A Study of the Relationship between Modern Food Retail Penetration and Urban Indonesian Consumers' Food Shopping Behaviour, Consumption and Dietary Patterns

By

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Declaration

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree.

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Abstract

Indonesia is experiencing a dramatic growth in the number of modern food retailers, such as hypermarkets, supermarkets and mini-markets. Given this, policy makers are concerned about the impact of 'modern food retail penetration' or 'supermarket penetration' on Indonesian food chain participants. The primary objective of this thesis is to analyse, in an urban Indonesian context, the relationship between modern food retail penetration and changes in food shopping behaviour and dietary patterns. Data from a survey of 1,180 urban households from three Indonesian cities: Surabaya, Bogor, and Surakarta, are scrutinized to shed light on these issues.

The first analysis focused on factors that help explain consumers' shopping behaviours. In this respect, the frequency of shopping for food at modern versus traditional retail outlet formats was examined. Findings show that traditional food retailers are still used most frequently by the majority of consumers. Consumers who shopped more frequently at modern food retailers tend to have higher incomes, more education, more assets, credit cards, and higher concerns about nutrition information labels and food safety. Conversely, price-sensitive consumers were more likely to shop at traditional food retailers.

The second study expanded upon consumer's choice of food retail format and examined the determinants of consumers' food expenditure shares in both modern and traditional food retail formats. The results of econometric analysis confirm that consumers who had the highest probability in spending more on food in modern food retailers were consumers with children under 5 years old, a high-income, education, and asset as well as concerned about safety. On the other hand, sensitive-price consumers were more likely to patronize in traditional food retailers.

The third analysis extended to the knowledge the effect of food expenditure shares at modern food retailers on diets and health outcomes. The results of OLS and Instrumental

Variables regressions suggest a negative and significant relationship between the share of food expenditure at modern food retailers and the healthiness of consumer food purchases even after controlling for other characteristics (e.g., age, gender, education, income) that may also contribute to food consumption decisions. The final chapter summarises the key findings and provides policy recommendations and opportunities for future research.

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Abbreviations

ACIAR	Australian Centre for International Agricultural Research
ANOVA	Analysis of Variance
BMI	Body Mass Index
FAFH	Food away from home
FAO	Food Agriculture Organization
FDI	Foreign Direct Investment
FFV	Fresh Fruit and Vegetables
GHK	Geweke-Hajivassiliou-Keane
ICASEPS	the Indonesian Centre for Agriculture Socio-Economic Research and Policy Studies
IDR	Indonesia Rupiah
IFPRI	the International Food Policy Research Institute
IMF	the International Monetary Fund
IV	Instrumental Variable
KMO	the Kaiser-Meyer-Olkin
KPPU	Komisi Pengawasan Persaingan Usaha (Commisison for Supervision of Business Competition)
LoI	Letter of Intent
LPG	Liquefied Petroleum Gas
OLS	Ordinary Least Square
QML	Quasi-Maximum Likelihood
NCDs	Non-Communicable Chronic Diseases
SD	Standard Deviation

Susenas	Survey Sosial Ekonomi Nasional (The National Socioeconomic Survey)
UK	the United Kingdom
US	the United States
USDA	the United States Department of Agriculture
WHO	World Health Organization
2SLS	Two Stage Least Square

Chapter 1: Introduction

Economic growth, urbanization, foreign direct investment (FDI) and changing lifestyles have all contributed to the globalization and rapid rise of modern food supply chains in developing and emerging economies (Faiguenbaum, Berdegué & Reardon 2002; Reardon et al. 2003; Reardon, Timmer & Minten 2012). The globalization and transformation of food retailing, or the 'supermarket revolution' have had a profound effect on players in the food system, including consumers, in these countries (Faiguenbaum, Berdegué & Reardon 2002; Reardon et al. 2003).

For producers, the ongoing transformation of food systems creates both opportunities and challenges (Dries et al. 2009; Reardon, Timmer & Minten 2012; Weatherspoon & Reardon 2003). Previous studies show that penetration of supermarkets[1] can be associated with increases in farm household income and alleviation of rural poverty (Maertens, Minten & Swinnen 2012; Maertens & Swinnen 2009; Rao & Qaim 2011). Other studies reveal that the rapid rise of the modern food supply chain leads to worse inequality in rural areas because small-holder farmers may be excluded from participation in the new agri-food system (Farina & Reardon 2000).

For consumers, the 'supermarket revolution' can be associated with positive outcomes such as increasing diet diversity as a result of increasing competition and new modern retail formats that may provide a wider variety of products (e.g. dairy, non-traditional fruits and vegetables), lower prices, increased safety, and higher quality food products (Minten, Reardon & Sutradhar 2010; Reardon, Henson & Gulati 2010). On the other hand, the

[1] I use the term *supermarkets* as shorthand for different groups of modern food formats, and I differentiate the group (hypermarkets, supermarkets, and minimarkets) only when necessary. Hypermarkets are very large modern stores which occupy more than 8000 m^2, with at least 10 or more cash registers selling both food and other groceries. Supermarkets are medium to large-sized stores occupying between 300 to 8000 m2, with 2-9 cash registers selling both foods and other groceries. Minimarkets or convenience stores are small, modern stores with 1-2 cash registers (Suryadarma et al. 2010).

rapid rise of modern food retailers may have an adverse effect on existing traditional food retailers even though the modern retailers influence variety among retail outlets (Reardon & Berdegue 2002; Suryadarma et al. 2010). There is evidence that if traditional food retailers[2] are crowded out, this reduces consumers' access to fresh, affordable produce (Schipmann & Qaim 2011a; Robinson, Caraher & Lang 2000). If fresh food is less affordable, diet quality is likely to be adversely affected. For example, changes in price and availability in modern retail outlets may considerably reduce the consumption of fresh fruit and vegetables while increasing that of highly processed food.

In the existing literature, which discusses the rapid rise of modern food retailers, consumer issues have received little attention (D'Haese, Van den Berg & Speelman 2008; D'Haese & Van Huylenbroeck 2005). Furthermore, only a few studies have investigated the impact of modern food retailers on traditional food retailers' market share and consumer behaviour, particularly the change in food purchasing and consumption as well consumers' diet transition.

The earliest existing literature focuses on the impact of the penetration of supermarkets on traditional food retailers' market share (Goldman, Krider & Ramaswami 1999; Goldman, Ramaswami & Krider 2002; Schipmann & Qaim 2011a; Suryadarma et al. 2010). The second strand of research focuses on consumers' food expenditure (D'Haese & Van Huylenbroeck 2005; Gorton, Sauer & Supatpongkul 2011; Neven et al. 2006). The third group of empirical evidence concentrates on consumers' diet transition (Asfaw 2008;

[2] Traditional food retailers refer to warungs or small shops, semi-permanent stands, traditional wet markets, and peddlers. *Warungs* are family-owned stores located in a building or part of a house, often in residential areas. Only some warungs have cash registers. They typically sell snacks, beverages, and dry goods. *Semi-permanent stands* are vendors who sell from a table, stand, cart, or stall that can be moved, but generally stays in one place during the day. They often sell fresh fruits and vegetables. *Traditional wet markets* are places where a large number of vendors can set up shops at tables or in stalls under a common roof. They are generally managed by the city and may be surrounded by outdoor vendors. *Peddlers* are vendors who move their products around the city on foot, by bicycle, or in a motorized cart. They often bring perishable goods into residential neighbourhoods or serve public areas with many pedestrians (Minot et al. 2013).

Banwell et al. 2013; Kelly et al. 2014a, 2014b; Kimenju et al. 2015; Rischke et al. 2015; Tessier et al. 2008).

However, there is little consensus in the literature that the rapid rise of modern food retailers has captured traditional food retailers' market share or affected consumers' dietary patterns. Previous studies have shown that in many countries traditional markets still co-exist with modern markets, even though the penetration of supermarkets has long existed in the markets (e.g., Goldman, Krider & Ramaswami 1999; Goldman, Ramaswami & Krider 2002). Other studies reveal that supermarkets have captured traditional retailer's market share (e.g., Dries et al. 2009; Reardon, Henson & Berdegué 2007; Reardon et al. 2003).

Yet, in terms of the impact of growth of supermarkets, Hawkes (2008) suggests that supermarket operators' decisions in five key areas have important dietary implications: (1) location and format of outlets; (2) foods sold; (3) prices charged; (4) promotional strategies used; and (5) nutrition-related activities implemented. The resulting dietary implications can be both positive (e.g., increased diet diversity, lower food prices and increased food accessibility) and potentially negative (e.g., inequalities in food accessibility and increased consumption of nutrient-poor highly processed foods).

Thus, this thesis aims to contribute to the literature by advancing the understanding of the relationship between the rapid rise of supermarkets and their impact on consumer shopping behaviour and dietary change. In doing so, this research addresses several gaps in the literature.

First, previous studies, which examined the impact of modern retail penetration on traditional food retailer market share focused only on a single type of food retail format or analysed information from a very small sample (Gorton, Sauer & Supatpongkul 2011; Maruyama & Trung 2007; Shiu & Dawson 2001). This research uses data collected from a

large number of urban households (n=1180) and covers multiple retail formats, including hypermarkets, supermarkets, minimarkets, semi-permanent stands, wet markets, and peddlers. With this extension, this study allows for a more accurate identification of the relationship between the penetration of modern food retailers and traditional food retailers.

Another significant contribution of this study is that it is the first study to provide insight into the impact of supermarket penetration on diet transformation in Indonesia. Several studies have examined the relationship between supermarkets and diet transition in developing countries (Asfaw 2008; Banwell et al. 2013; Chege, Andersson & Qaim 2015; Kelly et al. 2010; Kelly et al. 2014a; Kimenju et al. 2015; Mergenthaler, Weinberger & Qaim 2009; Rischke et al. 2015; Tessier et al. 2008), but none of these were conducted in Indonesia.

