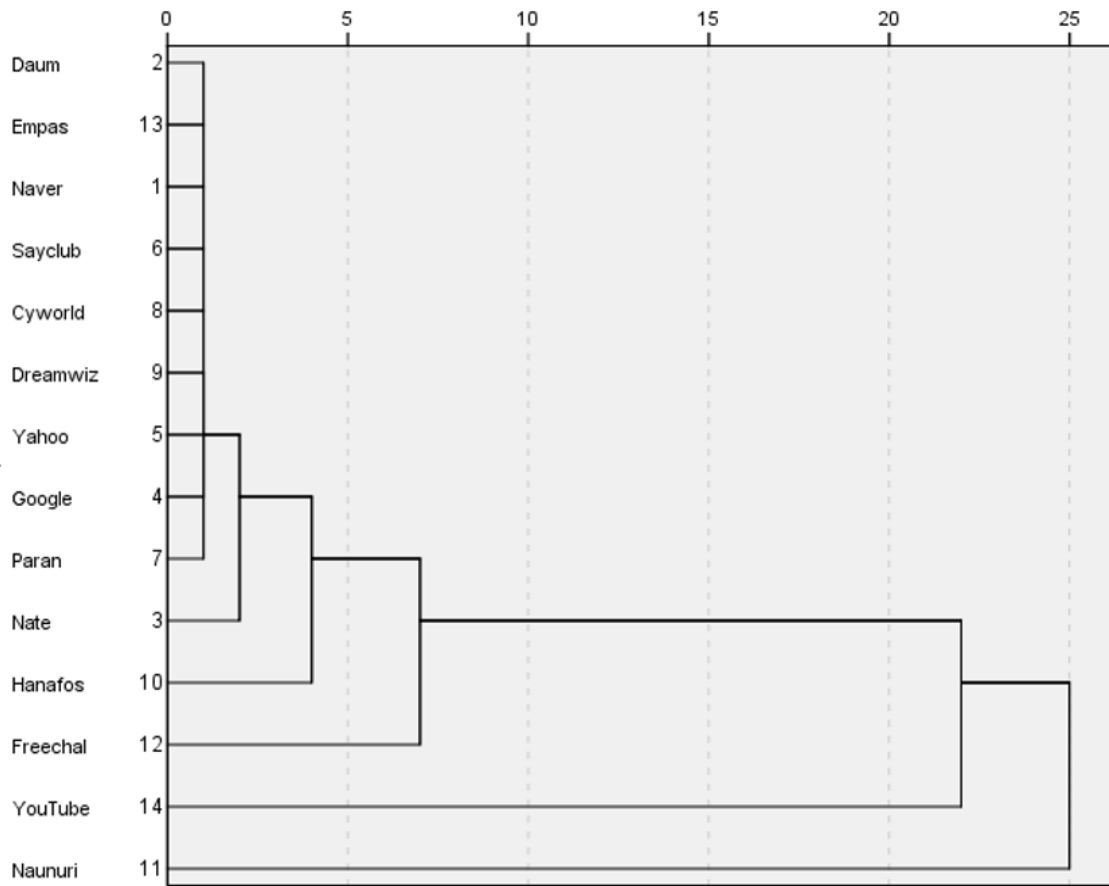


Fig. 4 Clustering of Internet portal service providers in December 2009

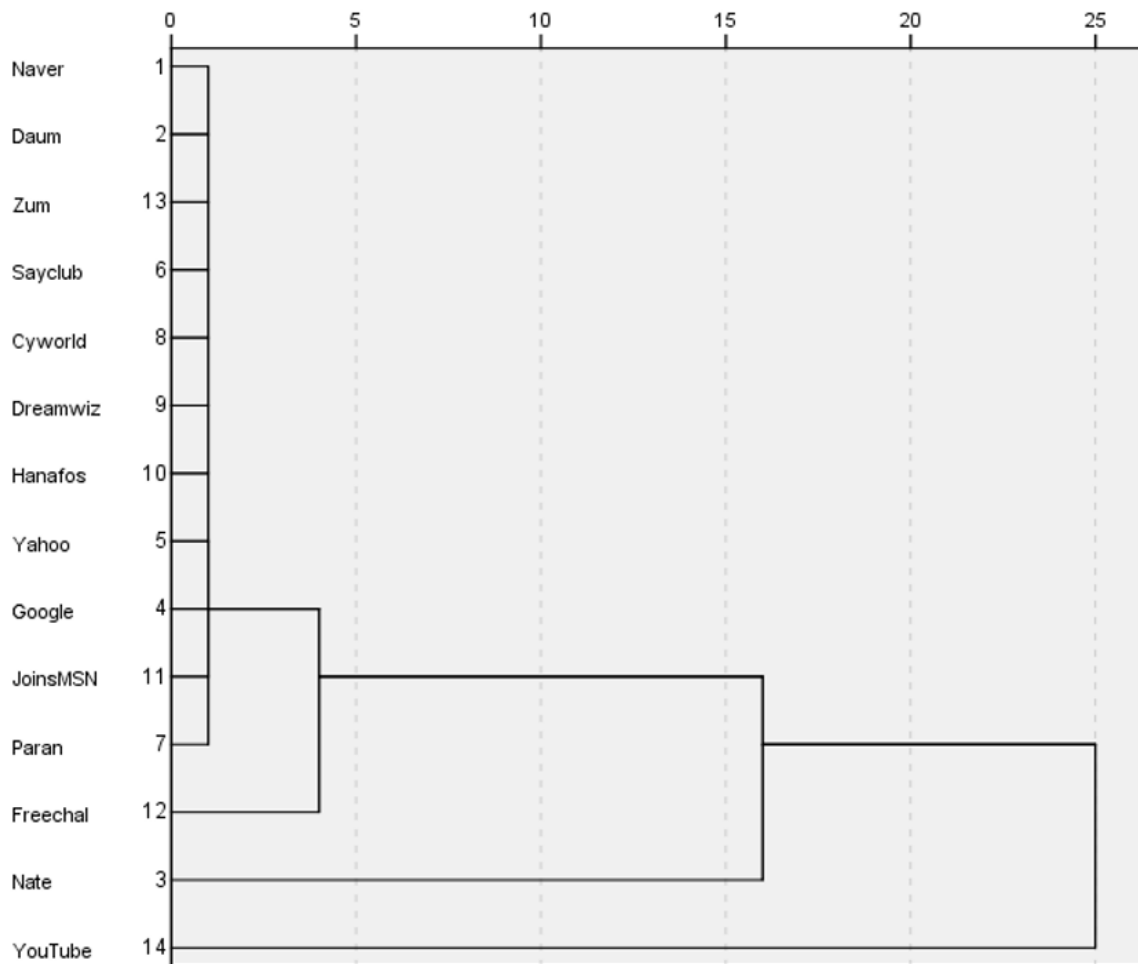


Fig. 5 Clustering of Internet portal service providers in December 2010

It was an unexpected outcome to find that Nate, the third player in the Korean Internet portal service market, does not belong to the same market with the two major competitors, Naver and Daum when clustering is made the smallest. The same feature in clustering can be found in Fig. 5, using the data of December 2010. In Fig. 5, 11 Internet portal service providers form the first cluster and Nate again does not belong to the cluster.

The information presented in Figs. 6, 7 and 8 resolve this puzzling finding. From Figs. 6 and 7, it can be observed that Naver and Daum are competing in similar service arrears even though they have relative strength in different services. In Fig. 8, however, it is readily apparent that Nate has quite a different service mix and users' page views are mostly coming from mobile and personalized services. In other words, Nate is a specialty service provider, rather than a multiple service provider. This finding implies that the simple market definition based on 1S4C, which was used by the KFTC in 2008, does not accurately reflect the actual structure of

competition in the Korean Internet portal service market.

