

# **Visualizing asymmetric competition**

## **using perceived quality measure from the customer reviews**

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The problem of competitive market structure representation is one of the popular topics in recent marketing surveys. One of the main challenges marketing researchers can possibly face is the growing number of products within the categories as well as the rising quantity of the categories themselves. There is plenty of distinct approaches to competitive market structure representation. One of the conventional approaches is represented in the paper of Netzer et al. (2012) using surveys and scanner panels for data collection. This approach fails to meet the growing complexity of the market and the increasing number of the products. One of the novel approaches is to make use of big data and apply machine learning techniques to visualize the market competitiveness (Ringel and Skiera 2016).

The other interesting direction of the research lays in the field of customer reviews. Customer reviews contain information about the products considered and represent the perceived price-quality ratio of the customer towards the reviewed product. Indeed, writing review requires at least some knowledge about the product and its characteristics, as well as subjective comparison of this product with competitors (or some ideal image of product that reviewer refers to).

Therefore, our main goal in this study is to combine developed approaches in the field of competitive market structure representation and customer review analysis in order to determine and visualize asymmetric competition on the market. For that purpose, we use the data on product reviews and product characteristics on Amazon.com web-site from May 1996 till June 2014. We focus on the consumable product categories instead of durables in order to be able to compare the product reviews of the customers for substitutes.

In the remainder of the work we provide a short literature overview, describe the dataset used in our research, present the approach, discuss the differences from the existing one and show the obtained results.

### **Literature overview**

One of the novel approaches with regard to visualizing the market structure is to make use of clickstream data of consumers on e-commerce web-sites (Moe 2006; Ringel and Skiera 2016).

There is considerable research studying the market competitiveness with use of sets of substitutes or complements. One of the most prominent theoretical contributions to the field of product categorization effects is provided by Shocker et al. (2004) considering both static and dynamic effects of complements and substitutes, providing taxonomy of intercategory relationships. As for empirical studies, Kim (2011) considers “also viewed” sets to calculate the distance between the products. Moe (2006) uses the clickstream data of consumers on e-commerce web-sites in order to construct the consideration set for each customer.

Ringel and Skiera (2016) develop further this approach and use customer browsing data to define consideration sets and the degree of global and local competitiveness of the products. Using their DRMABS (decomposition and Reassembly of Markets by Segmentation) model they visualize asymmetric competitive market structure.

From the other side, in the last several years the problem of the customer reviews has come into researchers' notice. The majority of studies in this area is devoted to the identification of specific attributes in a review, namely its language, and the characteristics of the author, that affect the helpfulness and the perceived quality of the review. Mudambi and Shuff (2010) in their paper on Amazon.com customer reviews consider review extremity and review depth as the factors of review helpfulness and their impact for different types of products. Kim et al. (2006) argues over the efficiency of the current “manual” review helpfulness measure (which is the rating of the review reported by other users) and investigates the useful features including length of the review, its unigrams, etc. to develop automatic review measure using machine learning techniques. Wan and Nakayama (2011) investigate the bias in the review’s ratings.

A lot of studies are dedicated to the sentiment analysis of customer reviews. Guan et al. (2016) conduct sentiment analysis using deep learning framework to identify semantic orientation of a review. Lak and Turetken (2014) compare sentiment analysis results (using text analytic techniques that automatically detect the polarity of text) with star ratings of customer reviews. Fang and Zhan (2015) in their study provide Sentiment Polarity Categorization approach with application to the dataset of online product reviews collected from Amazon. Nguyen et al. (2014) apply supervised machine learning approach to implement document-level sentiment polarity classification.

In the following section we will try to combine the approaches mentioned above to define new measures of global and local asymmetry (according to definitions of Ringel and Skiera, 2016) including the perceived quality characteristic of the product left by the customers in their reviews.

## Description of the data

The dataset used in our paper contains product reviews and product characteristics on Amazon.com web-site from May 1996 till June 2014. This dataset was collected and used in literature about mechanisms of addressing product-related queries with customer reviews (McAuley and Yang 2016), about modeling the visual evolution of fashion trends (He and McAuley 2016), about image-based recommendations on styles and substitutes (McAuley et. al. 2015), etc.

The dataset comprises more than 142 million customer reviews from Amazon.com web-site, as well as the information about more than 9 million products from 24 different categories presented on the web-site. The full list of the available product characteristics and the attributes of customer reviews is presented in Table 1.

Attributes of the Customer review	Product characteristics
1. ID of the reviewer	1. ID of the product
1. ID of the product	1. Name of the product
2. Name of the reviewer	2. List price in US dollars
3. Helpfulness rating of the review	3. URL of the product image
4. Text of the review	4. Related products (also bought, also viewed, bought together, bought after viewing)
5. Rating of the product	5. Sales rank information
6. Summary of the review	6. Brand name
7. Time of the review	7. List of categories the product belongs to

Table 1. Amazon.com dataset characteristics

In the current research we are going to exploit the advantages of the dataset at our disposal. An access to the product side information for 24 different categories with the set of links to “also bought”, “also viewed”, “bought together”, and “bought after viewing” products available for more than 9.4 million product positions gives an opportunity to investigate cross-category effects on the product competitiveness. Using the methodology presented in the paper of Ringer and Skiera (2016), we would like to incorporate the effect of substitutes (or “cross-category consideration”, in terms of Shocker 2004).

We assume that the lack of consumer-side data in our case (we have no information about the demand for certain products, number of customers bought the product within some period, etc.) will be countervailed by the use of datasets on reviews left by the customers.

We decided to focus our attention on the segments of the Amazon.com market of consumable products instead of durables. The reasons for this decision are the following. First, we have no access to customer-sided data<sup>1</sup>, so we could not construct “consideration sets” containing substitutes according to assumptions of Moe (2006). Instead, we used the information on reviewers – those customers who left several reviews on the web-site. However, for durable goods the “the review set” of the customer rarely incorporates substitutes but complements. At the moment there are few researches reflecting impact of both complements and substitutes on the product competitiveness. One of the most prominent theoretical contributions to the field of product categorization effects is provided by Shocker et al. (2004) considering both static and dynamic effects of complements and substitutes, providing taxonomy of intercategory relationships. Dippold and Hruschka (2013) study the cross-category effects by looking at market baskets. Yet, they use the dataset of 20,000 market baskets collected at supermarkets, not the e-commerce data. Oestreicher-Singer and Sundararajan (2012) make use of complementary (“also bought”) sets to investigate the impact of other product visibility on the web-site to the demand levels of the products. Even though their approach partially takes into account the effect of both complements and substitutes, the market for books, which they consider, is very specific and considered as the market of experience goods<sup>2</sup>. Therefore, their approach is not fully applicable for the markets of search goods<sup>3</sup>. Moreover, there is no available technique to distinguish between complement and substitute effect using only information available in our dataset.

Thus, we decided to consider the market of dog food (both dry and wet). We also conducted additional analyses on the market of toothpastes and shampoos. We considered only the products in the “dog food” subcategory and cleared the list of the product from such complements as pet bowls, toys, etc. Therefore, our product dataset consisted only from the potential substitutes. In the current research we considered 1 211 product items in the category of “dog food”. For every of this product we found every review and the customers who left these reviews. To be able to compare the reviews of the customers we considered only those reviewers, who left at least one review. Detailed information of the datasets under consideration you can find in the Table 2 and Figure 1.

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<sup>1</sup> Ringel and Skiera (2016) used the collection of big search data (individual clickstreams) of thousands of consumers

<sup>2</sup>An experience good is a good “in which it is relatively difficult and costly to obtain information on product quality prior to interaction with the product; key attributes are subjective or difficult to compare, and there is a need to use one’s senses to evaluate quality” (Mudambi and Schuff 2010).

<sup>3</sup> A research good is a good “for which it is relatively easy to obtain information on product quality prior to interaction with the product” (Mudambi and Schuff 2010).

Dog food	
Number of products	1 121
Number of customers	2 793
Number of reviews	7 357
Shampoos	
Number of products	6 238
Number of customers	8 862
Number of reviews	23 065
Toothpastes	
Number of products	432
Number of customers	1 742
Number of reviews	3 945

Table 2. Datasets under consideration

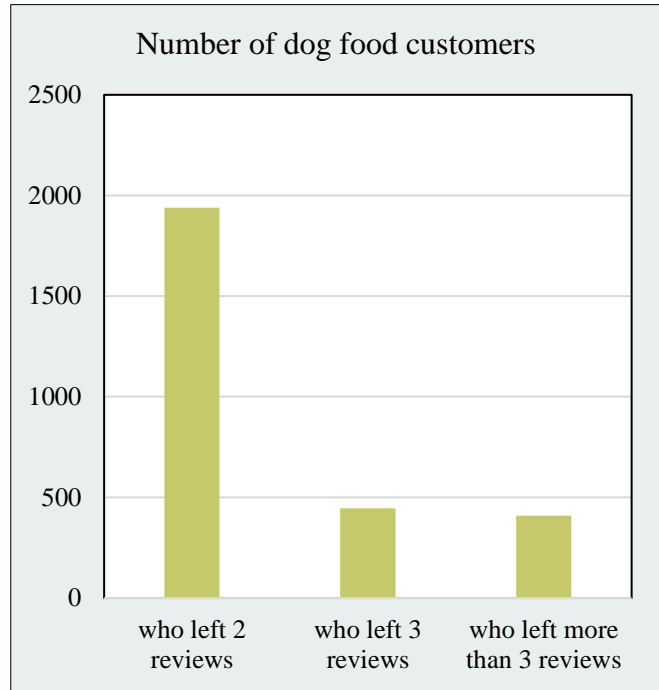


Figure 1. Distribution of review sets length for dog food customers

## Description of the approach

In our research we use the approach to market asymmetric competition visualization developed by Ringel and Skiera (2016) with minor amendments. These amendments are related to the differences in the nature of the data available to us. However, the main steps of the procedure are the same. First, we collect the data about the customers and their reviews left on Amazon.com web-site. Then we construct the “review sets” – the sets of products reviewed by the same customer. Afterwards we calculate the perceived quality measure of these products based on the reviews’ rating left by the customers and the polarity of the reviews. Using this measure and the frequency of the products appearance in the review sets we define the global and local asymmetry matrices and visualize the market structure using elements of DRMABS model – the model of Decomposition and Reassembly of Markets By Segmentation. Afterwards we compare results obtained from classical global and local asymmetry matrices and our matrices calculated with making use of perceived quality measure.

We decided to consider the review sets because of several reasons. First of all, we don’t have the customer-side data and the information about the clickstream of the customers. In addition, review set can be more suitable to determine the attitude of a customer towards certain products than consideration set. Consideration sets according to Moe (2006) are constructed from the clickstream data of consumers searching products online. One of the problems

occurring while using consideration sets in the model is that when customers are searching for some good, they usually don't have enough information about the products and the market yet. In classical search models of Lucas and Stokey (1989) and Pissarides (2000) the process of search stops only when the cost of acquiring additional information overwhelms the benefits from this information. Applied to our situation this concept profess that the clickstream data contains the information about the possible choices of the customers updating their information about the market and the products. So, this data can be irrelevant to the final decision of the customer who finished her process of search and have chosen the product. In other words, when customer looking for some product, the other goods in his clickstream can be irrelevant to that the customer searching for. Moreover, the products in the consideration set based on clickstream data can also be (dynamic and static) complements (according to Shocker et al., 2004). The problem of identifying both complement and substitute connections in the consideration sets is non-trivial problem and requires additional product-sided information analysis.

From the other side, review set contains the information of a customer who has already experienced the good or at least has some knowledge about the product to write a review<sup>4</sup>. This information belongs to the latest information set of the customer, after deciding about the products and revealing all characteristics of the good and its substitutes. Moreover, the data on the reviews is usually open sourced and does not require additional field research and costly campaigns, additional expenditures on personnel and do not cause personal data protection issues.

However, one can face several problems while considering review sets as a proxy for consideration sets of the customers. One of the problems is that not all customers leave reviews on the web-site. Thus, our results for market competitiveness can be biased because of the non-representative sample of the customers. However, this problem can be negated by including the helpfulness measure of the review under consideration. Helpfulness of the review depicts the popularity of certain review among all other customers on the web-site (number of votes) and the rate of relevance of the review (the ratio of number of positive votes to all votes for that review). In the current research we do not include this variable to our model due to the lack of the data on popularity of the reviews and the problem of integrating it to the measure of local and global asymmetry<sup>5</sup>.