These results presented in this thesis provide information that can help policymakers better understand how food retail transformation in Indonesia and related changes in consumers' food shopping and consumption patterns are likely to impact Indonesian food system more broadly. For example, is increasing modern retail penetration likely to lead to the "crowding out" of traditional wet markets or will consumers continue to shop and value traditional retail outlets in the future? Furthermore, do consumers who shop for food at modern food retail outlets have less healthy diets as a result of exposure and/or improved access to certain types of foods (e.g., processed foods that are relatively high in sugar, fat or salt) that may be associated with diet-related diseases (e.g., obesity, Type II Diabetes, heart disease).

1.1 Background and Overview of Food Retailing in Indonesia

In Indonesia, the first modern food retailers opened in the 1970s. Initially, the growth of modern retail formats was relatively slow and mainly occurred in major cities on Java Island, such as Jakarta and Surabaya. But after the Indonesian government allowed foreign

direct investment (FDI) in food retailing in 1999, the number of modern food retail outlets increased considerably from 1,176 outlets in 1999 to 11,342 in 2009, and their share of food sales increased from 5% to 11% (Dyck, Woolverton & Rangkuti 2012). In line with this development, traditional food retailer's share of total food sales decreased from 94% to 88% over this time (Dyck, Woolverton & Rangkuti 2012). The rapid rise in modern retailing is expected to continue, following the pattern of modern food retailer diffusion found in other areas of Southeast Asia such as Thailand (Reardon & Berdegue 2008; Reardon, Timmer & Minten 2012).

In the early stages of diffusion in Indonesia, modern food retailers typically focused on selling processed food and stable food items (World Bank 2007). However, modern food retail formats now also offer fresh produce and very different combinations of services to traditional food retail formats. For example, hypermarkets offer fresh produce including fruit, vegetables, meat, poultry and seafood and may offer discount prices if consumers are willing to buy in larger quantities. In addition, modern food retailers diversify their formats with services to accommodate unique consumers' needs, such as convenience (Reardon & Timmer 2007; Minten & Reardon 2008; Tandon et al., 2011). For example, minimarkets/convenience stores are being built in central city locations where available land is limited. The minimarkets service the lower and middle class consumers who live in densely populated areas in the city centre and may be time constrained.

As discussed earlier, this rapid rise of modern food retailers and their success in Indonesia raise concerns regarding their impact on consumers' dietary patterns. A question of fundamental interest is whether traditional food markets will be being crowded-out by supermarkets in Indonesia? If so, how does this impact consumers' food shopping behaviour and subsequent diet quality? Policy makers are concerned that supermarket penetration will lead to a loss of traditional food retailers, reduce competition and therefore

adversely impact welfare of both consumers and producers (Blanchard & Lyson 2002; Martens 2008). Access to modern retail formats may also encourage the consumption of highly processed foods with negative implications for diet related health, such as increases in non-communicable diseases (e.g., obesity, Type II Diabetes, heart disease) (Asfaw 2008; Kimenju et al. 2015; Rischke et al. 2015). In contrast, the proponents claim that modern food retailing offers greater access to a more diverse set of food products, lower prices especially for processed foods, increased competition through innovation and technology, and higher food safety and quality (Hausman & Leibtag 2007; Minten, Reardon & Sutradhar 2010; Reardon, Henson & Gulati 2010). Despite the importance of this issue, few studies have focused on investigating consumer behaviour and its implications in the context of the fast expanding modern retailing in Indonesia.

1.2 Objectives

In order to understand the impact of supermarket penetration on consumers' food purchasing and consumption behaviour, there are two essential considerations: (1) the impact of supermarket penetration on consumers' use of retail formats for food purchases, and their food expenditure shares at different types of food retail outlets and (2) the implications of supermarket penetration on Indonesian's dietary patterns. More specifically, the purposes of this research are:

1. To determine factors that help explain consumers' shopping behaviour with respect to the frequency of shopping for food at modern and traditional retail outlet formats.
2. To analyse determinants of consumers' food expenditure shares at both modern and traditional food retail formats.

3. To analyse the relationship between modern food retailer penetration and the healthiness of food expenditure shares.

1.3 Organization of the Thesis

This thesis is organized into six additional chapters. Chapter 2 provides a discussion of the literature on food retail transformation globally. The literature review highlights the implications of food retail transformation on food systems found in previous empirical studies. This includes the impact of the rise of supermarkets on retail outlet choice, food expenditures, and diet-related health. Previous research is also used to support the variables and methods used in this thesis.

Chapter 3 explains the questionnaire development, the sampling methods, data entry and manipulation, and descriptive statistics for the variables used in the empirical analyses. Chapter 4 deals with the first objective of this thesis: Indonesian consumers' choice of food retail formats – are traditional food retailers being crowded out? The chapter begins with a general overview of the rise of supermarkets and its impact on traditional food retailers. This is followed by a brief description of the model and data analysis. Finally, descriptive and econometric results from multivariate probit models are presented and discussed.

In Chapter 5, the determinants of urban household's food expenditure shares at both modern and traditional food retailers are presented and discussed in order to address the second objective. Fractional logit models are used to assess the determinants of consumers' expenditure shares on food categories in both modern and traditional food retailers. Chapter 6 addresses the third objective of this thesis: to analyse the relationship between household food shopping behaviour and household diet quality. The chapter reviews briefly the impact of supermarket penetration on consumers' diet quality. The empirical

model and econometric results are presented and discussed. Chapter 7 summarizes the main results of Chapter 4 through to Chapter 6 and provides a discussion of the implications stemming from the research results. The suggestions for future research are then presented. Finally, the Appendix contains a copy of the household survey instrument used to collect data.

Chapter 2: Literature Review

2.1 Introduction

This chapter provides a critical review of the international body of multi-disciplinary literature related to the impact of the growth of modern food retailers on consumers' consumption and shopping behaviour and household diet quality. This chapter is divided into six sections. The first section describes the transformation of food retailers in developing countries, and the second section focuses specifically on retail transformation in Indonesia. Sections 3 and 4 review the empirical literature dealing with key issues emerging from this transformation, that is, the impact of modern food format diffusion on traditional food retailers and on consumers' choice of retail outlets. The weaknesses of current studies regarding the impact of this rise on food expenditures at modern and traditional food retailers are discussed in order for us to understand how this research contributes to existing literature. The next section discusses how supermarket penetration may affect dietary patterns and diet-related health. The final section highlights current studies on dietary change in Indonesia and suggests that further research should be conducted to better understand the impact of the growth of modern food retailers on consumption and shopping pattern change. This literature review provides a background for the empirical analyses used in Chapters 4 to 6, which focus on the impact of the rapid rise of supermarkets on Indonesian urban consumers' consumption and shopping behaviour as well as their diet.

2.2 Transformation of Food Retailers in Developing Countries

Over the last four decades, food retailing in many developing countries has undergone a significant transition. Numerous studies have documented the early stages of this process (Goldman 1974a, 1974b, 1981, 1982; Kaynak & Cavusgil 1982; Samiee 1993; Yavas,

Kaynak & Borak 1981). The early literature on food retail markets in developing countries focuses mainly on the evolution of food retailers rather than the impact of changes in food retailing on the food system. Goldman (1974a) for example, describes the strategic transformation of a small store into a large store. Kayaks and Cavusgil (1982) compare the evolution of food retailers in developed and developing countries, revealing the roles of economic, social, cultural and lifestyle factors in the development of supermarkets and explaining the role of supermarkets in developing countries.

Reardon et al. (2003) explained how modern retailing evolved across Africa, Asia and Latin America. Agri-food systems in those countries changed from fragmented, local markets to larger, centralized, wholesale markets integrated in national trade. The literature also observes how increased income, urbanization, globalization and changing lifestyles have contributed to the rapid rise of supermarkets in Africa, Asia and Latin America (Minten, Singh & Sutradhar 2013; Reardon et al. 2003; Reardon, Timmer & Minten 2012).

Reardon, Timmer, and Minten (2012) point out that the transformation of food retailing in developing countries over the past 20 years is characterized by a rapid increase in the share of modern food retailers at the expense of traditional food retailers. They divide this transformation into three waves. The first wave happened in Latin America, Central Europe, and South Asia when modern food retailer shares in those countries increased from 5-10% in the early 1990s to more than 50% in the mid-2000s. The second wave started in the mid- to late 1990s in South Asia (not including transition countries like Vietnam), Central Asia, America, and Mexico. By the mid-2000s, the share of supermarket sales in Asia had increased to a range of some 30-50%. The third wave emerged in the late 1990s or early 2000s in China, Vietnam, India, and Russia where the average share of modern food retailers reached about 10-20% in the mid-2000s.

Even though the rapid rise of supermarket penetration differed across these three waves, empirical evidence shows that the patterns of modern food retailer diffusion are similar. Initially, modern food retailers mainly focused on servicing the high-income class in urban areas, and then spread to suburban, even rural, areas (Hu et al. 2004; Reardon, Henson & Berdegué 2007; Reardon, Henson & Gulati 2010; Stringer, Sang & Croppenstedt 2009; Weatherspoon & Reardon 2003). In the early stages, supermarkets were limited to offer processed food and staple food, and later expanded to provide fresh produce (Maruyama & Trung 2007; Minten, Singh & Sutradhar 2013; Reardon & Swinnen 2004).