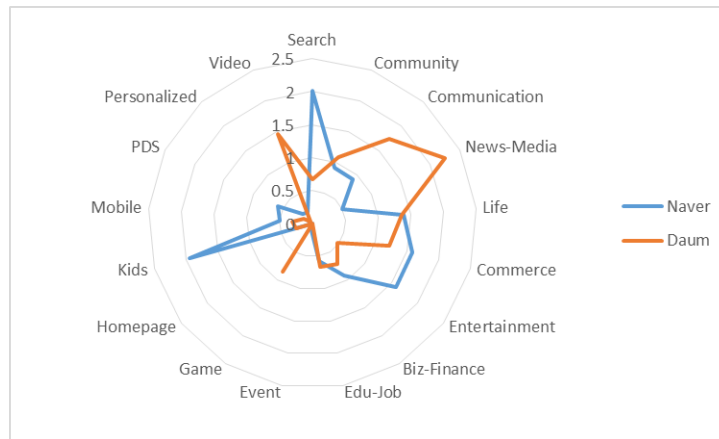


Fig. 6 RCPs of Naver and Daum in December 2009

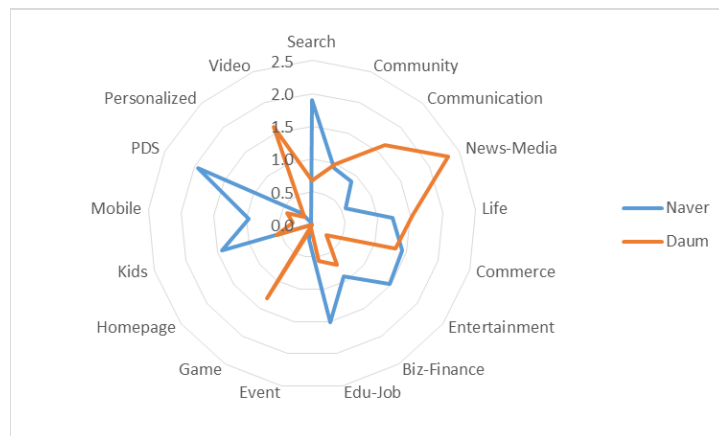


Fig. 7 RCPs of Naver and Daum in December 2010

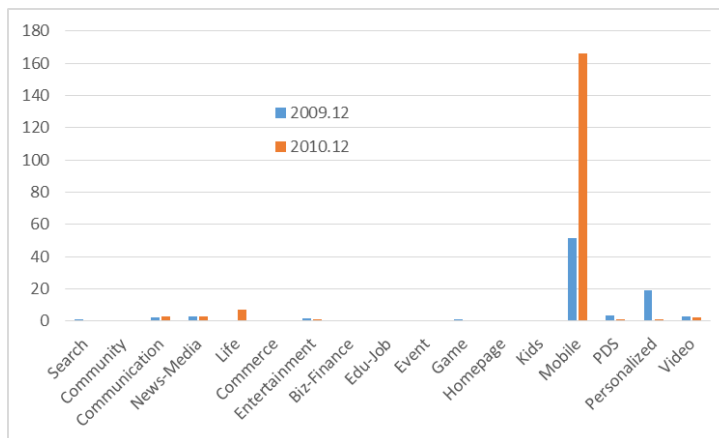


Fig. 8 RCPs of Nate in December 2009 and 2010



To assess the validity of the cluster analyses reported above, this study implemented cluster analyses using standardized RCP data. The outcomes, reported in Appendix 2, show that clustering is quite different from those shown in Figs. 4 and 5, but one consistently observed outcome is that Nate belongs to a widely different cluster from the one to which Naver and Daum belong.

## **5. Conclusion**

This paper reviewed the literature on cluster market definition, proposed a new approach, and applied that approach to the Korean Internet portal service market. The hypothetical monopolist test cannot be applied to cluster markets in which sellers sell multiple products or services because it is not possible to define the sellers' identity using a product or service and there is no unique price for a cluster of products or services. This paper proposed a new approach, utilizing the revealed comparative preference indexes, to find clustering of sellers in the cluster market. By implementing the cluster analysis using RCP data for the Korean Internet portal service providers, this paper illustrated how the Korean Internet portal service market can be defined.

The results of the analyses show that there is one cluster market in the Korean Internet portal service market, even though there is discretionary latitude for the competition authorities to choose the boundary of the market. In addition, the results confirm the concern that the a priori definition of the Internet portal service market using representative group of services like 1S4C could not reflect the differences in the service basket of multiservice sellers. According to the analyses, the third ranked player in the Korean Internet portal service market, Nate, is more like a specialty service provider, not a player competing in the cluster market with Naver and Daum.

This paper performed cluster analyses using the data for the Korean Internet portals and YouTube and found one market. By adding more samples providing some subsets of 17 services offered by the portals to the dataset, further research should investigate whether the one market definition is still valid and stable. The new market definition method proposed by this paper can be applied to other product or service cluster markets in which big box stores and financial intermediary businesses are competing.