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<sup>4</sup> Nowadays Amazon.com has the system of "confirmed purchase" reviews, i.e. reviews that have been left by customers who indeed bought the product. This information is not available to us, nevertheless, we assume that there are no fake reviews in our dataset, customers who left them have at least some knowledge about the goods.

<sup>5</sup> When calculating local and global asymmetry we already include the number of reviews of a product in the model. The question of weighting the vote of the customer for one review and existence of the review itself is nontrivial and requires additional research.

Another possible issue, is the existence of the complements in the review sets. We control for this problem by considering consumable products from one subcategory. For example, we have chosen only those products in the category of pet supplies that contain “food dog” words in the title or in the name of the subcategory. We also excluded all irrelevant products that could be in our list (e.g. “the bowl for dog food”) and checked whether we missed some relevant products by considering “also\_bought” and “also\_viewed” lists for products under consideration.

We also consider only non-singleton review sets of the customers, because we primarily interested in the connection between the products and the large number of singleton review sets would decrease the significance of the local asymmetry measure.

### **Perceived quality measure**

After defining the review sets we are going to identify competitive asymmetry of the products. The classical approach defines global competitive asymmetry as “consumers’ overall propensity to consider certain products, which serves as a proxy for market share” (Ringel and Skiera, 2016 p. 516). We also want to include in the global asymmetry post-purchase characteristics of the products. Such characteristics are rating of the product left by the reviewer (from 1.0 to 5.0) and the polarity of the review. These characteristics provide additional information on the products “quality” perceived by the customer. I. e. if the rating for product  $i$  is higher than the rating of product  $k$ , then customer will prefer product  $i$  to product  $k$  with higher probability. By constructing this perceived quality measure with use of rating and polarity of the reviews we include not only the popularity of the product in the measures of local and global asymmetry, but also preferences of the customers over the set of the products.

In order to calculate the measures of local and global asymmetry we first need to construct our perceived quality measure. How to combine the rating and the polarity of the review? To answer this question, we conducted short analysis of the data and looked at the characteristics of the polarity and rating distribution. As we can see from Figure 2, most of the reviews have rating 5.0, the mean of the reviews rating is 4.31. From the other side the mean of polarity measure is 0.19 (the polarity measure lies in the interval  $[-1,1]$ , where -1 is the most negative measure of the review, and 1 denotes the positive review measure).

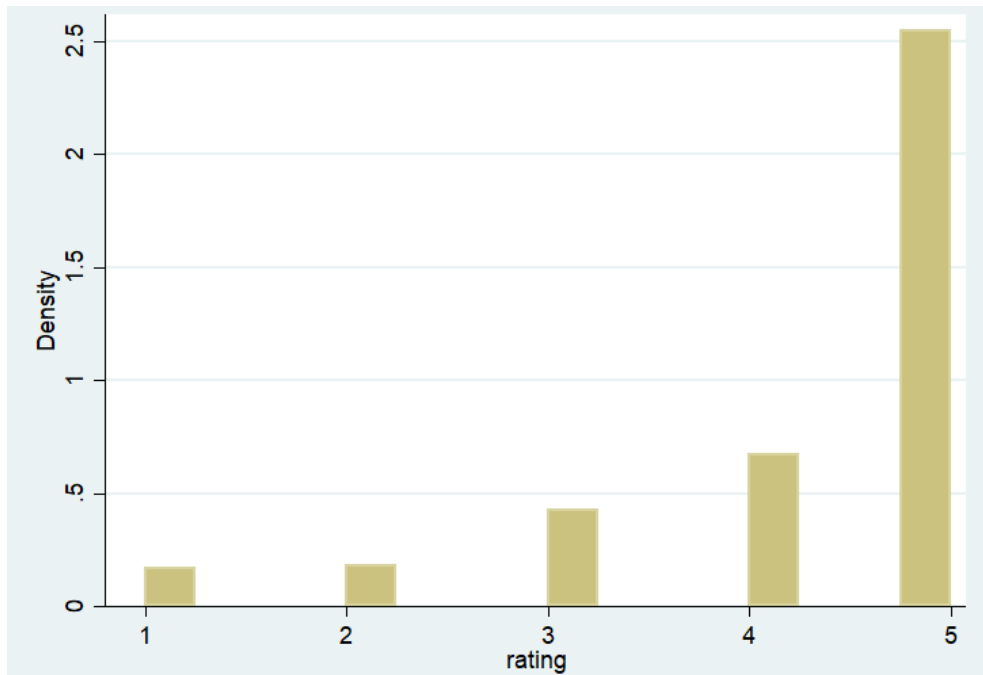


Figure 2. Distribution of the rating over reviews

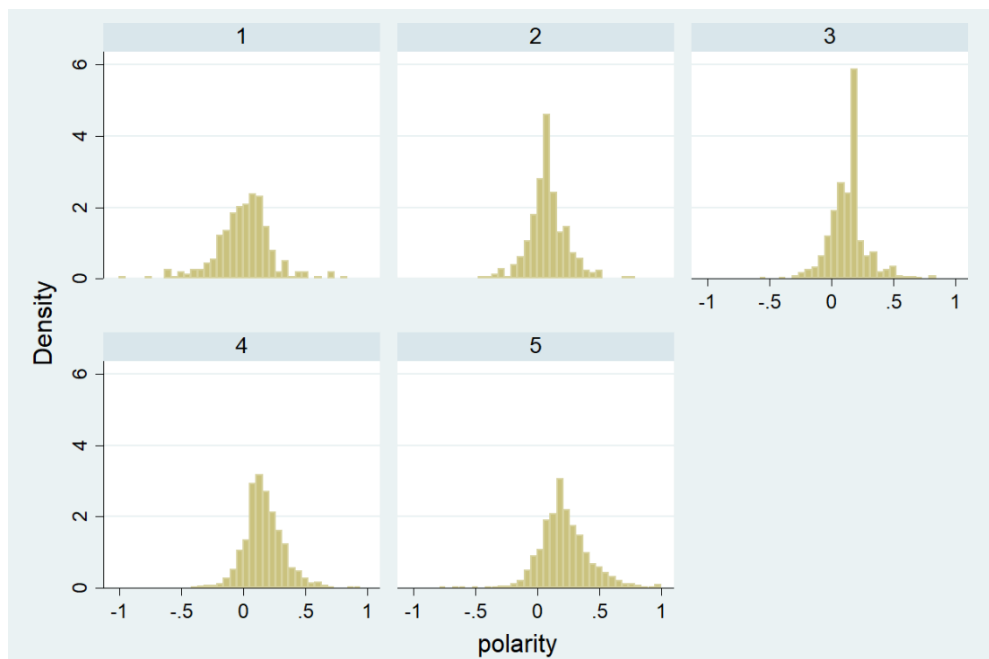


Figure 3. Distribution of polarity by different values of rating variable

Variable	Observations	Mean	Std. Dev.	Min	Max
Rating = 1	312	0,009	0,223	- 1,00	0,80
Rating = 2	339	0,087	0,155	- 0,46	0,75
Rating = 3	786	0,138	0,148	- 0,53	0,83
Rating = 4	1,238	0,171	0,158	- 0,42	0,91
Rating = 5	4,682	0,225	0,194	- 0,78	1,00

Table 3. Summary statistics of the Polarity measure for different values of rating variable



From Table 3 and Figure 3 we see that the mean and the range of polarity slightly changes for different rating levels. We can find both a review with rating 1 and polarity 0,8 and a review with rating 5 and polarity -0.8. To create the perceived quality measure of the product we decided to use an analog of the so called lexicographic preferences. We assume that the rating the customer leaves for the product is the main rough estimate of the product quality. However, customer may want to amend this rough rating estimate by writing review with different polarity. For example, if customer thinks that product is to good for rating 4 but not so good for rating 5 she can decide to assign the 4 rating and write the review with positive polarity measure to highlight the positive characteristics of the product. Another option is to assign 5-rating for the product but write more moderate review emphasizing some negative characteristics of the good.

Follow this logic we introduced the formula to calculate the perceived quality measure:

$$Q_i^j = R_i^j + \frac{1}{2}P_i^j,$$

where  $Q_i^j$  is the perceived quality measure of the product  $i$  left by customer  $j$ ,  $R_i^j$  is the rating of the product  $i$  left by customer  $j$ , and  $P_i^j$  is the polarity of the review left by customer  $j$  for the product  $i$ . According to this formula polarity cannot change the rating of the product and is just a correction of the rating the customer assigns to the product.

At first glance this quality measure looks to simplistic. However, it has strong intuition and easy to calculate. More complicated measures involve additional incentives in the behavior of the customers which are difficult to define with the data available. There are several studies investigating relations between polarity and rating. E.g. Lak and Turetken (2014) use machine learning techniques to forecast the rating from the polarity of the review in those cases, where ratings are unavailable (movies reviews). However, usually these two measures are used interchangeably and are not combined into one aggregated index. As polarity is continuous measure and rating is the discrete one, it is technically complicated to assign for polarity the main role in the quality measure. In the case where we want to combine rating and polarity so that their relations are not lexicographic, we face the question of dependence between them. This marginal characteristic can vary for different markets, products and customers.

After defining perceived quality measure, we can return to our global and local asymmetry measures. We calculate the global asymmetry measure for product  $i$  as following:

$$Y_i = \sum_{j \in J} Q_i^j G_i^j,$$

where  $Y_i$  is the global asymmetry measure of product  $i$ ,  $J$  is the index set of consumers,  $G_i^j = (i \in U_j \rightarrow 1, 0)$ , and  $U_i$  is the set of products that customer  $j$  left reviews on. Using this measure, we incorporate not only the popularity of the product but also its quality in comparison to all other products.

Local asymmetry measure for product  $i$  towards product  $k$  is calculated by the following formula:

$$Y_{ik}^* = \frac{\sum_{j \in J} Q_i^j G_i^j \times G_k^j}{\sum_{j \in J} Q_i^j G_i^j}$$

This measure includes not only the intensity of the competition of product  $i$  with product  $k$ , but also the strength of this competition for every customer by including the rating of the product  $i$  in the review sets where both  $i$  and  $k$  are presented.

### **Visualization of asymmetric competitive market structure**

In order to achieve submarket visualization, a similar approach to Ringel and Skiera (2016) has been taken. The approach taken by Ringel and Skiera, Decomposition and Reassembly of Markets by Segmentation (DRMABS) can be described in five steps. These steps consist of: 1) Finding the Submarkets, 2) Mapping Submarkets Globally, 3) Mapping Products Locally, Optimizing Globally, 4) Adding Asymmetry, and 5) Transposition of Product Attributes. These steps are followed through with certain alterations.

#### **1) Finding the Submarkets**

In order to identify the submarkets, our algorithm takes the global competitive asymmetry and local competitive asymmetry matrices, that have been computed using the products' occurrences in review sets, the content of the product reviews, and the rating of each of these reviews. As the number of submarkets is not known a priori, certain machine learning techniques such as k-means are not applicable. The approach taken by Ringel and Skiera is followed and network analysis techniques are used to detect submarkets. Louvain method, which was developed by Blondel et al. (2008), is employed. Louvain method is widely used for community detection on large networks and is highly efficient. Louvain method is a greedy optimization algorithm, which optimizes modularity of the partitions. Modularity is a quantitative measure that indicates the quality of the edges within the community compared to the expected value of randomly assigned edges. Modularity will also be used to compare the

quality of partitioning based on the competitiveness index for the cases, where review content and rating are used and where they are not used.