Recent studies in Asia also found that supermarkets share of the food market is growing rapidly and becoming more important some countries. Kohli and Bhagwati (2011) found that the average annual growth rate of modern retailer sales in India was 14%, while growth in sales by traditional retailers was only 4%. Similarly, Dabas, Sternquist, and Mahi (2012) reported that even though the share of modern food retailers accounts for only 3-5% of the total of all retailers in India, their total of sales accounts 26% of total retail spending.

The most phenomenal growth of modern food retailers in the 2000s occurred in China. The first modern food retailers in China were established in the mid-1980s (Goldman 2000), expanding to 2,500 by 1995 and growing dramatically to be more than 74,000 in 2003 (Hu et al. 2004; Xiang et al. 2004). In 1999, the total of supermarket sales accounted for only 30% of all Chinese urban food markets but 10 years later it was 48% (Stringer, Sang & Croppenstedt 2009).

Other Asian countries have also witnessed dramatic growth in supermarkets in the 2000s. Gorton, Sauer, and Supatpongkul (2011) revealed that in Thailand, since the first supermarket emerged in the mid-1990s, their share of the food retail market has expanded

rapidly. In 2001, supermarkets accounted for 53% of all retail markets, up from 26% in 1999 (Gorton, Sauer & Supatpongkul 2011). By contrast, the share of traditional food retailers decreased from 74% to 47% in the same time period. In the Philippines, sales of modern retailers soared 26% per year in the 2000s, and supermarket shares reached 45% of Philippine urban consumers' expenditure in 2010 (Romo, Digal & Reardon 2009).

Over the 1990s-2000s, there has been a similar rapid rise in the number of supermarkets in Vietnam. According to Maruyama and Trung (2007), in 1995, the number of supermarkets in Vietnam was only 12 in six of 64 cities, but by 2004, the number had increased to 244 modern retailers in 30 cities. The average growth of supermarket sales in Vietnam rose 15% during each of the years 2000 and 2005 (Maruyama & Trung 2007).

2.3 Retail Transformation in Indonesia

Similar to the trend in a range of developing countries, several phases of modern retail development have also occurred in Indonesia. From the 1970s to the 1990s, modern food retail development focused primarily on servicing the needs of upper-class consumers and expatriates in major cities such as Jakarta. These new retail outlets were mainly owned and managed by domestic businesses (Natawidjaja et al. 2007). In 1996, roughly one-third (313) of the 940 supermarkets operating in Indonesia were located in Jakarta (Chowdhury, Gulati & Gumbira-Sa'id 2005). Then, after growing for several years, supermarket expansion in Indonesia declined significantly as a result of the 1997 economic crisis. After 1998, however, the economic conditions in Indonesia began to improve and modern retail development increased accordingly. The number of supermarkets grew rapidly from 1235 in 1999 to 2068 in 2009 (Dyck, Woolverton & Rangkuti 2012). Significantly, foreign direct investment (FDI) in the Indonesian food retailing sector also intensified rapidly in this period, after the Indonesian government signed a letter of intent with the International Monetary Fund (IMF) in 1998, allowing FDI in food wholesaling and retailing.

Foreign direct investment in food retailing by firms such as *Carrefour* (France) and *Giant* (Malaysia) led to the expansion of modern supermarkets and also of hypermarkets. The number of hypermarkets grew significantly from 18 in 1999 to 141 in 2009, and sales grew from $US256 million to US$1,897 million (Dyck, Woolverton & Rangkuti 2012). Multinational food retailers dominate roughly 74% of these market shares. For example, *Carrefour* accounts for about 54% of the hypermarket share in Indonesia (Dyck, Woolverton & Rangkuti 2012). In line with the expansion of FDI in retailing, the number of domestically owned modern retailers have also increased and domestic modern retailers now compete with multinational retailers. *Matahari Putra Prima*, for instance, has expanded their hypermarket brand to several cities in Indonesia (KPPU 2009). In 2009, this brand accounted for 26% of hypermarkets (Dyck, Woolverton & Rangkuti 2012). Additionally, the Indonesian Para Group has bought 40% of the stock of the multinational *Carrefour* (KPPU 2009).

On the other hand, from 1999 to 2009 the number of minimarkets/convenience stores also increased rapidly. During this time, minimarkets share of modern retail food sales grew from 4% to 28%, while the number of minimarkets increased from 522 in 1999 to 10,039 in 2009 (Dyck, Woolverton & Rangkuti 2012). Modern food retailers are now attempting to compete with traditional food retailers in terms of price, quality, variety and service, focusing not only on high-income urban consumers, but also on consumers in smaller cities and lower income areas (Suryadarma et al. 2010). Thus, modern food retailing in Indonesia has evolved from focusing only on a small, high-income niche market to addressing the food needs of a larger share of the Indonesian population through a variety of new modern retail formats, such as minimarkets and convenience stores (Suryadarma et al. 2010).

A study by Dyck, Woolverton, and Rangkuti (2012) estimated that retail sales of food through traditional markets in Indonesia were declining by about 3.4% per annum; yet, sales of food at modern market were estimated to be growing at an average rate of 7.2% per year. From 1999 to 2009, the number of modern food retailers in Indonesia increased by about 89.6%, and currently modern food retail shares in Indonesia are estimated to account for more than 11% of Indonesia's overall food retail sales (Dyck, Woolverton & Rangkuti 2012). Interestingly, however, despite traditional retailers' decline in sales, modern retail penetration in Indonesia has not led to the disappearance of such retailers, and Indonesia still has a large variety of traditional retail formats selling food products. These range from street vendors, peddlers (mobile vendors), warungs (small retail outlets), and wet markets. Pesoro (2008) suggested that some traditional markets, selling fresh food such as meat, chicken, fish, vegetables and fruits, are able to compete against modern retailers. Suryadarma et al. (2010) also suggest that the main source of competition for traditional food traders in Indonesia is not from supermarkets, but rather from street vendors.

Thus, given the existing wide variety and number of both traditional and modern retailers in Indonesia, it is interesting to examine the relationships among the transformation of modern food retailers and change in food purchasing and consumption patterns as well as consumers' transition diet in Indonesia and to see how this compares to other countries. As suggested by Monteiro, Farina, and Nunes (2012), the existing literature that discusses the transformation of modern food retailers' focuses mainly on supermarkets and assumes that supermarkets mean big supermarket chain. There are relatively few studies that explore the variety of food retail outlets.

2.4 Modern Food Retailers' Penetration and Traditional Food Retailers

The impact of supermarket penetration on traditional food retailers has generated a debate, which has continued for two decades. On the one hand, some researchers such as Goldman, Krider, and Ramaswami (1999), Goldman, Ramaswami, and Krider (2002), and Goldman and Hino (2005) are sceptical about the progress of supermarket penetration. They doubt that supermarkets in East Asia can capture the market share of traditional food retailers. Researchers such as Reardon, Henson, and Berdegué (2007) and Dries, Reardon, and Swinnen (2004) have a contrasting view and argue that the rapid rise of supermarket penetration is very likely to reduce traditional retailers' market share. More recent studies have revealed that the impacts of these retail formats are extremely complex (Schipmann & Qaim 2011a).

In 1999, Goldman, Krider, and Ramaswami (1999) noted that in East Asia the structure of the food market was still dominated by the traditional market traders, and they catered to different income segments and different product categories. Moreover, more recently Goldman and Hino (2005) have argued that traditional retailers ('wet markets') are dominant over supermarkets because there are continuing obstacles to the proliferation of modern retail outlets. These include the government policy to restrict the operation of modern food retailers, and to strictly enforce the regulations and laws that provide support and subsidies to the traditional food retailers.

Goldman, Ramaswami, and Krider (2002) support their arguments by reference to retail trends in Hong Kong, South Korea, and Taiwan. In 2002, they noted that, even though supermarkets had existed in these market contexts for a long time, the supermarket market share in those countries were still below 50%. They conclude that the superiority of

the traditional wet markets in Asia is based on the real competitive advantages of these markets and is, therefore, not just a temporary phenomenon.

In line with finding's Goldman, Ramaswami, and Krider (2002) a study of Vietnam by Maruyama and Trung (2007) found that consumers who valued freshness, price, convenience and proximity tended to use traditional outlets, while those with higher incomes and more concern for food safety tended to shop in supermarkets. The study showed that wet markets were the favourite place to purchase fresh foods for most consumers. These authors argue that these continuing perceptions create barriers to the rapid rise of supermarkets in Vietnam.

These views have been challenged by Gorton, Sauer, and Supatpongkul (2011) who argue that Goldman and his co-authors fail to place the evolution of the supermarket in an appropriate historical context and do not recognize the possibility of structural change, which could benefit supermarkets**.** Engaging with the results of studies conducted by Reardon, Henson, and Berdegué (2007), Gorton, Sauer, and Supatpongkul (2011) use more recent data to argue that supermarket diffusion in East Asia took off in the 1990s. In addition, a 2005 study in Hong Kong shows that the share of traditional wet market sales declined significantly from 65% in 1994-1995, to 49% in 1999-2000 (Arendt 2005). This fact is also supported by the latest study in urban China by Goldman and Vanhonacker (2006), which reports that modern retailers are not now minor players in food markets. The market shares of modern retailers in urban China accounted for 79%, 46%, 37%, 33% and 22% of the retail markets for processed food, meat, fresh fruit, fish and vegetables, respectively. In addition, Stringer, Sang, and Croppenstedt (2009) point out that the share of modern food retailers in China accounted for 48% of all Chinese urban food markets in 2001.