**Appendix 1: Description of services offered by Internet portals**

Services	Description
Search	Information search through search engine algorithm
Community	Networking service among users including blogs, clubs, mini-homepages, bulletin boards
Communication	Communication service including email and short messages
News Media	News generated by media companies and related services including comments to main news
Life	Information on such topics as local issues, women, automobiles and travel
Commerce	Product information provision and connecting to online stores
Entertainment	Entertainment contents including movies, comics, and music
Biz-Finance	Information provision on financial and business topics such as stock trading and real estate
Education-Job	Education and job information
Event	Information on irregular social events
Game	Game information including online games and computer games
Homepage	Service for opening users' personal homepage
Kids	Educational content, games, and more for kids
Mobile	Content and information for mobile devices
PDS	Free software (public domain software) downloading service
Personalized	Personal information management service including calendar and contacts
Video	Video uploading and sharing service

**Appendix 2: Cluster analyses using standardized RCP data**

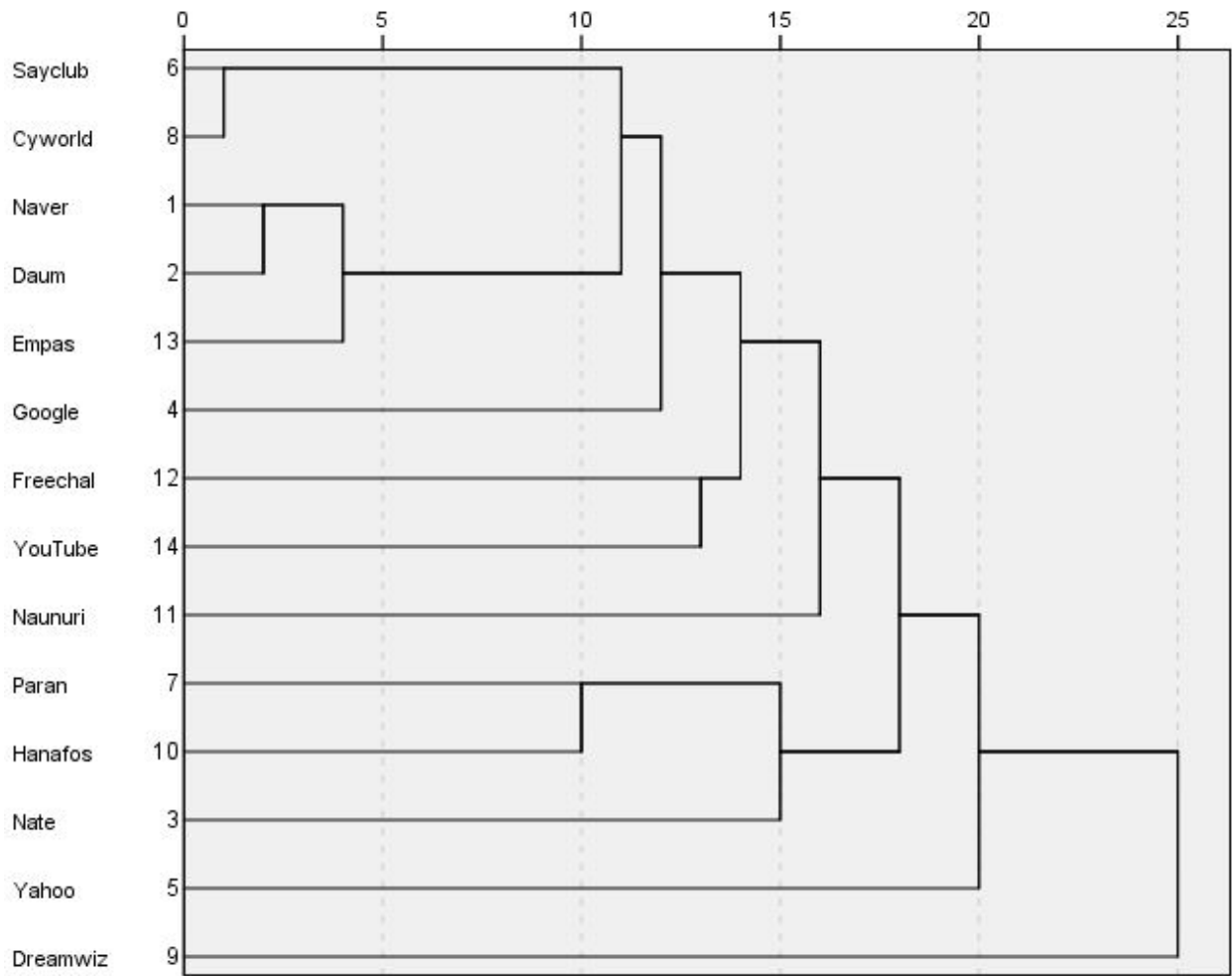


Fig. A21 Clustering of Internet portal service providers in December 2009

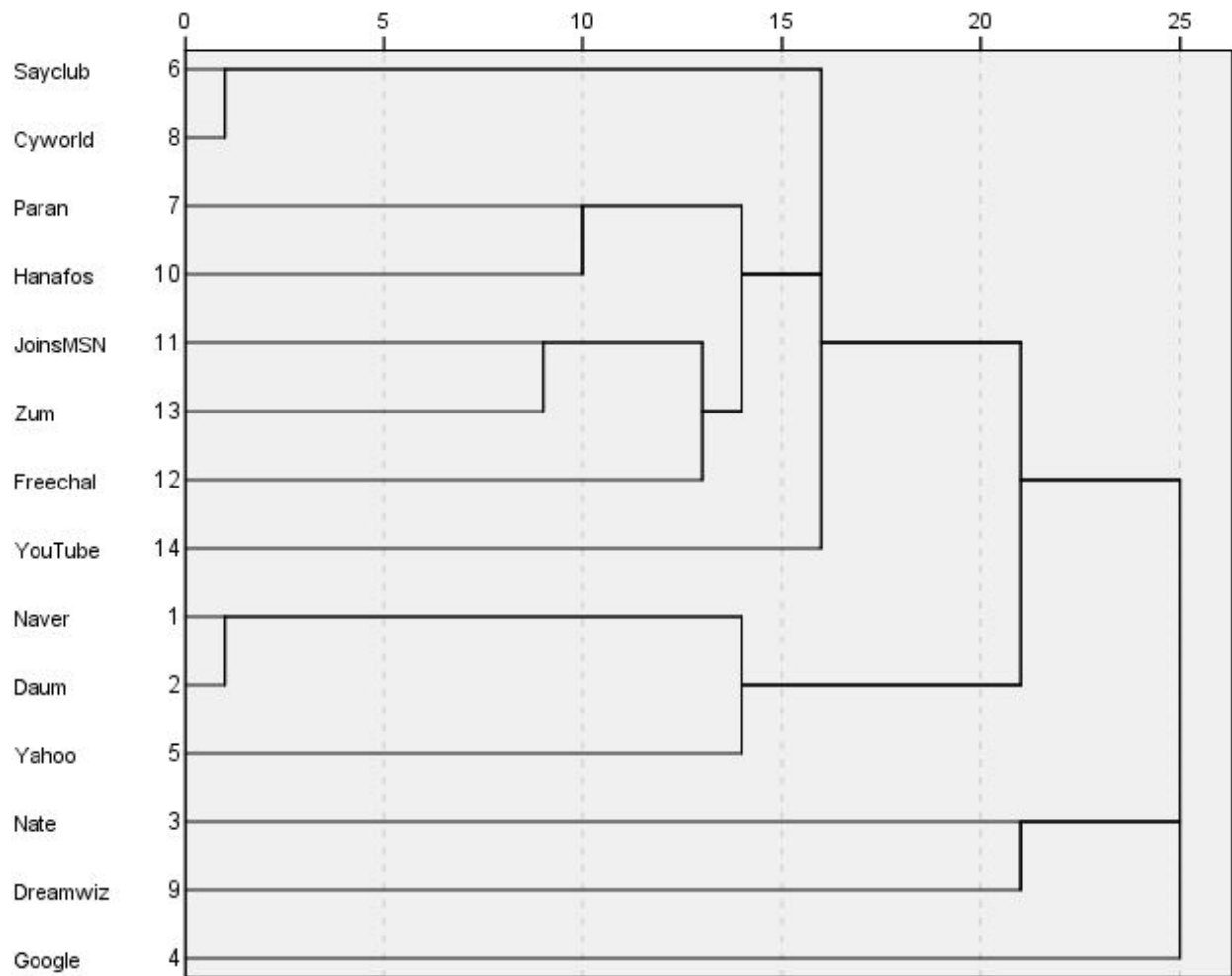


Fig. A22 Clustering of Internet portal service providers in December 2010

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