## 2) Mapping Submarkets Globally

Once the submarkets are identified, the representatives of submarkets are determined, in order to correctly place the submarkets on the global market structure map. The representative of a submarket is identified using the closeness centrality measure. Closeness centrality is the reciprocal of the average shortest path distance to the node over all reachable nodes (Linton, 1979). Higher values of closeness indicate higher centrality. For this step, the node with the highest closeness centrality is selected as the submarket representative. In order to correctly place the submarket representatives on the global market map, aggregate values of centrality of each submarket is also taken into account. The representatives of the submarkets with higher aggregate centrality are placed closer to the center of the map. The global mapping of the submarkets also involves taking the community sizes into consideration. In order to avoid overlapping of the nodes on the graph, we plot the representatives of the communities with enough distance between each other to leave the space for the remaining members of the submarket, where distance between two representatives is set as the radius,

$$radius = \frac{\text{maximum possible number of products in the submarket}}{\text{total number of products in the global market}}$$

## 3) Mapping Products Locally, Optimizing Globally

After the submarket representatives are plotted on the global market structure map with adequate distance between one another, the remaining products are added based on which submarket they belong to. Since at the previous step we take care of the problem with overlapping nodes, no further steps are taken at this stage to further dilate the products.

## 4) Add Asymmetry

At this stage, the competitive asymmetry information is added to the global market. Global competitiveness measure, which indicates the product's overall popularity, is represented through the node size. Local asymmetry measure, which indicates the competition between two products, is represented through the edge width.

## 5) Transposition of Product Attributes

This step is the representation of product attributes on the global market structure map. Transposition of product attributes step has been neglected since it would require a sophisticated data mining process to extract the product attributes from the reviews, which would not be feasible in the span of this project.

## Results

The visualization results both with and without the modified DRMABS methodology are provided for competitive asymmetry with and without the addition of perceived quality measure. The modularity values are calculated and compared in order to assess the existence of an improvement with perceived quality measure. The names of complete set of products are provided in the Appendix A. It is also important to note that application of the modified DRMABS approach is not expected to alter the modularity value or partition attributes, as modified DRMABS merely alters the positions of the nodes without altering the underlying partitioning structure.

### Competitive Asymmetry without Modified DRMABS

The network visualization of the global dog food market structure for competitive asymmetry measure without using modified DRMABS methodology is provided below.

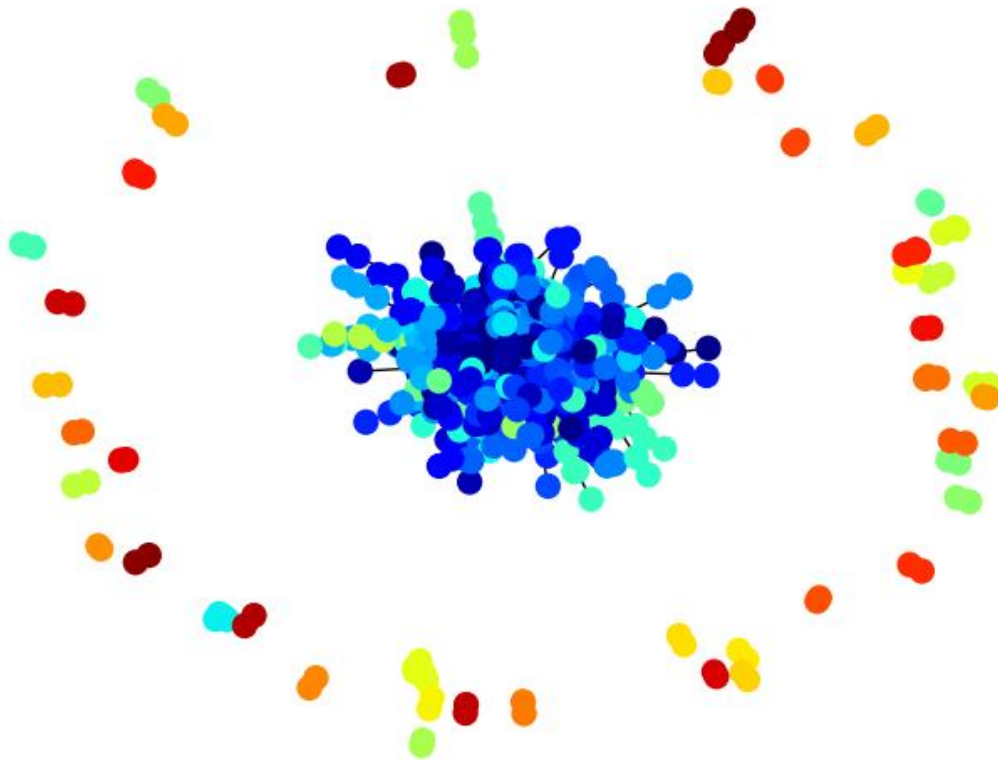


Figure 4. Network Visualization of Competitive Asymmetry without modified DRMABS

The number of submarkets is provided. The modularity value obtained for the given set of methodology is also provided.

Number of Submarkets	87
Modularity Value	0.819045634329

Table 4. Attributes of Competitive Asymmetry without modified DRMABS

## Competitive Asymmetry with Modified DRMABS

The network visualization of the global dog food market structure for competitive asymmetry measure using modified DRMABS methodology is provided below.

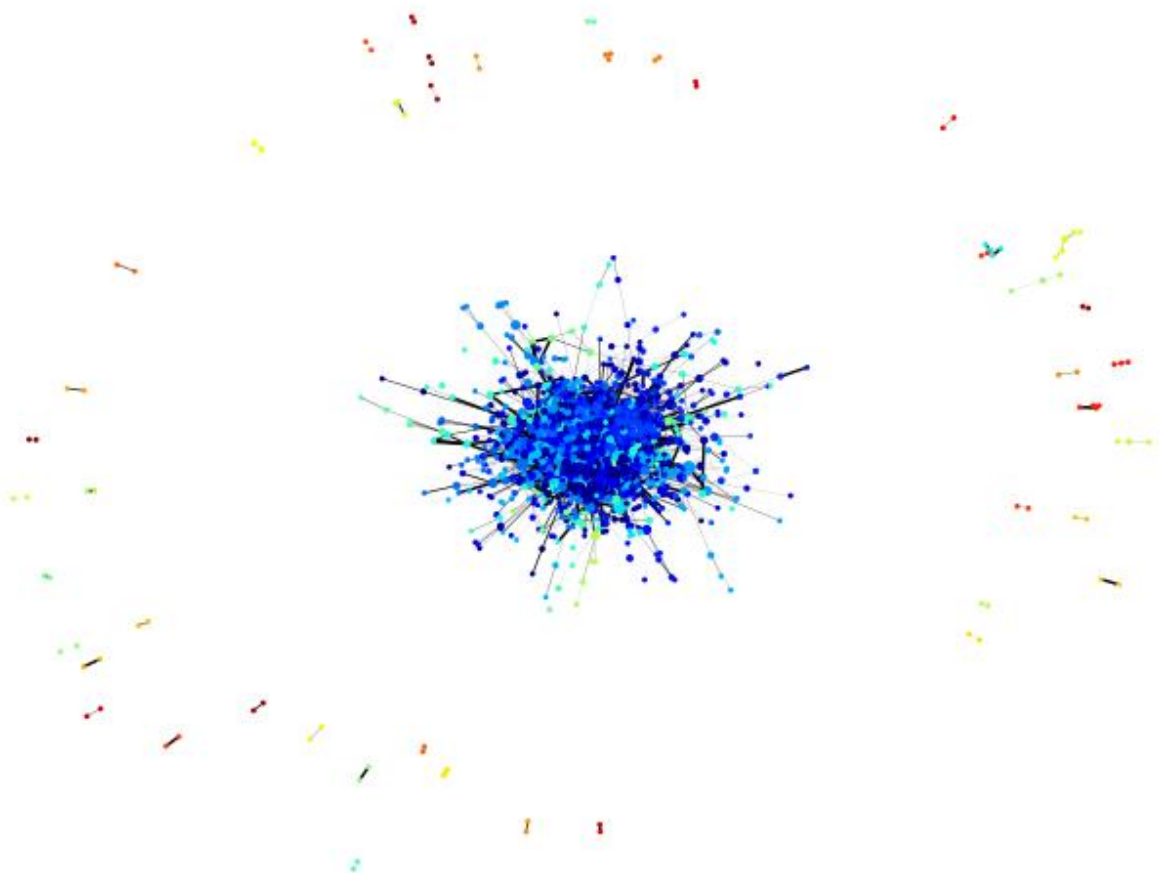


Figure 5. Network Visualization of Competitive Asymmetry with modified DRMABS

The number of submarkets and modularity value are not affected from the application of DRMABS method as expected.

Number of Submarkets	87
Modularity Value	0.819045634329

Table 5. Attributes of Competitive Asymmetry with modified DRMABS

### Competitive Asymmetry with Modified DRMABS and Focus on the Central Cluster

As it can be observed from the visualizations provided previously, there are certain products that are not connected to the central cluster, which indicates they are not competitors with most of the products. Removing these nodes allows us to focus on the products which are in strong competition with one another. The visualization with the removed nodes, which are not connected to the central cluster, is provided below.

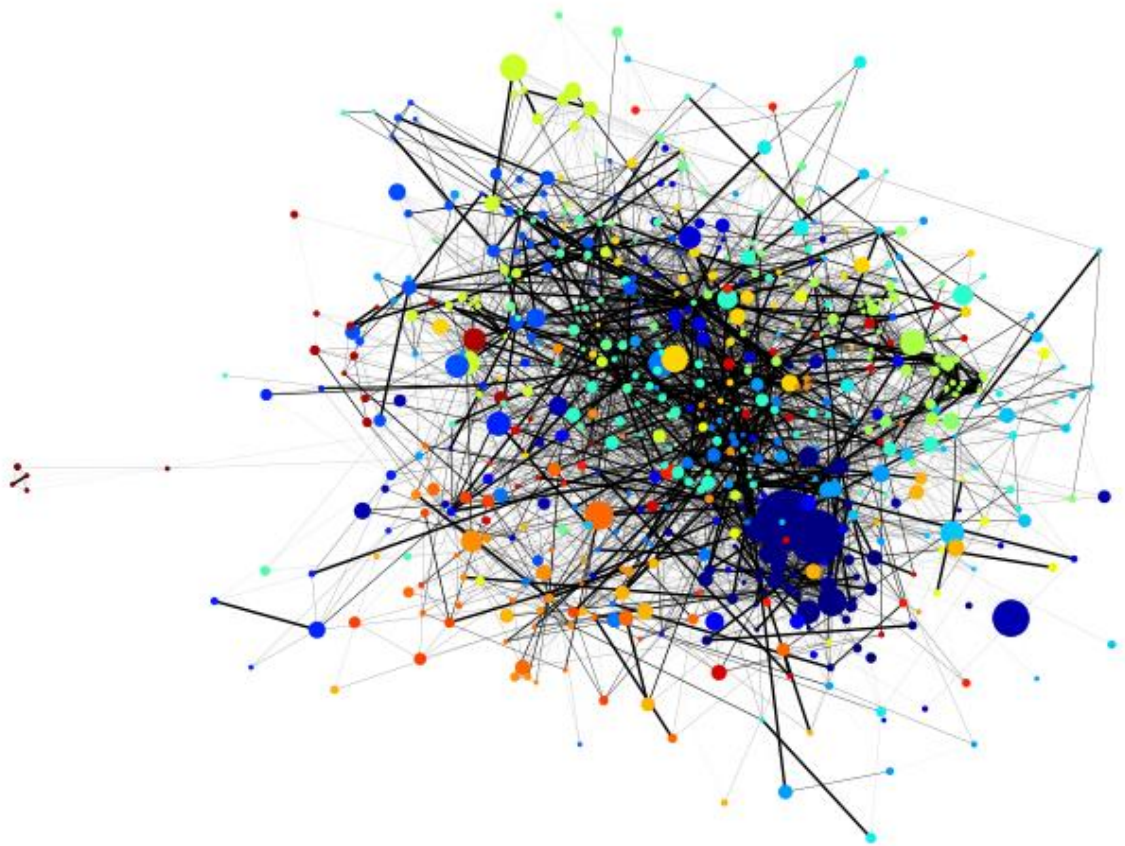


Figure 6. Network Visualization of Competitive Asymmetry with modified DRMABS and Focus on the Central Cluster

The number of submarkets, the size of each submarket, and the modularity value is also stated for this approach.