Reardon, Timmer, and Minten (2012) suggest that a supermarket revolution has continued to transform food retailing in Asia over the past two decades. Using secondary data from Planet Retail, Reardon, Timmer, and Minten (2012) report that the food sales of modern retailers in countries identified as in the second-wave and third-wave of the supermarket revolution have increased rapidly to capture the market share of traditional retailers. For example, they note that the annual compound growth of food sales in second-wave countries (Indonesia, Malaysia, Philippines and Thailand) increased by 11% over the previous eight years (2001-2009). In addition, a rapid rise in the annual compound growth of food sales occurred in third-wave countries such as China, India, and Vietnam, with annual growth of 40%. Therefore, Reardon, Timmer, and Minten (2012) contended that the supermarket revolution already has occurred in Asia, and it will continue to proliferate.

Extending Reardon's studies, Gorton, Sauer, and Supatpongkul (2011) analysed the extent to which modern retail markets have reduced traditional food retailers' market share in Thailand. Importantly, they found that the traditional wet markets' share of fresh food sales has decreased dramatically in Thailand. Their study showed that the supermarket characteristics such as convenient location, special offers, and atmosphere have positive effects on consumer decisions to use modern retail stores. Interestingly their results contradict the findings of Goldman, Krider, and Ramaswami (1999), which suggested those attributes are not important to Asian consumers when deciding to use a specific type of retail format. Ultimately, Gorton, Sauer, and Supatpongkul's (2011) findings confirm the supermarket revolution thesis for Thailand. Furthermore, they particularly question the notion that traditional markets in East Asia are retaining persistent competitive advantage in food retail markets.

The approach used by Gorton, Sauer, and Supatpongkul (2011) in their Thai study assumed that supermarkets provided superior products for consumers, and did not consider

that supermarket users might still prefer to purchase some products in traditional retail formats. Yet other studies suggest that there are reasons that modern and traditional food markets may co-exist. For example, studies conducted in Brazil, Latin America, Malaysia and Mexico have shown that despite penetration of supermarkets, traditional food outlets have not been displaced in these countries (Anand 2009; Chamhuri & Batt 2009; D'Andrea, Lopez-Aleman & Stengel 2006; Zinkhan, Fontenelle & Balazs 1999).

Additionally, Schipmann and Qaim (2011a) found that modern and traditional retail formats are gradually converging in Thailand. Clearly, these divergent findings indicate that there is no consensus in the literature on the implications of food retail transformation in Asia. The persistence of debate related to the process of retail modernization between proponents of the thesis of supermarket revolution, and its opponents, suggests the need for a further study to confirm the relevance of those views in the Indonesian context. Therefore, this thesis examines the impact of supermarket penetration on traditional market outlets for the Indonesian case.

2.5 Consumers' Shopping Behaviour in Relation to Different Food Retailers

As has been argued, the growth of modern food retailers in developing countries has generated an ongoing concern that supermarket penetration could displace traditional food retailers, causing hardship to small traders. Thus, there is a growing need to understand the drivers of consumers' food retail choice in the Indonesian retail context. Such understanding is important to help develop innovative strategies for traditional food retailers.

Over several years, many studies have explored issues related to consumers' retail format choice. Studies regarding retail format choice can be grouped in many ways. A first strand of studies focuses mainly on store attributes as the factor that determines retail

patronage and store format choice (Arnold, Oum & Tigert 1983; Carpenter & Moore 2006; Dodds 1991; Koelemeijer & Oppewal 1999; Pan & Zinkhan 2006; Seiders, Simonides & Tigert 2000; Sinha & Banerjee 2004). Another strand of research concentrates only on the factor of consumers as predictors of store patronage and store format choice (Bawa & Ghosh 1999; Crask & Reynolds 1978; Kahn & Schmittlein 1989; Li & Houston 2001; Rodriguez et al. 2002; Sirgy, Grewal & Mangleburg 2000; Staus 2009).

A third strand of studies has incorporated both the factors of shoppers and stores as determinants of choice of food retailers at the same type of retail format, for example, modern retailers or traditional retailers (Theodoridis & Chatzipanagiotou 2009). The final strand of research investigates the impact of these factors at both types of retail formats (Florkowski, You & Huang 2011; Maruyama & Trung 2007; Prasad & Aryasri 2011; Yun, Pysarchik & Dabas 2012) or across retail outlets (Dong & Stewart 2012). However, a handful of studies have explored consumers' choice of retail format in relation to food purchase choice. In addition, most previous studies have focused on developed country retailers without considering, for example, traditional wet markets or peddlers as a possible source of competition for modern food retailers in developing countries (Oghojafor, Ladipo & Nwagwu 2012). This has thrown new interesting light on the diversity of shopping and consumers' behaviour in developing countries, particularly in the Asian context.

In Asia, a number of studies of consumers' food retail choice among outlet types that include both the characteristics of consumers and stores have been conducted. For example, using probit and multinomial logit models, a study by (Sinha & Banerjee 2004) examined the effect of store attributes on consumers' choice among store types without considering consumers' characteristics. On the other hand, D'Haese and Van Huylenbroeck (2005) and Neven et al (2006) analysed the relationship between the

characteristics of respondent socio-economics and food store choice without considering the characteristics of store attributes.

In contrast to the studies discussed above, only few studies have given emphasis to both store attributes and socio-economic characteristics related to consumers' choice among food retail outlets. For example, a study by Maruyama and Trung (2007) identified factors in Vietnam that influenced the choice of consumers between supermarkets and wet markets using a binary choice probit model, using data gathered from a sample of 413 Hanoi households. The research revealed that the attribute of freshness and proximity affected shopping choice for fresh food in traditional outlets, while income and safety of fresh food variables increased consumers' marginal probability to shop in supermarkets.

Similar to Maruyama and Trung (2007), Gorton, Sauer, and Supatpongkul (2011) proposed alternative models with extending to estimate shopping behaviour on various products using bivariate tobit models. Using data gathered from 200 urban consumers in two cities, Bangkok and Chachoengso, Thailand, this study showed that income, age, sex, and education significantly affected the frequency of visits to both wet markets and supermarkets. These variables did also significantly influence the amount consumers spent per visit in both outlets. In addition, a variable of food safety also has a positive association with a frequency of visiting modern food retailers. On the other hand, the location variable did not affect the percentage of spending on fresh fruits and vegetables. However, the focus or emphasis of these studies was placed on both types of food retail formats, such as supermarkets and wet markets. In addition, these studies sampled a small number of consumers.

Only one study by Bai, Wahl, and McCluskey (2008) used a relative large representative sample of consumers and emphasized various retail outlets. The authors analysed data collected from 838 urban residents in Qingdao, China, using multivariate

probit models to examine Chinese consumers' choice of grocery retail stores. The research results showed that females tended to buy food in supermarkets and hypermarkets compared to males. Adults (≥30) preferred shopping for food in wet markets, supermarkets and hypermarkets, and were less likely to purchase food in minimarkets. In this context, income did not significantly increase the probability of purchasing food in minimarkets or supermarkets. However, higher income households preferred to purchase food in hypermarkets and were less likely to purchase food from wet markets (unlike the lower income consumers), while the variety and quality of products did significantly influence buying in hypermarkets. Even though the study included a relatively large sample of retail outlets, but the study was geographically limited to a city in China. Hence, the study did not reveal a variation in consumer shopping behaviour.

Several studies have investigated consumer food shopping behaviour towards supermarkets in Asian countries. Nevertheless, few studies conducted in Indonesia examined the same issue. For example, Hidayat (2008) explored the preferences of consumers for a variety of retail formats using survey questionnaire data from 700 respondents in 15 cities in Indonesia. He used Important Performance Analysis to measure the attributes of retail formats. The findings indicated that hypermarkets could provide customers with a better service than traditional markets. Another study by Nielsen (2007) examined the link between consumers' behaviour and the growth of modern retail in Indonesia. Data were collected from a survey in three cities: Jakarta, Bandung, and Cirebon, using stratified random sampling. Using a descriptive statistical analysis, the study showed that the wet market was still an important place where people bought fresh foods and basic needs in Indonesia. Meanwhile, modern retail outlets still had a more competitive advantage in packaged and processed foods than traditional markets. The study also revealed that for most shoppers, traditional markets had advantages in relation

to a location and positive pricing, offering fresher ingredients and more personalized service, with modern retail outlets having more convenience, hygienic environments, good service, and high quality brands. Even though this study used a relatively large and randomly selected sample of urban consumers, the analysis of this study was descriptive in nature. Additionally, the study did not identify the factors of store attributes as well as shoppers' attributes influencing consumers' food retail choice.

The existing literature on consumer behaviour towards the rapid rise of modern retails in Indonesia has neglected to incorporate the characteristics of consumers and stores. To address this gap, this thesis (chapter 4) explores the relationship between consumers' choice of food retail format and consumers' attributes as well store's attributes.

2.6 The Impact of the Rapid Rise of Supermarkets on Food Expenditure

Numerous studies have attempted to explain impact of the rapid rise of supermarkets in developing countries; most of which focus on this impact on small farmers, on small-holder farmers (Bignebat, Koç & Lemeilleur 2009; Hernández, Reardon & Berdegué 2007; Michelson, Reardon & Perez 2011; Stringer, Sang & Croppenstedt 2009), on rural development (Dries, Reardon & Swinnen 2004; Hu et al. 2004; Neven et al. 2009; Rao & Qaim 2011; Reardon, Stamoulis & Pingali 2007; Reardon et al. 2003; Weatherspoon & Reardon 2003), and on small traders (Ares & Gámbaro 2007; Cadilhon et al. 2006; Faiguenbaum, Berdegué & Reardon 2002; Gorton, Sauer & Supatpongkul 2011; Schipmann & Qaim 2011a; Suryadarma et al. 2010; Zhang & Pan 2013). Most of these works revealed that supermarket penetration could contribute to improving income smallholder farmers, rural development, and transformation of food system in developing countries. However, few studies have examined the impact of growth supermarkets in

developing countries on consumer expenditure behaviour change (D'Haese & Van Huylenbroeck 2005).

Several empirical studies have examined the effect of the rise of supermarkets on consumer food expenditure behaviour change. The previous studies focused on the impact of supermarket growth on share of food expenditures at supermarkets. Most of these studies report that the share of expenditure at supermarkets on fresh foods is still low, despite the advance of the modern food retailers (D'Haese & Van Huylenbroeck 2005; Figuié & Moustier 2009; Mai & Zhao 2004; Nielsen 2007). For example, using data from the National Household Expenditure Survey that utilized a sample of 27,260 households in Argentina, Rodriguez et al. (2002) found that consumers were more likely to purchase almost all foods at traditional food retailers. This study also reported that share of expenditure at supermarkets on fresh fruit and vegetables and on fish and seafood was only less than 25%, though the advance of modern food retailers. Mai and Zhao (2004) studied the characteristics of supermarket shoppers in Beijing, China. Using survey data from a sample of 200 shoppers, they found that urban consumers spent small amounts of money in supermarkets.

Figuié and Moustier (2009) studied an urban sample of 110 poor households in Hanoi, Vietnam. They found that low-income households still used traditional food retailers as their main retail source of food. Even though consumers perceived that supermarkets sold quality products, they bought very little food from them. In Indonesia, Nielsen (2007) studied the relationship between the rapid rise of supermarkets and consumer shopping behaviour. The study reported that Indonesian urban consumers only spent 4% of total food expenditure on fresh produce, and 29% on packaged foods at modern food retailers. On the other hand, 90% of consumers still purchased staple food at traditional food retailers. In contrast, D'Haese and Van Huylenbroeck (2005) examined changes in the

expenditure patterns of poor rural households in South Africa found that rural people mostly purchased their basic necessities from supermarkets rather than traditional markets.

However, these studies have been descriptive in nature. Therefore, these studies did not adequately address relationship between food expenditure share at supermarkets and their contributing factors. Two recent studies by Gorton, Sauer, and Supatpongkul (2011) and Narayan, Rao, and Sudhir (2012) addressed that issue. Using bivariate tobit models and data from samples of 200 consumers in two cities, Bangkok and Chanchengsao, Thailand, Gorton, Sauer, and Supatpongkul (2011) found that 36.8% of fresh fruit and vegetables and 40.3% of fresh meat was purchased from supermarkets. Only 30.1% of packaged goods and 17.9% of beverages were still purchased from traditional food retailers. In terms of factors influencing share of food expenditure at both modern and traditional food retailers, this study revealed that the price attribute was the most important attribute considered by consumers when buying fresh fruit and vegetables (FFV), although this attribute was less important for fresh meat and fresh fish. Speed of service and variety of products were significantly associated with greater share of expenditure on fresh fruit and vegetables at supermarkets. In addition, the study reported that there was a positive relationship between safety attributes and greater share of expenditure on FFV and fresh meat at supermarkets. Interestingly, it was found that income and education were not significant determinants of expenditure shares on FFV, fresh fish, or packaged goods at both supermarkets and wet markets. This study concluded that it is not a particular socio-economic group that tends to use modern food retailers but that they are used by all income strata.

Using a survey design, another study by Narayan, Rao, and Sudhir (2012) in India examined consumers' purchasing behaviour among different socio-economic classes. This research used data from a cross-sectional survey of 276 consumers and a panel survey of

266 consumers in Mumbai, India. The authors found that the ownership of a car or refrigerator was significant in relation to modern food retail expenditure share. In addition, households with credit cards were more likely to shop in modern food retail outlets. Furthermore, consumers who had a domestic employee and those who had preferences for product quality and home delivery also tended to have greater share of expenditure in modern retail outlets. Interestingly, this study also found that share of expenditure at modern retailers for the lower income group was greater than that that for the middle-income group. The study, therefore, concluded that modern retail outlet adoption is non-linear in terms of particular levels of income.

However, these studies were based upon data from limited samples and locations. In addition, econometric approaches used in the studies have some limitations. First, variable of interest of these studies, food retail expenditure shares at both food retailers, assumed the model of linear conditional mean of *y* (multinomial logit) or censored data (tobit). As suggested by Ramalho, Ramalho, and Murteira (2011), the tobit model can only used if the variable of interest has both upper and lower limits, which the variable of interest is not often in the case. Second, tobit models are suitable to examine censored data in range [0/1], but its application for data only in that range is not easy to provide justification (Maddala 1991). Third, assumption for using tobit models is inflexible, requiring the normality and homoscedasticity of variable interest, prior to censoring (Ramalho, Ramalho & Murteira 2011). In contrast to previous studies, this thesis (chapter 5) addresses the sample issues with relatively large and randomly selected sample of urban consumers (1180 households) in three cities in Indonesia and also econometric approach issues with application fractional logit model. In addition, I believe that this is the first work that demonstrates the relationship between supermarket user and consumer food expenditure behaviour in Indonesia case.

2.7 Supermarket Penetration and Diet Transition

A particularly significant outcome of changes in shopping patterns and food expenditure is seen in the impact on household diet. Evidence for a direct relationship between shopping behaviour and quality of household diet has been well documented (Beydoun & Wang 2007; Hersey et al. 2001; Horton & Campbell 1991; Laraia et al. 2004; Thompson et al. 2011; Turrell & Kavanagh 2006). For example, in the US Hersey et al. (2001) examined the association between food shopping practices and the quality of dietary intake. The authors reported that the food shopping practices of their sample played a pivotal role in the availability of nutrients, and thus affected the amount of nutrients consumed. In another study, in Australia, Turrell and Kavanagh (2006) explored the relationships between respondent characteristics and food shopping behaviour, as well as the association of these variables with participants' dietary intake. The study found that education level and income variables influenced food purchasing behaviour. Food shoppers who had a lower education level and lower incomes were least likely to purchase foods that were high in fibre and low in fat, salt and sugar. Later, Thompson et al. (2011) analysed the relationship between the food shopping behaviour of older adults in the UK and its implications for dietary intake. Their results indicated that respondents who shopped often tended to have higher fat intake.

Numerous studies demonstrate that diet quality and health status are affected by food marketing environments such as supermarkets (Cummins & Macintyre 2006; Cummins et al. 2005; Feather 2003; Michimi & Wimberly 2010; Moore et al. 2008; Shohaimi et al. 2004; Webber, Sobal & Dollahite 2010). Evidence from the US has shown that better access to supermarkets is associated with healthier diet quality and a lower prevalence of obesity (Larson, Story & Nelson 2009; Morland, Diez Roux & Wing 2006). In recent studies in this context, Morland, Wing, and Diez Roux (2002) found that the presence of

supermarkets in deprived areas was more likely to increase fruit and vegetable consumption. Inagami et al. (2006) also reported that better access to a large grocery store tended to increase healthy eating behaviours. Evidence from the UK, however, has shown no strong relationship between the presence of supermarkets, individual diet quality, and fruit and vegetables consumption (Cummins et al. 2005; Wrigley, Warm & Margetts 2003). These studies found that the average increase in fruit and vegetable intake was small.

Many studies have also investigated the relationship between food retailers, fast food access, BMI and obesity (Cummins & Macintyre 2006; Drewnowski 2004; Larson, Story & Nelson 2009; Ploeg et al. 2009). In general, these studies conclude that better access to fresh food retailers in general is a link to lower risk of obesity, but better access to fast food outlets is a link to higher risk of obesity. However, there are mixed results, which show the impact of fast food access on obesity. Some studies demonstrate that better access to fast food is more likely to increase the risk of obesity for adults and children, but others reveal no relationship (Larson, Story & Nelson 2009; Ploeg et al. 2009).

The majority of the studies above focused on the associations among food environment, customers' shopping choice behaviour, dietary patterns and health outcomes in developed countries. To date, a few studies have focused on systematic evidence of the impact of the growth of supermarkets on dietary transition in developing countries (Popkin 2014). Several empirical studies have examined this topic (Asfaw 2008; Banwell et al. 2013; Kelly et al. 2010; Kelly et al. 2014a; Kimenju et al. 2015; Rischke et al. 2015; Tessier et al. 2008). Most of these studies indicated that supermarket penetration is related to higher consumption of energy-dense food and processed food; however, there is one exception, Tessier et al. (2008) found that increased supermarket use is associated with improved dietary quality.

While the studies by Kelly et al. (2010), Kelly et al. (2014a) and Banwell et al. (2013) are descriptive in nature, other studies have applied econometric techniques to analyse these issue. For example, Tessier et al. (2008) examined the association between supermarket shoppers and their diet quality in Tunisia. The study used data collected from 724 households selected by a two-stage clustered random sampling method. The data were analysed using multinomial logit models and the findings indicated that 60 of the Tunisian households used supermarkets to buy most of their food items. The result of the research revealed that regular shoppers were households with higher incomes, and with well-educated members. Another result showed that the existence of supermarkets improved diet quality slightly.

Similar to Tessier et al. (2008), Asfaw (2008) made an important contribution to providing new insight into the situation in developing countries by studying the relationship between shopping behaviour at supermarkets and households' dietary patterns in Guatemala. The data for this research were taken from the 2000 Living Standards Measurement Study Survey (LSMS) of Guatemala and covered 7,276 households, of which 2,852 were rural and 3,424 urban. The instrumental variable method was used to measure the effect of socio-economic and demographic factors in relation to calorie share of food. The study found that an increase of supermarket purchases had a positive effect on the share of the purchasing total for pastries and processed food but did not have a positive effect on the share of vegetables and fruit. Therefore, it was concluded that the rapid rise of supermarkets in Guatemala probably has a negative influence on household dietary practice in this country. However, Richkes et al (2015) point out that Asfaw's study used data from the household living survey that it was not particularly designed for examining dietary impact of supermarket. Hence, the study did not capture such key interest variables as share of expenditures across retail format. Furthermore, Asfaw's

conclusion is questioned by Hawkes (2008) and by Milosevic et al. (2012) because it is only indicative. Another weakness of the Asfaw's conclusion is that the research did not control the actual effect of supermarkets on processed food purchases relative to other factors.