Number of Submarkets	26
Modularity Value	0.7499145734

Table 6. Attributes of Competitive Asymmetry with modified DRMABS and Focus on the Central Cluster

### Addition of Perceived Quality without Modified DRMABS

The network visualization of the global dog food market structure for addition of perceived quality measure without using modified DRMABS methodology is provided below.

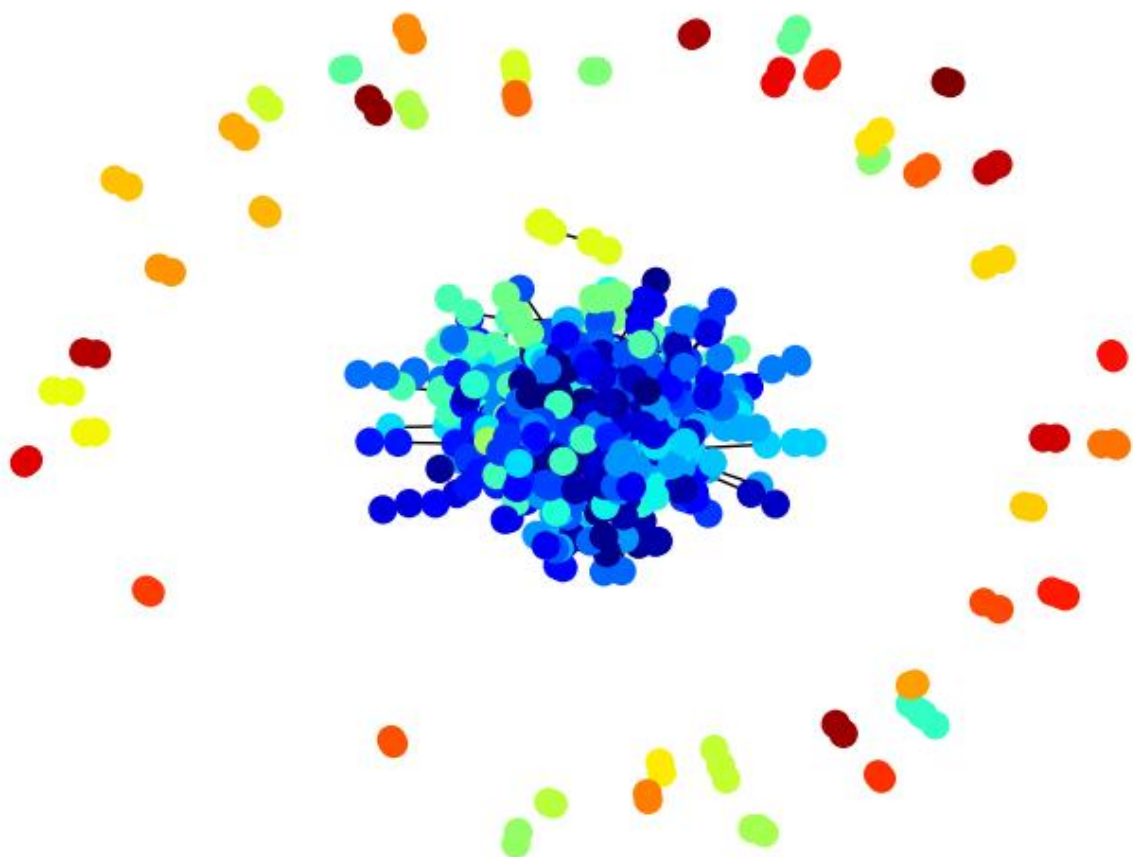


Figure 7. Network Visualization of Addition of Perceived Quality without modified DRMABS

The number of submarkets and sizes of each submarket are provided below. It can be observed that the number of submarkets decreased. The effect of the addition of perceived measure can also be observed on modularity, which is a quantitative measure that indicates the quality of partitioning. Modification on local and global asymmetry using the perceived quality led to an increase in modularity, which indicates an increase in the quality of identifying submarket identification.

Number of Submarkets	86
Modularity Value	0.821167287773

Table 7. Attributes of Addition of Perceived Quality without modified DRMABS

### Addition of Perceived Quality with Modified DRMABS

The network visualization of the global market structure for addition of perceived quality measure using the modified DRMABS technology is provided below.

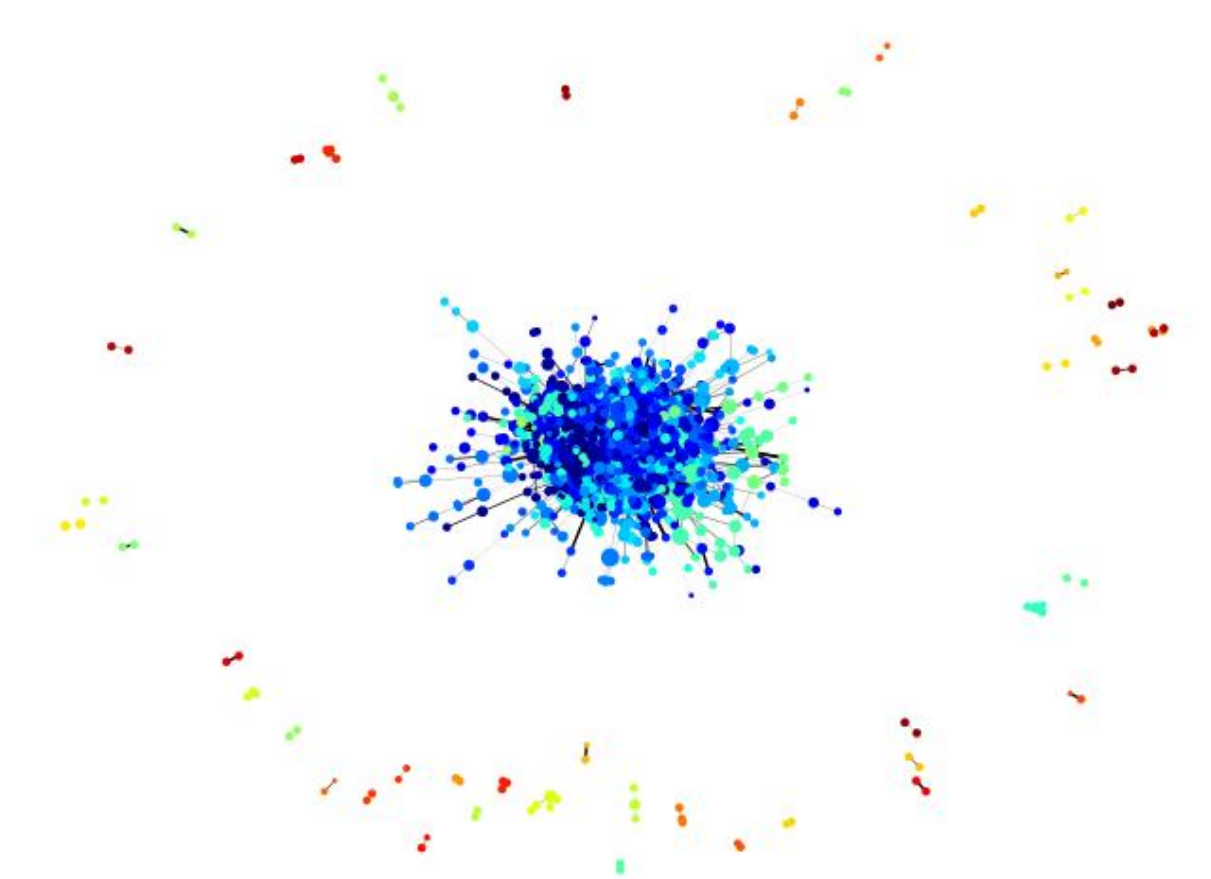


Figure 8. Network Visualization of Addition of Perceived Quality with modified DRMABS

The number of submarkets, sizes of submarkets, and modularity values are not affected by the modified DRMABS technique as expected.

Number of Submarkets	86
Modularity Value	0.821167287773

Table 8. Attributes of Addition of Perceived Quality with modified DRMABS



### Addition of Perceived Quality with Modified DRMABS and Focus on the Central Cluster

Once again, in order to be able to observe the central cluster, where the links are denser and the competition is stronger, the nodes that are not connected to the central cluster are removed. Visualization for this case is provided below.

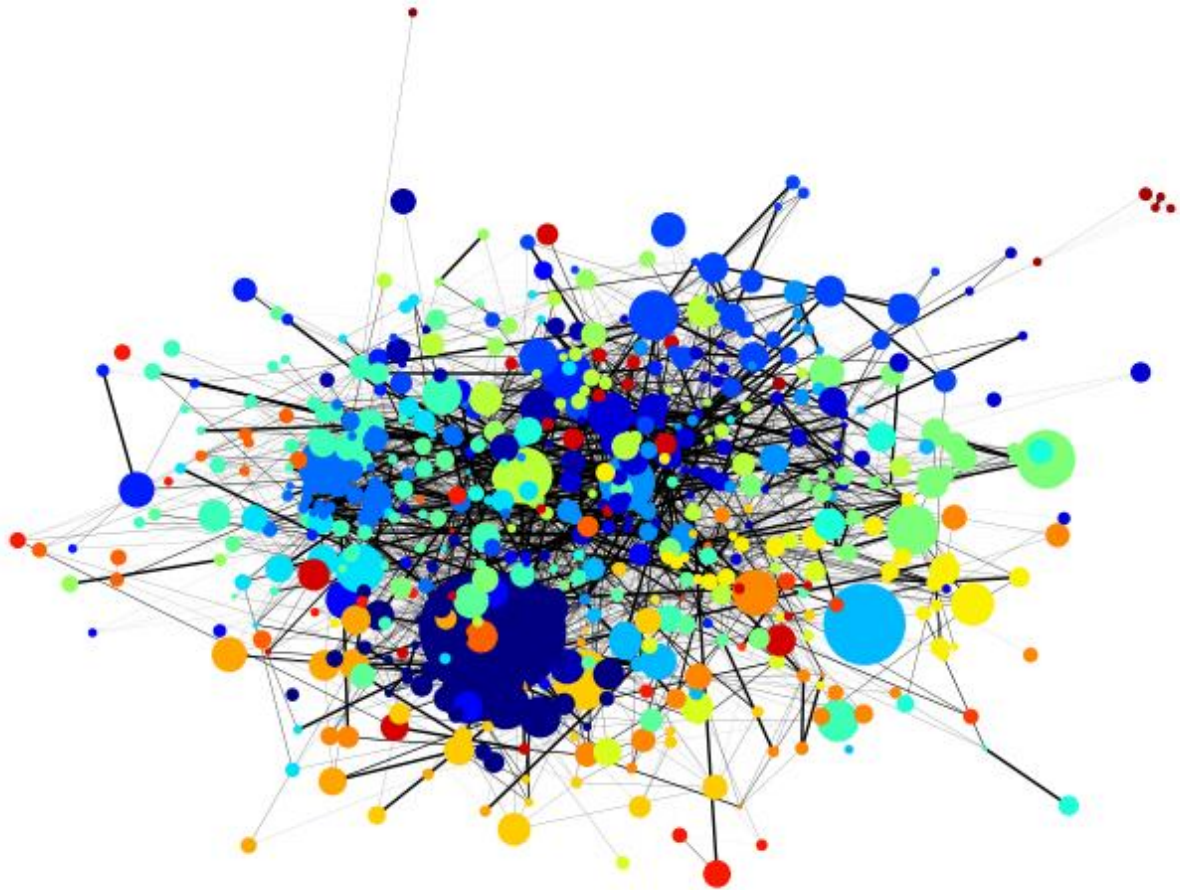


Figure 9. Network Visualization of Perceived Quality with modified DRMABS and Focus on the Central Cluster

The number of submarkets and modularity value are provided for this case as well. It can be observed that the number of communities decreased, as well as the modularity value.

Number of Submarkets	27
Modularity Value	0.750651422928

Table 9. Attributes of Addition of Perceived Quality with modified DRMABS and Focus on the Central Cluster

Comparison of the three cases of the two alternative approaches, namely competitive asymmetry and addition of perceived quality on top of this measure, shows that the modularity value is higher for the addition of perceived quality measure. This result points out that considering the review content and rating provides higher values of modularity, which in turn implies partitioning of better quality.