This thesis addresses these gaps in previous studies by using a unique set of household level data from a survey conducted on three cities in Indonesia that was designed for analysing dietary impact of supermarket. It (in Chapter 6) examines a causal relationship between increased household use of modern retail formats and dietary pattern for urban household. In addition, to my knowledge, this is the first study that aims to analyse this relationship in Indonesia.

2.8 Summary

In developing contexts, the food retail sector has undergone significant transformation for more than two decades. This has led to serious concerns about the impact of this change on consumer shopping behaviour and diet transformation. As a result, in recent years, there has been considerable research interest in the impact of the growth of modern food retailers on consumer behavioural change and related implications. One aspect of the issue, which is a particularly important focus, is how the impact of supermarket penetration has changed food consumption and shopping patterns. Some scholars have explored how the rapid rise of modern food retailers has replaced traditional food retail outlets (Dries, Reardon & Swinnen 2004; Gorton, Sauer & Supatpongkul 2011; Reardon, Henson & Berdegué 2007). However, other scholars have shown that the traditional markets co-exist with modern food retailers; and to some extent, modern and traditional retailing formats are gradually converging (Schipmann & Qaim 2011a). The current study contributes to this debate providing evidence in the Indonesian context.

Another aspect of the impact of the growth of modern food retailers on consumer behavioural changed is how the impact of supermarket penetration has changed household food expenditure share at across outlets. There have been few studies examining this issue. Most of these studies are descriptive in nature. Only two recent examples of studies Gorton, Sauer, and Supatpongkul (2011) and Narayan, Rao, and Sudhir (2012) used econometric analysis and included variables of respondent characteristic and store attributes. Unlike to many previous studies, this thesis addresses issues related the number of samples and econometric approach with using relatively large and randomly selected sample and using fractional logit model. In addition, the model incorporated variables of nutrition concern and label use concern. Herrmann and Roeder (1998) argue that the inclusion of other variables such as nutrition concern and health concern in demand analysis contributes significantly to explaining changing food expenditure patterns. Consequently, with these extensions, I can make a more focused estimate of the relationship between changing food-purchasing choices at various retail outlets and consumers' socio-demographic characteristics, store attributes and consumer behaviour attributes.

Even though the penetration of supermarkets has long existed in developing countries, but there has been little investigation of the impact of modern food retailer penetration on consumer behaviour and its implications, especially on dietary pattern (Hawkes 2008; Popkin 2014). Asfaw (2008), Banwell et al. (2013), Kelly et al. (2014a), Kimenju et al. (2015), Rischke et al. (2015) and Tessier et al. (2008) explored relationship between the growth of the modern market in developing countries, consumer behaviour and diet transformation. However, only works of Rischke et al. (2015) and Kimenju et al. (2015) were especially designed for examining causal relationship between the user of supermarkets and dietary transition in developing countries. Several studied have

suggested that additional study is needed to better understand the relationship (Asfaw 2008; Gómez & Ricketts 2013; Hawkes 2008; Humphrey 2007; Popkin 2014). To address this gap in the literature, this thesis also analyses the relationship diet transition and shopping behaviour. Specially, data from a survey of 1180 urban Indonesian households is used to explore whether higher food expenditure at supermarkets relates to a specific dietary pattern.

To date, there has been little investigation into the impact of modern food retailer penetration on consumer behaviour and its implications. Consequently, the primary objective of this study was to estimate the impact of supermarket penetration on consumers' retail formats choice, their food expenditure shares, and their diet urban consumers in relation to their retail source, share of food expenditure and shopping patterns. In this way, the impact of the growth of modern food retailers in Indonesia will be better understood.

Chapter 3: Research Method and Descriptive Statistics of Survey Responses

3.1 Introduction

The purpose of this chapter is to provide an overview of the research methods used to collect and analyse the data used to address each research objective outlined in Chapter 1. This includes a description of the development of the questionnaire used to collect data from respondents, the methods used to develop the sample of respondents surveyed, and a summary, including descriptive statistics, of the Indonesian sample used in this research.

3.2 Questionnaire Development

A questionnaire and a sampling method were developed after conducting an extensive review of relevant literature; interviewing key informants from the Indonesian Government[3] and the food wholesaling and retailing sector; and completing a total of six 'consumer' focus groups. Key informants were interviewed to understand the availability of existing information and data on supermarket share of the market in urban locations on the Java Island in Indonesia; other sources of data collected about food consumption behaviour and diet-related health; and retailers' and wholesalers' perceptions of changes taking place in food systems and their impacts on firms and consumers, and their competitive strategies.

With respect to the literature review, we considered studies which examined the factors leading to modernisation of food retailing in developing and emerging economies (the 'supermarket revolution'); the impact of this change on food systems, including households' food shopping and consumption behaviour; and modern versus traditional

[3] I interviewed staff at the Indonesian Central Bureau of Statistics (BPS) to gain information regarding survey design in Susenas or Survey Sosial Ekonomi Nasional (The National Socioeconomic Survey) that they had conducted. I also interviewed staffs of Dinas Pengelolaan Pasar (Market managing office) in three cities to seek to elicit information about governing of a market owned by local governments.

food retailers' competition strategies. The focus groups were conducted in three Indonesian cities: Surabaya, Bogor, and Surakarta during November 2009 and April 2010 in each city. The participants, ranging from seven to ten in each group, were those responsible for making food purchase decisions for the household. All the participants were female, but they had diverse socio-demographic backgrounds in terms of household income, education and ethnicity. Their mean age was 47 years, and the participants ranged from 30 to 70 years old. The participants received a small gift for their participation.

A trained and experienced discussant (native Indonesian) facilitated the discussions in the local language (Bahasa Indonesia) using a script of open-ended questions[4] to stimulate and guide discussion. This script was developed based on established focus group guidelines (Krueger & Casey 2009). The discussion was recorded for subsequent transcription and analysed with the permission of the participants. The results of these focus group discussions provided an insight into the pattern of food consumption and shopping of urban consumers and were further used to develop the questionnaire.

The main aim of the questionnaire was to investigate the behaviour of respondents and their households in relation to food consumption, food shopping and meal preparation. The survey obtained information on respondents' frequency of shopping for food at the seven retail formats considered (modern and traditional outlets), as well as distance and travel time to each retail formats. Information was gathered on respondents' attitudes regarding the quality, safety, price, and trustworthiness of products sold at each retail format and the most important attributes when purchasing various categories of food products. Additionally, information was obtained regarding the household's frequency of using each retail format for purchasing an extensive list of food products, expenditures on

[4] I asked questions in the questionnaire to obtain information about the attitudes and behaviour of respondents and their households in relation to food consumption, food shopping and meal preparation. Further more, I gathered information about household concerned about the safety and healthfulness of their food.

food product categories at each retail format type, as well as household members' health status and in-depth socio-demographic information.

After the initial questionnaire and survey training manual was drafted, 35 experienced enumerators were hired and a three-day training session was conducted with the enumerators to ensure they understood the aim and context of each question in the survey. Experienced members of the research team, which included researchers from the University of Adelaide, the International Food Policy Research Institute (IFPRI), and the Indonesian Centre for Agriculture Socio-Economic Research and Policy Studies (ICASEPS) supervised and conducted the training. Several revisions to the questionnaire and manual were made during the enumerator training sessions. These revisions were to address concerns raised by the enumerators, based on their experience conducting household surveys in Indonesia. Finally, the questionnaire was pre-tested in Bogor city by the trained enumerators with each enumerator pre-testing two to three surveys. The purpose of the pre-test was to ascertain whether the questionnaire was clear and the respondents understood the context of each question. The results of the pre-test were used to refine the final field questionnaire.

The final questionnaire contained 12 sections[5] which addressed the following topics: the characteristics of members of the household; housing and assets; cooking and shopping attitudes and behaviour; shopping behaviour; food consumption; non-food expenditure; retail outlet use; quality preferences, food safety and convenience; most important factors when purchasing food (e.g. price, safety, quality etc.); nutrition attitudes and food

[5] The questionnaire consists of 15 pages, and the interview ran for 1-2 hours. Respondent fatigue is always a potential issue with a survey that entails a 1-2 hour interview, particularly when the respondents are urban households. However, my questionnaire was relatively "light" compared to some surveys conducted in developing countries. For examples, The National Socioeconomic Survey (SUSENAS) in Indonesia is 36 pages (core plus expenditure questions) long, the Ghana Living Standards Survey is 66 pages long, and the Vietnam Living Standard Survey was 110 Pages long. In addition, I went through time training the enumerators how to gain their cooperation and patience, explaining the aims for the survey, that is confidential, and attempting to make the interview conversational and more interesting than a list of questions and answers. Finally, if respondent fatigue was a big concern, I would presume that some of the respondents had rejected to complete the interview, but the refusal and incomplete rate of my survey were pretty low.

concerns; certification awareness, purchases, perceptions; certification; diet-related health management, and others. The complete questionnaire is provided in Appendix. Some sections of the questionnaire are not directly relevant to this thesis. Therefore, only the sections of the questionnaire that are relevant to this thesis are explained in the following paragraphs.

The household section was used to collect basic information on each member of the family, including: name, gender, the relationship between a member of the family and the head of household, age, marital status, main job, job hours, members of household pregnant or lactating, weight, and height. Some of this information was used in subsequent analysis to explain household food shopping and purchasing behaviour.