## **Summary and Conclusion**

In this paper, we provided a measure of competitiveness among the specific type of non-durable product, namely dog food, and configured a network to visualize the competitive relationships. We made use of Amazon product metadata and Amazon review data as our data set. Our approach in building the competitiveness measure is similar to the approach of Ringel and Skiera (2016). However, instead of consideration sets based on clickstream data we build review sets which include products that were reviewed by the same customer. We also analyzed the review content and review ratings to increase the accuracy of our results. We calculated the local and global asymmetry measures using the metrics specified earlier.

We then proceeded to visualize the competitiveness based on the local and global asymmetry metrics. To achieve this, we followed a slightly modified version of DRMABS. The networks obtained from the competitiveness measure without any review metric and without the application of DRMABS and the networks obtained from competitiveness with review metrics were provided. The networks obtained from both approaches using DRMABS, which allows the networks to reflect competitive asymmetry, were also provided. Finally, the network of the products that are densely linked and are in a strong competition is taken as the center of focus and is provided using both with review metrics and without review metrics approaches. In all the cases mentioned, we observe a higher value of modularity for the with review metrics measurement approaches, which indicates a higher quality of partitioning the global market into submarkets.

To conclude, incorporating review data, namely review polarity and review rating, leads to more accurate results in terms of identifying submarkets. Further research can be conducted to understand the application of this approach to complement goods or to improve the measurement approach to achieve higher accuracy in submarket identification.

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## **Appendix A – Product Names**

"B001VJ0B0I": "Purina Beneful Dog Food, 15.5 Pound"

"B002CJIPEK": "Purina Chef Michael's Dog Food"

"B004SBMU9Q": "Blue Buffalo Large Breed Chicken & Brown Rice Dog Food 30 lbs"

"B001F2GDO4": "Rachael Ray Nutrish Dry Dog Food, Beef & Rice Recipe, 6-Pound Bag"

"B0006345PM": "Hill's Science Diet Adult Oral Care Dry Dog Food, 30-Pound Bag"

"B0018CJYTC": "Taste of the Wild Dry Dog Food, Wetlands Canine Formula with Roasted Wild Fowl, 5 Pound Bag"

"B002ZNW346": "Blue Buffalo Wilderness Grain Free Dry Dog Food, Duck Recipe, 24-Pound Bag"

"B001VIY9KW": "Royal Canin Dry Dog Food, Medium Puppy 32 Formula, 30-Pound Bag"

"B003P9XGDG": "Blue Buffalo Wilderness Grain Free Dry Dog Food, Salmon Recipe, 24-Pound Bag"

"B004QM0OFY": "Rachael Ray Nutrish Healthy Weight Dry Dog Food, Turkey Recipe"

"B006BU77F4": "Taste of the Wild Grain-Free High Prairie Dry Dog Food for Puppy, 30-Pound Bag"

"B0009F84HW": "Merrick Puppy Plate Dog Food 30lb Bag"

"B0019CTOKA": "Pro Plan Adult Shredded Blend Lamb And Rice Formula Dry Dog Food"

"B001F2I9YG": "Rachael Ray Nutrish Dry Dog Food, Chicken/Vegetable Recipe"

"B001F2KB4C": "Rachael Ray Nutrish Dry Dog Food, Beef & Rice Recipe, 14-Pound Bag"

"B000QSN238": "Nutro Max Dry Dog Food - Adult Large Breed, 35 lb."

"B000W5SLB8": "Taste of the Wild Dry Dog Food, Hi Prairie Canine Formula with Roasted Bison & Venison, 30-Pound Bag"

"B001S9F2MS": "Purina One Dog Food - Beef & Rice (18lb.)"

"B0048Z6UZC": "Instinct Grain-Free Salmon Meal Dry Dog Food by Nature's Variety, 25.3-Pound Package"

"B005ATVY88": "Hill's Science Diet Ideal Balance Adult Chicken and Brown Rice Dinner Dry Dog Food Bag"

"B006TJV1PY": "Hill's Science Diet Ideal Balance Adult Grain Free Chicken and Potato Dinner Dry Dog Food Bag, 12-Pound"

"B000633M38": "Hill's Science Diet Adult Light Dry Dog Food"

"B0006345QG": "Hill's Science Diet Adult Light Small Bites Dry Dog Food"

"B0040BDYZS": "Merrick Whole Earth Farms Senior Dry Dog Food, 8-Pound Bag"

"B0089A5R9C": "Merrick Classic 5-Pound Small Breed Real Chicken, Brown Rice and Green Pea Dog Food, 1 Bag"

"B0009YYSVO": "Natural Choice Dog Chicken, Rice and Oatmeal Formula Dog Food Cans, 12-1/2-Ounce, 12 pack cans"

"B0026LIX50": "IAMS Dog Food Ground, Savory Dinner with Juicy Turkey & Rice, 13.2-Ounce Cans (Pack of 12)"

"B005KSPVQ0": "EVANGER'S 776008 Grain Free Chicken, Sweet Pot, Pumpkin Dry Dog Food, 4.4-Pound"

"B000A3SJ8W": "Natural Balance Canned Dog Food, Grain Free Limited Ingredient Diet Venison and Sweet Potato Recipe, 12 x 13 Ounce Pack"

"B001B04Z2M": "Blue Buffalo Canned Dog Food, Chicken Dinner (Pack of 12 12.5-Ounce Cans)"

"B002ANA70I": "Natural Balance Canned Dog Food, Grain Free Limited Ingredient Diet Venison and Sweet Potato Recipe, 12 x 6 Ounce Pack"

"B001BCOZ70": "Castor & Pollux Natural Ultramix Adult Dry Dog Food, 15 Pound Bag"

"B001BCWAFY": "Castor & Pollux Natural Ultramix Large Breed Adult Dry Dog Food, 30 Pound Bag"

"B004P8JMZC": "Merrick Whole Earth Farms Senior Chunky Loaf Dog Food, 13.2 Ounce Can (12 Pack)"

"B004Y8TYZQ": "Castor & Pollux Natural Ultramix Grain-Free Chicken and Vegetable Dinner Adult Dog Food, 13 Ounce Can"

"B00D8GEWT8": "PetKind Grain-Free All Natural Dog Food, 13 oz cans (Pack of 12)"

"B0002AB9FS": "Grizzly Salmon Oil All-Natural Dog Food Supplement in Pump-Bottle Dispenser"

"B000W5N2D0": "Limited Ingredient Diets Potato and Duck Formula Small Breed Bites Dry Dog Food", "B007794QTS"

"Blue Buffalo Small Breed Wilderness Chicken Adult Dry Dog Food, 4.5-Pound"

"B0000TSQ6G": "Holistic Select Adult Health Dry Dog Food"

"B004LWEUUY": "Castor & Pollux Natural Ultramix Weight Management Adult Dry Dog Food, 5.5 Pound Bag"

"B004QLX0LA": "Rachael Ray Nutrish Just 6 Limited Ingredient Dry Dog Food, Lamb & Rice Recipe"

"B003C5TCYU": "Natural Balance Dry Dog Food, Ultra Premium Formula, 30 Pound Bag"

"B000GEYWV8": "EVO 95% Venison Canned Dog Food - 24x5.5 oz"

"B000WFKERM": "EVO Dog 95% Meat Venison Canned Dog Food"

"B001VJ0ERI": "Natural Balance Venison Sweet Potato Formula Dog Food (Pack of 12 6-Ounce Cans)"

"B005HUVW46": "Instinct Grain-Free Canned Dog Food, Chicken Formula, 5.5-Ounce Cans (Pack of 12)"

"B002AYGFP8": "ZiwiPeak Real Meat Grain Free Air Dried Dog Food, Venison, 11lb"

"B003ALMW0M": "Kong Wobbler Dog Food And Treat Dispenser"

"B007OT50QY": "Instinct Raw Boost Grain-Free Chicken Meal Formula Dry Dog Food by Nature's Variety, 4.1-Pound Bag"

"B000N5XCQG": "Merrick Cowboy Cookout Dog Food 13.2 oz (12 Count Case)"

"B004P8JNCY": "Merrick Grain Free Real Chicken Dog Food, 13.2 Ounce Can, 12 Count Case"

"B00009OLE2": "AvoDerm Natural Chicken Meal and Brown Rice Formula Dog Food"

"B0018CK0EU": "Stella & Chewy's Freeze Dried Dog Food for Adult Dogs, Beef Patties, 16 Ounce Bag"

"B0000AH3QT": "Purina ONE SmartBlend Dry Dog Food"

"B000LURXOK": "Fromm Gold Holistic Adult Dry Dog Food"

"B001QCKS4O": "Purina Pro Plan Dry Adult Dog Food, Shredded Blend Chicken and Rice Formula, 35-Pound Bag"

"B000NVBVCC": "Stella and Chewy's Freeze Dried Dog Food for Adult Dogs, Chicken Patties, 6-Ounce Bag"

"B0018CK0G8": "Stella & Chewy's Freeze Dried Dog Food for Adult Dogs, Lamb Patties, 6 Ounce Bag"

"B004NFG2XW": "Stella & Chewy's Surf & Turf Freeze Dried Dog Food Dinner, 6 oz"

"B0018CLWS8": "Taste of the Wild Dry Dog Food, High Prairie Canine Formula with Roasted Bison and Venison, 5 Pound Bag"

"B0037TUHAY": "Royal Canin Dry Dog Food, Poodle 30 Formula, 10-Pound Bag"

"B0040BDZ0M": "Merrick Whole Earth Farms Senior Dry Dog Food 35 Pound Bag"

"B0089A5JY0": "Merrick Grain Free 25-Pound Real Buffalo and Sweet Potato Dog Food, 1 Bag"

"B0089A62MS": "Merrick Classic 30-Pound Adult Real Chicken, Brown Rice and Green Pea Dog Food, 1 Bag"

"B0089A67XM": "Merrick Grain Free 25-Pound Real Duck and Sweet Potato Dog Food, 1 Bag"

"B0028GY8UW": "Earthborn Holistic Primitive Natural Grain-Free Natural Dog Food"

"B004P8JNEM": "Merrick Whole Earth Farms Puppy Chunky Loaf Dog Food, 13.2 Ounce Can, 12 Pack"

"B00028HN64": "Dr. Harvey's Canine Health Miracle Dog Food, 10 Pounds"

"B001B185I6": "Dr. Harvey's Canine Health Miracle Dog Food, 5 Pounds"

"B0018CLWRE": "Taste of the Wild Dry Dog Food, Pacific Stream Canine Formula with Smoked Salmon, 5 Pound Bag"

"B002YMHBCM": "Eukanuba Large Breed Adult Dog Food - 20 Pounds"

"B005OCX5XI": "ALPO Prime Cuts Dog Food Variety Pack, 9.90-Pound"

"B0015G862M": "Stella & Chewy's Freeze Dried Dog Food for Adult Dogs, Beef Patties, 6-Ounce Bag"

"B003BGB24S": "Stella & Chewy's Duck Duck Goose Freeze Dried Dog Food Dinner, 16 oz"

"B00IDZTGKE": "Nutrience Grain Free Dog Food, 18-Pound Bag"

"B003R0LLIU": "Purina Pro Plan Select Dry Adult Dog Food"

"B005HN364M": "Royal Canin Maxi Puppy, Dry Dog Food Formula, 35-Pound Bag"

"B004P8JMYI": "Merrick Whole Earth Farms Adult Chunky Loaf Dog Food, 13.2 Ounce Can (12 Pack)"

"B00008DFOG": "Beef Formular Natural Roll Dry Dog Food"

"B000633V3E": "Natural Balance Dog Food, Lamb Formula, 4 Pound Roll"



"B000633V48": "Natural Balance Dog Food, Turkey Formula, 4 Pound Roll"

"B00063425K": "Hill's Science Diet Mature Adult Active Longevity Small Bites Dry Dog Food"

"B004P3970C": "Natural Balance Limited Ingredient Diets, Lamb and Brown Rice Formula, Canned Dog Food, 13-Ounce, Pack of 12"

"B0018CIP6K": "Taste of the Wild Dry Dog Food, Pacific Stream Canine Formula with Smoked Salmon, 30-Pound Bag"