The purpose of housing and assets was to provide basic information about the following topics: religion and ethnicity of the head of household and spouse, the main source of drinking water, the main type of toilet used by the household, the main type of lighting, type of fuel for cooking, and distance to the nearest public transport. Assets also included the number of each asset and the year each asset was bought by the household.

The objective of the cooking and shopping attitudes and behaviour section was to provide general information on cooking habits, shopping attitudes and consumer perceptions of retail store attributes. Cooking habits covered information on whether the household had a cook or housekeeper (domestic assistant) and who in the household was primarily responsible for cooking food for family meals. Information on the shopping attitudes referred to the following main questions: *who in the household is primarily responsible for deciding what food products to purchase? Who does the majority of food shopping?* and *How often is the food for the evening meal shopped for in an average month?*

The consumer perceptions of retail store attributes section included 22 questions, which asked respondents to indicate, using a scale of 1 to 5, the level of importance of each attribute when deciding where the consumer would purchase food.

The goal of the *shopping behaviour section* was to provide basic information on respondents' shopping behaviour related to their frequency of shopping for food at the seven retail formats (hypermarkets, supermarkets, mini-markets/convenience stores, semi-permanent stands, small shops/warung[6], traditional wet markets, and peddlers), as well as the distance and travel time to each format. Additionally, information was obtained regarding the main reasons that respondents purchased food products at this outlet.

The objective of the section *food consumption* section was to obtain information regarding changes in food consumption, and the consumer's frequency of using each retail outlet for buying an extensive list of 67 categories of food products. Information was also obtained so that household expenditures on each food product category and at each retail format type could be calculated.

The purpose of the section *non-food expenditure* was to assess the estimation of total non-food expenditures for each household. The information covered household expenditures on the following items: housing, health, education, transportation, clothing, tobacco, celebrations, other leisure spending, other non-food consumption, and renting of their home. Household expenditures were used in this study as a proxy for household income.

The purpose of the section *quality preferences, safety and convenience* was to provide information about respondents' attitudes regarding the quality, safety, price, and trustworthiness of food sold at each retail format and the attributes they perceived to be most important when purchasing various categories of food products.

[6] Warung is small shops in Indonesia language (bahasa)

The purpose of the *factors in food choice* section was to gain information related to the major factors influencing purchases of various categories of food product. Respondents were asked to indicate the three most important factors influencing their food (in general) purchase decisions, as well as the factors influencing decisions to purchase various categories of food products. Additionally, information was obtained regarding the type of nutritional information respondents looked for, as well as their primary sources of nutrition information.

The attitudes section was used to gather information about respondent's concerns about nutrition, food safety and quality and diet-related health. The objective of the diet-related health management section was to provide basic information on the history of household members' health status and management practices related to health. The section covered respondents' concerns about issues that might affect their household such as obesity, diabetes, high blood pressure, cancer and food allergies. The section also covered information about any changes the household had made in order to manage or prevent these problems.

The objective of the last section was to gather information regarding the average physical activity of household members, household income, and change in household health status and household standard of living. The section also gained information on the primary reason for the change in health status and standard of living of household members in the last five years.

3.3 Sampling Methods

The household surveys were conducted from November 2010 to February 2011. The sample consisted of 1,180 households from three cities: Surabaya, Bogor, and Surakarta. These cities were chosen to represent large, medium, and small cities, respectively. Based on the 2010 Indonesian population census, the population of Surabaya was 2.6 million

people, making the city the second-largest city in Indonesia after Jakarta. Surabaya is a port city located in the East Java province. The population of Bogor was 0.95 million people, making it the city the 11th largest city. Bogor is located on outlying capital of Jakarta in the province of West Java. Surakarta had 0.5 million people, making it the 19th largest city. It is located in the province of Central Java. Each Indonesian city is divided further into Kecamatan (sub-district), Kelurahan (village), Rukun Warga (ward), and Rukun Tetangga (neighbourhood).

For each city, households were selected using systematic random sampling methods after stratifying by income and distance to nearest hypermarket or supermarket (Minot et al. 2013). In order to focus on the respondents' shopping and expenditure patterns in modern food retail outlets, this study oversampled households in higher income areas, and households in neighborhoods close to hypermarkets and supermarkets. The sampling weights were utilized when calculating the results in order to compensate for this over-representation. This allowed the study to make an estimation of the general population for the area of research.

Development of the sample involved four stages. First, three cities were selected from the 20 cities in Java with a population of at least 500,000 people. The study selected one city in eastern (Surabaya), western (Bogor), and central Java (Surakarta). Those cities represent a large, a medium, and a small city, respectively. Second, kelurahan (suburbs) were selected using systematic random sampling for each city, after stratifying by proximity to supermarkets or hypermarkets.

Proximity to modern retail outlets was defined differently in each city because of data availability and based on focus group discussions conducted in each city, which identified what households considered to be close proximity. In Surabaya and Bogor, kelurahans were selected randomly, with stratification and oversampling of kelurahans based on whether or not modern food retail outlets (hypermarkets and supermarkets) existed within one kilometre[7] of the kelurahan border. In Bogor kelurahans were selected randomly, stratified to oversample kelurahans within 5-10 kilometres. In Surakarta, stratification was between kelurahans with an administration office within 5-10 kilometres of modern outlets and those whose offices were not. This stratification allowed us to oversample households located close to a large modern food retail outlet.

The third step involved selecting Rukun Tetangga (RT) or household groups from each subdistrict (kelurahan). RTs were also selected using systematic random sampling methods, stratified by the income level of the RT in order to oversample high-income households. I chose to oversample high-income households because data collected during the design phase, including interviews with key informants and consumers during focus groups suggested that higher income households were more likely to use supermarkets and low income households rarely used supermarkets. In the fourth and last stage, households were randomly selected from lists maintained by the offices of the RT. The total number of selected kelurahans, selected RTs and households in each city is shown in Table 3.1.

[7] The use of one-kilometre was somewhat arbitrary, but it was selected to achieve a roughly equal number of "near" and "far" kelurahans. If I required the kelurahans to have a supermarket within its borders (0 km distance), the number of "near" kelurahans would have been too small. If I defined "near" to mean within 5 km of a supermarket, the large majority of them would be "near".

Table 3.1 The number of selected kelurahans, RTs and households in three cities

City	Number of kelurahan close to supermarkets	Number of kelurahan not close to supermarkets	Number of selected RTs per kelurahan	Number of selected households per RT	Number of household samples in each city
Surabaya	15	5	2	15	600
Bogor	10	10	2	7	280
Surakarta	8	7	1	12	300

3.4 Data Entry and Cleaning

The survey data was entered by ICASEPS staff in Bogor. They were trained in CSPro software by IFPRI and this software was used for all data entry and data cleaning. In order to verify whether the data was complete or not, basic statistical analysis of each question was carried out using STATA software. In some cases, the data entry team asked enumerators for clarification or to follow-up with the respondents to get complete information.

Tables 3.2 to 3.7 show the variables used in the empirical analysis in this thesis. Descriptive statistics for the continuous variables are shown in means and standard deviations while discrete variables are presented using in percentage (frequency) figures. Sampling weights are used in this descriptive analysis.

3.4.1 Characteristics of participant household members

A summary of the socio-demographic characteristics of the survey respondents and their household members is provided in Table 3.2. Approximately 89% of the respondents in the study were female. The high share of the female respondents is not surprising because females are still largely responsible for household food purchase decisions in Indonesia. The average age of the respondents was 43 years old. The average education of the respondents was 9 years; 84% of the respondents were married and lived in a

household with four to five family members. Roughly 49% of the respondents were employed at least part-time and worked outside of the household, 45% were housewives. Only 7% of the respondents were employed in a professional job or position (e.g., doctor, nurse, teacher, manager, executive, administrators). The respondents had an average monthly household income level of around 2,000,000 to 5,000,000 IDR (US$166 per month to US$415 per month). The main religion of the households was Muslim (91%), and the dominant ethnic background was Javanese (65%).

Table 3.2 Respondent and household socio-demographics characteristics

Variable Name	Description	Mean	Std. Dev.	Percentage
Gender	Sex of	0.89	0.32	
	1=Male			11.23
	2=Female			88.77
Age	Age of respondent	43.02	12.4	
Education	Years of education of respondent	9.35	4.52	
Marital status	Marital status of respondent	2.19	0.66	
	1= Single			3.54
	2= Married			83.82
	3= Separated or divorced			2.43
	4= Widowed			10.21
Household Size	Total of household members	4.47	1.67	
Occupation	Respondents' occupation	2.45	0.94	
	1=Self-employed			25.46
	2=Employee, professional			6.91
	3=Employee, semi-skilled			4.75
	4=Employee, labourer			6.43
	5=Other employee			4.91
	6=Housework			44.82
	7=Retired			4.10
	8=Not working			2.62
Work hours	Hours a week a respondent works	71.37	30.79	
Household Income	Approximate income of household	6.53	1.20	
	Less than 50,000 IDR/month			0.02
	50,000 to 100,000 IDR/month			0.47
	100,000 to 200,000 IDR/month			0.37
	200,000 to 500,000 IDR/month			3.91
	500,000 to 1,000,000 IDR/month			12.51
	1,000,000 to 2,000,000 IDR/month			29.22
	2,000,000 to 5,000,000 IDR/month			35.41
	5,000,000 to 10,000,000 IDR/month			13.23
	More than 10,000,000 IDR/month			4.85
Religion	Main religion of household			
	Muslim			90.84
	Christian			8.15
	Other			1.01
Ethnicity	Ethnicity of head of household			
	Javanese			64.79
	Sudanese			15.54
	Chinese			10.95
	Other			8.73

A summary of the housing and assets owned by households are presented in Table 3.3. Table 3.3 shows that approximately 32% of households used aqua/bottled water as the main source of drinking water. The majority of households used electric lights as the main type of lighting, and liquefied petroleum gas (LPG) as the main type of fuel for cooking. Nearly 64% of households owned a refrigerator and 71% of households owned motorbikes, but only 17% owned a car or truck. Debit cards were more popular among households compared to credit cards. Nearly one-third (32%) of households had a debit card, while only 11% had a credit card.