"B0018CIRMM": "Stella & Chewy's Freeze Dried Dog Food for Adult Dogs, Lamb Patties, 16 Ounce Bag"

"B00INU05N6": "Iams Premium Protection Adult Dry Dog Food, 11-Pound"

"B0006345MA": "Purina Beneful Dog Food"

"B0006346RY": "Natural Balance Dry Dog Food, Grain Free Limited Ingredient Diet Duck and Potato Formula, 15 Pound Bag"

"B0006346S8": "Natural Balance LID Duck Dry Dog Food 28lb"

"B000W5QSZ": "Taste of the Wild Dry Dog Food, Wetlands Canine Formula with Roasted Wild Fowl, 30-Pound Bag"

"B000633V3O": "Natural Balance Beef Formula Dog Food Roll, 4-Pound"

"B004INIV0G": "Purina Alpo Prime Cuts Beef Stew Canned Dog Food, 22-Ounce (Pack of 12)"

"B008G50ABU": "Acana Pacifica Dry Dog Food (15lb - New Formula)"

"B0089A5YKE": "Merrick Classic 30-Pound Adult Real Lamb, Brown Rice and Apples Dog Food, 1 Bag"

"B0089A5Z4Y": "Merrick Classic 30-Pound Adult Real Beef, Whole Barley and Carrots Dog Food, 1 Bag"

"B0018CJWPI": "Diamond Dry Dog Food for Adult Dog, Original Chicken Flavor, 50 Pound Bag"

"B0035FPU3E": "Nature's Recipe Dry Dog Food for Adult Dog, Healthy Skin Vegetarian Recipe, 35 Pound Bag"

"B007DI14WA": "Pedigree Complete Nutrition dry dog food for Adult Dogs, 17lb"

"B0030N5HB6": "Purina Pro Plan Dry Adult Dog Food, Shredded Blend Beef and Rice Formula, 18-Pound Bag"

"B006WW8412": "Rachael Ray Nutrish Naturally Delish Wet Dog Dog Food, 8-Ounce Tub (Pack of 8)"

"B00IDZT22Q": "Nutrience Original Adult Chicken Meal with Brown Rice Recipe Dog Food, 18-Pound Bag"

"B00028HN3M": "Sojos Original Dog Food Mix"

"B001NY3VAI": "Addiction Pet Foods Homestyle Venison and Cranberry Dinner Dog Food"

"B001PS5J8E": "Addiction Holistic Dry Dog Food - Wild Kangaroo & Apples Entree - 3 Pounds"

"B001Q2XSQ4": "Addiction Holistic Dry Dog Food - Wild Kangaroo & Apples Entree - 15 Pounds"

"B001QWDYEA": "Addiction Pet Foods Herbed Lamb and Potatoes Dog Food"

"B002C5L3W0": "Addiction Pet Foods Le Lamb Dog Food"

"B002C5VUNM": "Addiction Pet Foods La Porchetta Dog Food"

"B003U0M23A": "Addiction Pet Foods Country Chicken and Apricot Dinner Dog Food"

"B003U0R6EU": "Addiction Pet Foods Steakhouse Beef and Zucchini Entrée Dog Food"

"B004K2M5OI": "Sojos Complete Beef Dog Food Mix (2 lb)"

"B006FS0NR6": "Purina Beneful IncrediBites Dog Food"

"B00HPZPID2": "Hill's Ideal Balance Large Breed Natural Chicken & Brown Rice Recipe Mature Adult Dry Dog Food"

"B0018CJJ9W": "Natural Balance Dry Dog Food, Grain Free Limited Ingredient Diet Venison and Sweet Potato Recipe, 28 Pound Bag"

"B000WFRPCY": "Purina Moist & Meaty Dog Food"

"B002CJD5GI": "Purina Mighty Dog Dog Food, 5.5 Ounce (Pack of 24)"

"B0027IQC6E": "Sojos Complete Dog Food Mix"

"B000WFQ64C": "Fromm Gold Holistic Puppy Dry Dog Food"

"B000WFNQ6S": "Chicken Soup for the Puppy Lover's Soul Dry Dog Food for Puppy, Large Breed Chicken Flavor, 35 Pound Bag"

"B0040BDYSU": "Merrick Whole Earth Farms Puppy Dry Dog Food 17.5 Pound Bag"

"B0018CK0EA": "Stella & Chewy's Freeze Dried Dog Food for Adult Dogs, Chicken Patties, 16 Ounce Bag"

"B0089A5UPI": "Merrick Classic 5-Pound Adult Real Lamb, Brown Rice and Apples Dog Food, 1 Bag"

"B0018CE91A": "Ultra Premium Formula Small Breed Bites Dry Dog Food"

"B002AN8F52": "Natural Balance Canned Dog Food, Grain Free Limited Ingredient Diet Duck and Potato Formula, 12 x 6 Ounce Pack"

"B00DURIP7K": "Hill's Science Diet Baked Light Biscuits with Real Chicken Dog Food, 9-Ounce Pouch"

"B00379J1TM": "Blue Buffalo Wilderness Grain Free Dry Dog Food, Duck Recipe, 4.5-Pound Bag"

"B0089A5W3S": "Merrick Grain Free Real Pork And Sweet Potato Recipe Dog Food, 1 Bag"

"B0089A5P9O": "Merrick Classic 30-Pound Large Breed Real Chicken, Brown Rice and Green Pea Dog Food, 1 Bag"

"B000HBAJ62": "Purina Pro Plan Entrée Adult Dog Food, 13-Ounce Cans (Pack of 12)"

"B0029NUGO6": "Pedigree Puppy Complete Nutrition Dry Dog Food 16.3 lb"

"B005DL78KQ": "Hill's Science Diet Puppy Savory Stew Beef and Vegetables Dog Food Can, 12.8-Ounce, 12-pack"

"B005HUVW0U": "Instinct Grain-Free Beef Formula Canned Dog Food by Nature's Variety, 5.5-Ounce Cans (Pack of 12)"

"B00C9XLHXU": "Back to Basics Grain-Free Dry Dog Food"

"B000084F62": "Wells PRO PAC Lamb Meal & Rice Dog Food - 33 lb. Bag"

"B000BURCNC": "Royal Canin Dry Dog Food, Medium Adult 25 Formula, 30-Pound Bag",

"B000LURXOU": "Fromm Gold Nutritionals Adult Dry Dog Food 15lb"

"B005OCX8VC": "Busy Rollhide Dog Food Small Pouch, 12-Ounce"

"B0085JN42Y": "Purina Beneful Prepared Meals Dog Food Variety Pack, 60-Ounce"

"B008EXEMOU": "Blue Buffalo Freedom Grain Free Chicken Recipe Adult Dry Dog Food, 24-Pound"

"B0049B1VWM": "LIFE4K9 Canned Dog Food, Lamb and Barley Formula, 13.2 Ounce Cans (Pack of 12)"

"B0049B1VX6": "LIFE4K9 Canned Dog Food, Chicken and Barley Formula, 13.2 Ounce Cans (Pack of 12)"

"B000QSOPN4": "AvoDerm Natural Oven-Baked Original Formula with Beef Meal Dog Food, 15-Pound"

"B0018CLVGQ": "Oven-Baked Small Bites Original Formula with Beef Meal All Life Stages Dry Dog Food"

"B000N5XCQQ": "Merrick Mediterranean Banquet Dog Food 13.2 oz (12 Count Case)"

"B00388XW7Y": "Blue Buffalo Wilderness Grain Free Canned Dog Food, Turkey and Chicken Recipe (Pack of 12 ,12.5-Ounce Cans)"

"B003IRIEEG": "Taste of the Wild Wetlands Grain-Free Canned Dog Food (12/13.2oz cans)"

"B003R0LL1C": "Canidae 12-Pack Canned Dog Food, Grain Free Salmon And Mackerel Formula, 13-Ounce Can"

"B0026LIWFG": "IAMS Proactive Health Dog Food, Ground Savory Dinner with Lamb & Rice, 13.2-Ounce Cans (Pack of 12)"

"B00A47LGL6": "Prairie Homestyle Canned Dog Food, 5.5-Ounce, 12-Pack", "B00DURIOI0": "Hills Science Diet Adult Grain Free Dog Food"

"B0018CDV6E": "Instinct Grain-Free Beef Formula Canned Dog Food by Nature's Variety, 13.2-Ounce Cans (Pack of 12)"

"B0047CRDNO": "Instinct Grain-Free Beef Meal and Lamb Meal Dry Dog Food by Nature's Variety, 25.3-Pound Package"

"B007JY4E98": "NOW! 152347 Fresh Grain Free Senior Dog Food, 12-Pound Bag"

"B003MQN33U": "Purina Pro Plan Dry Adult Dog Food, Shredded Blend Lamb and Rice Formula, 18-Pound Bag"

"B001L47B9W": "Weruva Variety Pack Canned Dog Food, (Pack of 12 cans)"

"B001TM2A5G": "Weruva Dog Food, Steak Frites, 14-Ounce Cans (Pack of 12)"

"B001TM3XKW": "Weruva Dog Food, Bed & Breakfast Dog Food, 14-Ounce Cans (Pack of 12)"

"B004SBMS9I": "Evanger's Hand-Packed Hunk of Beef Canned Dog Food"

"B00BIYLHVS": "Hill's Ideal Balance Tender Chicken and Vegetables Recipe 12-Pack Dog Food Can"

"B0026KG0DI": "Nutro Natural Choice Senior Dog Food, 5 Lbs"

"B004CQZQQG": "Hill's Science Diet Adult Large Breed Dry Dog Food Bag"

"B002WF77B6": "Purnia Alpo Chop House in Gravy Dog Food"

"B004INAQTK": "Purina Alpo Prime Dog Food"

"B000FN9S78": "Fromm 4-Star Chicken A La Veg Dry Dog Food 5lb"

"B007GCGO64": "Zignature Lamb Dry Dog Food, 27-Pound"

"B003IRJTCC": "Taste of the Wild Canned Dog Food for All Lifestages, Pacific Stream Canine with Smoked Salmon Formula (Pack of 12, 13.2 Ounce Cans)"

"B006BU77E0": "Taste of the Wild Grain-Free High Prairie Dry Dog Food for Puppy, 15-Pound Bag"

"B0018CJJ9C": "Natural Balance Dry Dog Food, Grain Free Limited Ingredient Diet Venison and Sweet Potato Recipe, 15 Pound Bag"

"B0018CFR1Q": "Instinct Grain-Free Canned Dog Food, Chicken Formula, 13.2-Ounce Cans (Pack of 12)"

"B0050HZ9G8": "Limited Ingredient Diets Sweet Potato and Chicken Small Breed Bites Dry Dog Food"

"B005HUVS0E": "Instinct Grain-Free Chicken Meal Dry Dog Food by Nature's Variety, 4.4-Pound Package"

"B005HUVT6M": "Instinct Grain-Free Beef Meal & Lamb Meal Dry Dog Food by Nature's Variety, 4.4-Pound Package"

"B007OT52H6": "Instinct Raw Boost Grain-Free Duck Meal & Turkey Meal Formula Dry Dog Food by Nature's Variety, 4.1-Pound Bag"

"B000N648JU": "Merrick Turducken Dog Food 13.2 oz (12 Count Case)"

"B000N5XCPM": "Merrick Grammy's Pot Pie Dog Food 13.2 oz (Pack of 12)"

"B000N5XCRU": "Merrick Thanksgiving Day Dinner Dog Food 13.2 oz (12 Count Case)"

"B000N62E4G": "Merrick Puppy Plate Dog Food 13.2 oz (12 Count Case)"

"B004LWGLM4": "Ultramix Puppy Dry Dog Food, 5.5 Pounds"

"B004Y6KK6K": "Back to Basics Instinct Dry Dog Food"

"B001J5R8H8": "Kibbles 'n Bits Wet Dog Food Variety Pack, 12/13.2-Ounce Cans (Pack of 2)"

"B002GJ72XQ": "Wells PRO PAC Adult Mini Chunk Superpremium Dog Food - 33 lb. Bag"

"B00IDZT294": "Nutrience Natural Healthy Adult Dog Food, 18-Pound Bag"

"B007T9WINC": "Precise Holistic Complete Grain Free Chicken with Vegetables Formula Canned Dog Food (13.2oz (12 in case))"

"B00B4XFWGE": "Daves 95 Premium Meats Chicken Recipe Can Dog Food"

"B00170D748": "Merrick Before Grain #1 Chicken Dry Dog Food, 6.6-Pound Bag"

"B00HPZEM34": "Hill's Science Diet Adult Grain-Free Salmon Dry Dog Food"

"B0009F5RXG": "Merrick Cowboy Cookout Dog Food 30lb Bag"

"B004Y8TVN6": "Castor & Pollux Organix Grain-Free Adult Dry Dog Food, 14.5 Pound Bag"

"B00AU0SX7C": "Hound & Gatos 98% Beef Formula Canned Dog Food 12/13-oz cans"

"B000WAFJ0E": "FirstMate Pet Foods Chicken with Blueberries Dog Food"

"B001PR18U8": "FirstMate Australian Lamb Dog Food"

"B00A48WHDQ": "FirstMate Pet Foods Can Turkey Dog Food, 12.5-Ounce, Pack of 12"

"B000W5P0KI": "Orijen Puppy Grain-Free Dry Dog Food, 15.4lb"

"B000W5SLHW": "Orijen Grain-Free Adult Dry Dog Food, 15.4lb"

"B003EGX5SG": "Orijen Puppy Grain-Free Dry Dog Food, 5.5lb"

"B000VK33C6": "Newman's Own Organics Adult Dog Food Formula"

"B000633V3Y": "Natural Balance Turkey Formula Dog Food Roll, 2.5-Pound"

"B00HPZEMPM": "Hill's Science Diet Perfect Weight Dry Dog Food"

"B004ZIGT44": "Instinct Grain-Free Lamb Meal Formula Limited Ingredient Diet Dry Dog Food by Nature's Variety, 25.3-Pound Bag"

"B000QSLY6K": "ProPlan Select Turkey Dry Dog Food 33lb"

"B001J5R7YW": "Kibbles 'n Bits Small Breed Mini Bits Savory Beef & Chicken Flavor Dog Food, 8-Pound"

"B0026M4NRQ": "Purina Dog Chow Dry Dog Food 44.1lb"

"B003766HZ6": "Beneful IncrediBites Dry Dog Food, 14-Count Pouches (Pack of 2)"

"B00393C3F0": "Hill's Science Diet Adult Large Breed Dry Dog Food - 35-Pound Bag"

"B0050KCLSO": "Addiction Raw Dehydrated Grain-Free Dog Food, Outback Kangaroo Feast, 2lbs"

"B003C5NT0I": "Natural Balance Sweet Potato and Bison Formula Dog Food, 15-Pound Bag"

"B00609PJIS": "Hi-Tek Naturals Grain Free Chicken Meal and Sweet Potato Formula Dry Dog Food, 30 Pounds"

"B0089A6VC4": "Merrick Classic 5-Pound Puppy Real Chicken, Brown Rice and Green Pea Dog Food, 1 Bag"

"B00HPZPIE6": "Hill's Ideal Balance Small Breed Natural Chicken & Brown Rice Recipe Mature Adult Dry Dog Food, 4-Pound"

"B000W5U5H6": "Taste of the Wild Dry Dog Food, Hi Prairie Canine Formula with Roasted Bison & Venison, 15-Pound Bag"

"B0018CFQJO": "Instinct Grain-Free Duck Meal & Turkey Meal Dry Dog Food by Nature's Variety, 25.3-Pound Package"

"B003SEATYC": "Grandma Lucy's Artisan Grain-Free Premix Dog Food, 3-Pound Bag"

"B005UV1IVY": "Blue Buffalo Wilderness Grain Free Chicken Healthy Weight Dry Dog Food, 4.5-Pound"

"B0074JN05W": "Royal Canin Puppy Dry Dog Food, 13-Pound"

"B008EXFSLQ": "Royal Canin Puppy Dry Dog Food, 15-Pound"

"B0009YUI86": "Blue Buffalo Weight Control Formula Dry Dog Food, 30-Pound Bag"

"B0032BH4K8": "Royal Canin Labrador Retriever Dry Dog Food, 30-Pound Bag"

"B000634160": "Hill's Science Diet Adult Advanced Fitness Original Dry Dog Food"

"B000VK339Y": "Newman's Own Organics Canned Dog Food"

"B00HPZEJPK": "Hill's Ideal Balance Active Natural Chicken & Oats Recipe Adult Dry Dog Food"

"B00C97O83W": "Nature's Variety Instinct Grain-Free Limited Ingredient Diet Rabbit Meal Dry Dog Food Bag, 4.4-Pound"

"B0051F3AJW": "Acana Wild Prairie Dog Food - Acana Wild Prairie Dog Food 15 lb"

"B0009X63VS": "Chicken Soup for the Dog Lover's Soul Dry Dog Food for Senior Dog, Chicken Flavor, 35 Pound Bag"

"B000WFEODW": "Chicken Soup for the Dog Lover's Soul Dry Dog Food for Adult Dog, Light Chicken Flavor, 35 Pound Bag"

"B006BU77A4": "Taste of the Wild Grain-Free Pacific Stream Dry Dog Food for Puppy, 30-Pound Bag"

"B002AYA6M6": "ZiwiPeak Real Meat Grain Free Air Dried Dog Food, Lamb, 2.2lb"

"B002AYAMIE": "ZiwiPeak Real Meat Grain Free Air Dried Dog Food, Lamb, 11lb"

"B003C5JYG6": "Horizon Legacy Adult Dry Dog Food 25lb"

"B000W5P0J4": "Orijen Puppy Grain-Free Dry Dog Food, 29.7lb"

"B0040BET8E": "Merrick Whole Earth Farms Adult Dry Dog Food, 35-Pound Bag"

"B00609PJEC": "Hi-Tek Naturals Grain Free Lamb Meal and Sweet Potato Formula Dry Dog Food, 30 Pounds"

"B004B9COVE": "Dogswell Nutrisca Dog Food, Lamb and Chickpea, 15-Pound Package"

"B004B9COX2": "Dogswell Nutrisca Dog Food, Chicken and Chickpea, 15-Pound Package"

"B001TM3XI4": "Weruva Dog Food, Funky Chunky Chicken Soup, 14-Ounce Cans (Pack of 12)"

"B003O7ZON4": "Blue Buffalo Small Breed Chicken & Rice Dog Food, 15 lb. bag"

"B007SWZ8Q4": "Blue Buffalo Freedom Grain Free Adult Chicken Recipe Canned Dog Food"

"B000ROR8QS": "Sojos Grain-Free Dog Food Mix"

"B003MGGAQ2": "Hill's Science Diet Mature Adult Active Longevity Original Dry Dog Food"

"B00H3R3WG2": "Kibbles 'n Bits Dog Food Original Savory Beef & Chicken Flavor"

"B003AO5DLO": "Royal Canin Medium Cocker Spaniel Dry Dog Food, 25-Pound Bag"

"B009LQD6PU": "Blue Buffalo Healthy Weight Chicken and Brown Rice Recipe for Small Breeds Dry Dog Food, 15-Pound"

"B00HPZEKV8": "Hill's Ideal Balance Slim & Healthy Natural Chicken & Barley Recipe Adult Dry Dog Food"

"B005KSISTM": "Purina Beneful Healthy Fiesta Dog Food"

"B000JL90TC": "Natural Balance Premium Dog Food Roll Lamb Formula, 1 Pound Roll"

"B000W5QSYA": "Taste of the Wild Dry Dog Food, Wetlands Canine Formula with Roasted Wild Fowl, 15-Pound Bag"



"B003F77BFW": "Halo Spot's Stew Natural Dry Dog Food, Adult Dog, Wholesome Chicken Recipe, 10-Pound Bag"

"B004HFRMFA": "Natural Balance Canned Dog Food, Vegetarian Recipe, 12 pack of 13 ounce cans"

"B00063434K": "Natural Balance Duck and Potato Formula Dog Food (Pack of 12 13-Ounce Cans)"

"B000W5QTJ4": "Orijen Senior Grain-Free Dry Dog Food, 29.7lb"

"B000W5SLEU": "Orijen Adult Dry Dog Food (29.7 lb)"

"B000XZBXP8": "Blue Buffalo Dry Dog Food, Lamb and Rice Recipe, 30-Pound Bag"

"B005KSPWDW": "Wysong Optimal Performance Dog Food Case, 32-Pound"

"B00COVAYNQ": "Victor Dog Food Select Ocean Blend with Wild Salmon and Brown Rice, 40-Pound"

"B000634HD2": "Natural Balance Vegetarian Formula Dog Food, 28-Pound Bag"

"B000084F0P": "Purina Pro Plan Select Dry Adult Dog Food"

"B0040BA0BO": "Merrick Whole Earth Farms Senior Dry Dog Food 17.5 Pound Bag"

"B0089A5EZE": "Merrick Grain Free 12-Pound Real Buffalo and Sweet Potato Dog Food, 1 Bag"

"B000N62E46": "Merrick Wingaling Dog Food 13.2 oz (12 Count Case)"

"B000084F5Y": "Wells PRO PAC Adult Chunk Superpremium Dog Food - 33 lb. Bag"

"B000N648JA": "Merrick French Country Cafe Dog Food 13.2 oz, 12 Count"

"B004TMGSWY": "Hi-Tek Naturals Chicken Meal and Rice Formula Dry Dog Food for Active Dogs"

"B00609PJLU": "Hi-Tek Naturals Grain Free Chicken Meal and Sweet Potato Formula Dry Dog Food, 15 Pounds"

"B002BR9GUU": "Acana Wild Prairie Grain-Free Dry Dog Food, 29.7lb"

"B002IQO03M": "STELLA & CHEWY'S DUCK DUCK GOOSE FREEZE DRIED DOG FOOD DINNER, 6 OZ"

"B000PEAMP4": "Instinct Grain-Free Dry Dog Food, Chicken Meal Formula, 25.3-Pound Package"

"B007SWZ922": "Blue Buffalo Large Breed Freedom Grain Free Chicken Recipe Dry Dog Food, 24-Pound"

"B0018CLH92": "Nature's Recipe Canned Dog Food for Adult Dog, Healthy Skin Vegetarian Recipe (Pack of 12 13.2 Ounce Cans)"

"B003VIWOES": "Nature's Recipe Dry Dog Food for Adult Dog, Healthy Skin Vegetarian Recipe, 15 Pound Bag"

"B002C23N8K": "Back to Basics Honesty Chicken Dry Dog Food"

"B0089A66N8": "Merrick Grain Free 25-Pound Real Chicken and Sweet Potato Dog Food, 1 Bag"

"B0032BOIH0": "Royal Canin Yorkshire Terrier Dry Dog Food, 10-Pound Bag"

"B0018CE6DQ": "Chicken Soup for the Dog Lover's Soul Dry Dog Food for Adult Dog, Large Breed Chicken Flavor, 35 Pound Bag"

"B000W5QT2G": "Go! Dry Dog Food, Natural Grain Free Endurance Formula, 6 Pound Bag"

"B001AHUO5I": "Merrick Before Grain #3 Buffalo Dry Dog Food, 11.1-Pound Bag"

"B00APVQNXM": "Great Life Dog Food Limited Ingredients Dog Food, 30-Pound, Buffalo"

"B000HBAJ4Y": "Pro Plan Canned Dog Food, 13-Ounce Cans (Pack of 12)"

"B006TAD1FG": "Purina Pro Plan Adult Dog Food, 5.5-Ounce Cans (Pack of 24)"

"B007SX0OYE": "Dr. Harvey's Canine Health The Miracle Dry Dog Food, Dr. Harvey's"

"B007GCIJ7Q": "Zignature Wild Trout Dry Dog Food, 4-Pound"

"B007GCIJOE": "Zignature Wild Trout Dry Dog Food, 13.5-Pound"

"B0006342KA": "Hill's Science Diet Adult Sensitive Stomach & Skin Dry Dog Food"

"B006FRYOLI": "Busy Heartyhide Chicken Dog Food, 5-Ounce (Pack of 6)"

"B003TQUSVS": "Flint River Ranch Lamb & Rice Dog Food Samples Pack - 2lb"

"B000W5QT3A": "Go! Dry Dog Food, Natural Grain Free Endurance Formula, 25 Pound Bag"

"B001QEEXCK": "Canidae Dry Dog Food for All Life Stages"

"B0049B1VYK": "LIFE4K9 Chicken and Barley Formula Dry Dog Food for All Dogs, 30 Pounds"

"B007PH6C3U": "PureVita Grain Free Bison Entree Dog Food 5 lbs."

"B00B7RUPPU": "Pure Vita Bison Dry Dog Food-5LB-"

"B008EXEMX6": "Blue Buffalo Life Protection Formula Natural Lamb and Brown Rice for Small Breeds Dry Dog Food, 15-Pound"

"B0040BA0DM": "Merrick Whole Earth Farms Adult Dry Dog Food, 17-1/2-Pound Bag"

"B002OY0QDQ": "Purina Pro Plan Focus Dry Adult Dog Food"

"B009LQFHHA": "Rachael Ray Nutrish Dry Dog Food, 'Beef & Rice Recipe' 28-Pound"

"B001TM2A2Y": "Weruva Dog Food, Paw Lickin' Chicken, 14-Ounce Cans (Pack of 12)"

"B001TM3XK2": "Weruva Dog Food, Jammin' Salmon, 14-Ounce Cans (Pack of 12)"

"B0018CFNFG": "Natural Balance Dry Dog Food, Grain Free Limited Ingredient Diet Small Bites Duck and Potato Formula, 12.5 Pound Bag"

"B001FTZ7MQ": "Life's Abundance Turkey & Shrimp Breakfast in Broth Canned Dog Food 24-5.5 oz Cans"

"B006BU77RW": "Taste of the Wild Grain-Free Pacific Stream Dry Dog Food for Puppy, 15-Pound Bag"

"B00COIB79Y": "Nature's Variety Prairie Venison and Barley Recipe Dry Dog Food"

"B0048Z8NFW": "Nature's Variety Instinct, Grain-Free Canned Dog Food, Rabbit, 13.2 Ounces (Single Can)"

"B004P8JNF6": "Merrick Grain Free Real Texas Beef Dog Food, 13.2-Ounce Can, 12-Pack"

"B00170D6SK": "Before Grain Buffalo Canned Dog Food (13.2-oz, case of 12)"

"B004K2GCTW": "Precise 726331 Holistic Complete Large/Giant Breed Adult Dog Food, 30-Pound"

"B001SIU13O": "Beneful Healthy Dry Dog Food"

"B00CPK928Y": "Blue Freedom Grain Free Beef Dry Dog Food 24lb"

"B003P9XG4K": "Blue Buffalo Basics Dry Dog Food, Turkey and Potato Recipe, 24-Pound Bag"

"B001F2GDOE": "Rachael Ray Nutrish Chicken & Veggies Dog Food - 14lb"

"B00EA90FDY": "Great Life Dog Food Grain Free Potato Free Dog Biscuits, 1-Pound, Venison"

"B004DCVNV6": "Castor & Pollux Organix Chicken and Brown Rice Adult Dog Food, 12.7 Ounce Cans (Pack of 12)"

"B005FC74RK": "Castor & Pollux Organix Grain-Free Turkey and Vegetable Adult Dog Food, 12.7 Ounce Cans (Pack of 12)"

"B00474A4AG": "Castor & Pollux Organix Chicken and Potato Adult Dog Food, 12.7 Ounce Cans (Pack of 12)"

"B004LLD27M": "Castor & Pollux Organix Weight Management Adult Dry Dog Food, 14.5 Pound Bag"

"B00ATP1BTK": "Victor Dog Food Grain-Free Active Dog and Puppy Beef Meal and Sweet Potato, 30-Pound"

"B00B1U7F10": "Victor Dog Food Grain-Free Joint Health Beef Meal and Sweet Potato, 30-Pound"

"B00C78QOD0": "Victor Dog Food Senior Healthy Weight Management Diet Dog Food with Glucosamine and Chondroitin, 40-Pound"

"B00CJLP4EA": "Victor Dog Food Select Hi-Pro Plus Formula for Active Dogs and Puppies, 40-Pound"

"B003P9XG0E": "Blue Buffalo Wilderness Grain Free Canned Dog Food, Duck and Chicken Grill (Pack of 12 12.5-Ounce Cans)"

"B006FS0OV6": "Puppy Chow Healthy Morsels Dog Food, 4.40-Pound (Pack of 3)"

"B001VIYBBE": "Purina Pro Plan Dry Adult Dog Food, Shredded Blend Natural Lamb and Rice Formula, 35-Pound Bag"

"B001QZOCL6": "Unagi & Seaweed Entree Grain Free Dog Food 13.8oz, Pack of 24"

"B004VWVPHK": "Addiction Black Forest Rabbit with Blueberries Grain-Free Canned Dog Food (24/13 Ounce Cans)"

"B000N62E3M": "Merrick Wild Buffalo Grill Dog Food 13.2 oz (12 Count Case)"

"B005BQJIXS": "Hill's Science Diet Ideal Balance Mature Adult Chicken and Brown Rice Dinner Dry Dog Food Bag, 30-Pound"

"B002AY5BHG": "ZiwiPeak Real Meat Grain Free Air Dried Dog Food, Venison, 2.2lb"

"B002AYAMPC": "ZiwiPeak Natural New Zealand Venison Daily Cuisine Dog Food (12/13.5-oz cans)"

"B00106X348": "AvoDerm Natural Chicken Meal and Brown Rice Formula Weight Control Dog Food"

"B001CX3QOG": "HARMONY FARMS 2-Flavor Variety Pack Dog Food (Roast Lamb Dinner & County Chicken Dinner) 12.5-Ounce Cans (Pack of 24)"

"B003P9XFW8": "Blue Buffalo Dry Dog Food for Small Breed Puppies, Chicken and Oatmeal Recipe, 15-Pound Bag"

"B003MWBDK4": "Hill's Science Diet Puppy Lamb Meal and Rice Recipe Large Breed Dry Dog Food Bag"

"B003C5RLGG": "Natural Balance Dry Dog Food, Grain Free Limited Ingredient Diet Bison and Sweet Potato Recipe, 28 Pound Bag"

"B004YVOGJM": "Instinct Grain-Free Turkey Meal Formula Limited Ingredient Diet Dry Dog Food by Nature's Variety, 25.3-Pound Bag"

"B006HKAQ88": "Hill's Science Diet Mature Adult Dog Savory Stew Wet Dog Food, 12.8-Ounce Can, 12-Pack"

"B0007DGQHG": "Natural Balance Organic Formula Dry Dog Food, 12.5-Pound Bag"

"B003E743FE": "Royal Canin Dry Dog Food, Medium Active Special 25 Formula, 30-Pound Bag"

"B005OCXHW2": "Purina Puppy Chow Dry Dog Food 34lb"

"B004Y8TY24": "Castor & Pollux Natural Ultramix Grain-Free and Poultry-Free Adult Dry Dog Food, 15 Pound Bag"

"B004QVZ9KK": "Grain Free Lamb Meal Dry Dog Food Size: 5-lb bag"

"B006S87QTG": "Tuffy's Pet Food NutriSource Grain Free Heartland Select with Bison Dry Dog Food, 5-Pound"

"B0045P7LNK": "Taste of the Wild Grain-Free Canned Dog Food Variety Pack - Wetlands, Pacific Stream, High Prairie, and Sierra Mountain (Pack of 12, 13.2 oz cans)"

"B007X8AGBK": "Blue Buffalo Small Breed Basics Limited Ingredient Formula Turkey and Potato Adult Dry Dog Food, 4-Pound"

"B004MJS4Q2": "Earthborn Holistic Great Plains Feast Grain-Free Natural Dog Food"

"B001CST8PM": "Natural Balance Dry Dog Food, Ultra Premium Formula, 15 Pound Bag"

"B001CWVZUY": "HARMONY FARMS Healthy & Holistic Chicken & Brown Rice Adult Dog Food, 17.5-Pound Bag"

"B0029NN8KK": "Pedigree Chicken Rice and Veg Dry Dog Food"

"B000633T6I": "Diamond Dry Adult Dog Food, Maintenance Chicken Flavor"

"B0007G9FHQ": "Natural Balance Organic Formula Dry Dog Food, 25-Pound Bag"

"B003VSREG6": "Hill's Science Diet Mature Adult Large Breed Dry Dog Food Bag"

"B000NHSLVU": "Merrick Senior Medley Dog Food 13.2 oz ,12 count"

"B0025V4QAW": "ALPO Chophouse Originals Dog Food Variety Pack, 12-Count, 13.2-Ounce Cans"

"B0026LITWC": "IAMS Dog Food Chunks with Tender Beef & Vegetables Simmered in Gravy, 12.3-Ounce Cans (Pack of 12)"

"B0026LIXHI": "IAMS Proactive Health Dog Food, Chunks with Chicken in Gravy, 12.3-Ounce Cans (Pack of 12)"

"B006TAD0AM": "Purina Pro Plan Entrée Adult Dog Food, 5.5-Ounce Cans (Pack of 24)"

"B0009X0RA6": "Chicken Soup for the Dog Lover's Soul Dry Dog Food for Adult Dog, 35 Pound Bag"

"B000634LGU": "Nutro Ultra Adult Dry Dog Food"

"B000XZDYXM": "Blue Buffalo Dry Dog Food, Lamb and Rice Recipe, 15-Pound Bag"

"B000634HCI": "Natural Balance Vegetarian Formula Dog Food, 5-Pound Bag"

"B001EX0NWM": "Natural Balance Vegetarian Formula Dog Food, 15-Pound Bag"

"B002J3SJXG": "Maxim Grain-less Diet Chicken and Veggie Dog Food"

"B0062FJ2J2": "Lamb Green Tripe Freeze Dried Dog Food"

"B0089A66T2": "Merrick Grain Free 12-Pound Real Chicken and Sweet Potato Dog Food, 1 Bag"

"B002J3QIJS": "Maxim Grain-less Diet Buffalo and Veggie Dog Food"

"B0002EOW4E": "Tripett Grain-Free All Natural Dog Food, 13 oz cans, Pack of 12"

"B0089A5SSW": "Merrick Grain Free 13.2-Ounce Real Duck Dog Food, 12 Count Case"

"B000XQ6RKI": "AvoDerm 13-Ounce Chicken and Rice Dog Food Cans, Case of 12"

"B000XQCNL0": "AvoDerm Natural Chicken Meal and Brown Rice Formula Weight Control Dog Food, 13-Ounce Cans, Case of 12"

"B0040BDPC0": "AvoDerm Natural Turkey & Vegetable Stew Dog Food - 12 12.5-Ounce Cans"

"B003P9WU7E": "Royal Canin Dry Dog Food, Dachshund Formula, 10-Pound Bag"

"B001BDD26Y": "Purina One Dog Food, 4-Pound Bag (Pack of 6)"

"B005IG6P50": "Alpo Chop House Roasted Chicken Flavor Dog Food 13.2 oz"

"B005DO024W": "EVO 95% Chicken & Turkey Canned Dog Food - 12x13.2 oz"

"B004VLF8PG": "Beneful IncrediBites Adult Dog Food"

"B006P038EE": "Chef MICHAEL'S StewedChicken Dog Food, 3-Ounce (Pack of 12)"

"B002ANE0ME": "Newmans Own Organic Grain Free Can Dog Food Beef"

"B001QE90I2": "Go! Canned Dog Food, Grain Free Chicken Turkey and Duck, 13.2 Ounce Cans (Pack of 12)"

"B0029NR3XS": "PEDIGREE SMALL BREED dry dog food for Adult Dogs less than 25 LBS. Original 15.9 lb"

"B00IK5V7ZE": "Iams ProActive Health Adult Small and Toy Breed Premium Dog Food, 12.5-Pound"

"B000MT5GAI": "Nutro Ultra Small Breed Dry Dog Food 8lb"

"B004U7F3QA": "ULTRA Small Breed Adult Pate Dog Food - 3.5 oz. (100 g), Pack of 24"

"B006GOINFS": "Max Dog Natural Chicken Meal and Rice Recipe Large Breed A