Table 3.3 Descriptive statistics for housing and assets of respondent households

Variable Name	Description	Percentage	N
Drinking water	Main source of drinking water of household		1180
	1=Aqua/bottled water	32.41	
	2=Indoor tap	24.92	
	3=Refill water	19.20	
	4=Other	23.47	
Lighting	Main type of lighting used by household		1180
	1=Electric lights	99.11	
	2=Oil Lamps	0.89	
Fuel	Type of fuel used by household for cooking		1180
	1=Electricity	3.68	
	2=LPG	78.86	
	3=Kerosene	13.99	
	4=Other	3.47	
Refrigerator	Number of refrigerators owned by household		1180
	1=Yes, own at least 1 refrigerator	63.91	
	2=Otherwise	36.09	
Motorbikes	Number of motorbikes owned by household		1180
	1=Yes, own at least 1 motorbike	70.94	
	2=Otherwise	29.06	
Cars or Trucks	Number of cars or trucks owned by household		1180
	1=Yes, own at least 1 car or truck	16.64	
	2=Otherwise	83.36	
Debit Cards	Number of debit cards owned by household		1180
	1=Yes, own at least 1 debit card	32.12	
	2=Otherwise	67.88	
Credit Cards	Number of credit cards owned by household		1180
	1=Yes, own at least 1 credit card	11.04	
	2=Otherwise	88.96	

3.4.2 Descriptive statistics for cooking and shopping attitudes and behaviour

This section reports on the cooking and shopping attitudes and behaviour of the respondents with summary statistics provided in Tables 3.4 to 3.6. Table 3.4 presents respondents' household behaviour related to cooking, shopping and buying prepared food away from home.

Table 3.4 Descriptive statistics for cooking and shopping attitudes

Variable Name	Description	Percentage	N
Assistant cooking	Domestic employee helps with cooking food		1180
	1=Yes, at least sometimes	7.80	
	0=No	92.20	
Assistant shopping	Domestic employee who helps with shopping for food		1180
	1=Yes, at least sometimes	6.08	
	0= No	93.92	
Purchase decisions	Person in household responsible for deciding what food products to purchase		1180
	1=Male adult family member	2.56	
	2=Female adult family member	94.65	
	3=Domestic employee	0.54	
	4=Other	2.24	
People shopping	Person in household who does majority of food shopping		1180
	1=Male adult family member	3.10	
	2=Female adult family member	93.52	
	3=Domestic employee	1.59	
	4=Other	1.78	
Meal decisions	Person in household responsible for deciding food family will have for a meal		1180
	1=Male adult family member	2.70	
	2=Female adult family member	94.50	
	3=Domestic employee	0.46	
	4=Other	2.24	
Shopping List	Use a written shopping list when shopping for food		1180
	1=Yes	10.63	
	0=No	89.37	

Only a small share of the households, 8% and 6%, had assistance from a domestic employee when cooking and shopping for food, respectively. Female adult family members in the household were primarily responsible for deciding what food products to purchase (95%) and they also did the majority of the food shopping in 94% of the households. Only 11% of the households made and used a written list when shopping for food.

Table 3.5 provides a summary of respondent households' behaviour related to use of prepared food and purchases of food consumed away from home. Households ate dinner together at home an average of four times per week. On average, two to three times per month households purchased "ready-to-eat" food for the evening meal from outside the house, brought it home, and ate it at home. A very small share (about 1%) of the households purchased food from a delivery service and ate it at home on a regular basis (at least once per month). Roughly one-quarter (24%) of the households consumed their main family meal at a restaurant at least weekly. On average, the households used street stalls and food vendors more frequently than other types of businesses, with 34% of the respondents indicating they purchased food for their main family meal from a street stall or vendor at least once per week.

The respondents were asked to rate using a scale of 1 to 5 (where 1 = Not at all important; 2 = Somewhat important, … 5 = Extremely important), how important 22 different retail outlet characteristics were when deciding where to purchase food. On average, the following retail characteristics were rated most highly: 'provides food that is safe to eat', 'provides food that is fresh', 'cleanliness' (including environment), 'friendly staff' and a 'store that is easy to get to'. Attributes such as the store offering a delivery service, air conditioning, fixed prices, opportunities to purchase on credit and being close to entertainment and social opportunities were of low importance, on average.

Table 3.5 Household behavior related to use of prepared food and food purchased away from home

Variable Name	Description	Mean	Percentage
Dinner together at home	Number of days dinner eaten together per week in household	3.92	
"Ready to eat" meals	Number of "ready-to-eat" meals purchased outside the house, brought home, and eaten at home per month		
	6=Every day		11.82
	5=2-6 times per week		11.95
	4=Once a week		15.03
	3=2-3 times per month		12.49
	2=Once a month		15.33
	1=Few times per year		2.88
	0=Never		30.50
Delivery Service	Number of meals purchased from a delivery service and eaten at home per month		
	6=Every day		4.66
	5=2-6 times per week		1.68
	4=Once a week		2.51
	3=2-3 times per month		0.35
	2=Once a month		0.85
	1=Few times per year		0.19
	0=Never		89.77
Restaurant	Number of meals purchased and eaten at restaurants per month		
	6=Every day		9.33
	5=2-6 times per week		9.32
	4=Once a week		5.75
	3=2-3 times per month		3.91
	2=Once a month		2.59
	1=Few times per year		0.52
	0=Never		68.59
Street Stalls	Number of meals purchased from street stalls or vendors and eaten away from home per month		
	6=Every day		11.13
	5=2-6 times per week		10.43
	4=Once a week		12.73
	3=2-3 times per month		8.93
	2=Once a month		9.55
	1=Few times per year		1.75
	0=Never		45.49

Table 3.6 Average level of importance respondents placed on retail format attributes when deciding where to purchase food

Description	Mean	Std. Dev.
Provides food that is safe to eat	3.37	0.61
Provides food that is fresh	3.34	0.62
Cleanliness (including environment)	3.31	0.66
Friendly staff	3.26	0.68
Store is easy to get to	3.24	0.61
Provides food product information (weight, labels, expiry, etc.)	3.16	0.90
Low prices	3.11	0.88
Fast service	3.11	0.73
High-quality food products	2.96	0.97
Flexible prices (able to negotiate or bargain)	2.93	0.97
Size of items	2.90	0.78
Wide variety of food products (good selection)	2.90	0.81
Good display (easy to find products)	2.76	0.91
Store provides discount	2.70	1.18
Better opening hours	2.58	1.07
Offers product unpackaged	2.20	1.18
Close to other non-food shopping	1.91	1.26
Delivery service	1.86	1.32
Air-conditioning	1.82	1.33
Fixed price	1.80	1.16
Ability to purchase on credit	1.36	1.36
Close to entertainment & social opportunities	1.25	1.19

3.4.3 The descriptive statistics for shopping behaviour

Tables 3.7-3.11 provide an overview of the average urban Indonesian households' shopping behaviour. Table 3.7 provides the average estimated travel time (minutes) to reach, and the physical distance (kilometres from respondents' households) to the nearest of each type of food retail formats.

Table 3.7 Descriptive statistics for time (minutes) and distance (km) needed to get to the nearest food retail outlets

Variable	Mean	Std. Dev.
Time to hypermarkets	20.36	13.11
Time to supermarkets	17.60	11.52
Time to minimarkets	8.75	6.21
Time to semi-permanent stands	8.75	9.03
Time to small shops	3.15	2.40
Time to wet markets	13.49	10.7
Time to peddlers	1.43	1.32
Distance to hypermarkets	3.98	3.81
Distance to supermarkets	3.60	4.28
Distance to minimarkets	0.89	1.35
Distance to semi-permanent stands	0.82	2.01
Distance to small shops	0.07	0.56
Distance to wet markets	2.23	3.78
Distance to peddlers	0.03	0.26

The average travel time for respondents to reach hypermarkets (20 minutes) and supermarkets (18 minute) was significantly more than the travel time to reach traditional retailers, particularly small retail shops (3 minutes). However, it is somewhat interesting to note that the time required to get to the nearest minimarket (approximately 9 minutes) was shorter than the travel time to traditional wet markets (about 14 minutes). Both peddlers and small shops were the outlets closest in distance to the respondents' homes and hypermarkets were the furthest in distance, 0.03 km, 0.09 km, and 12.02 km, respectively. Peddlers often move around in residential areas making it relatively easy for respondents to reach this type of retail outlet.

Table 3.8 shows that respondents tend to use a wide variety of retail formats to shop for food. Considering all retail formats, small shops (warung) and wet markets were used most frequently by consumers with 40% and 34% of the consumers indicating they shopped 'daily' at small shops and wet markets, respectively. Only 2% of the urban

consumers shopped at modern markets (hypermarkets, supermarkets or mini-markets/convenience stores) on a daily basis. However, 23% of the consumers used modern markets at least weekly.

Table 3.8 Households' (%) food shopping frequency at various retail formats (n=1180)

	Hyper-markets	Super-markets	Mini-markets	Semi-permanent stands	Small shops	Wet markets	Peddlers
Daily	0.54	0.38	1.48	7.47	39.87	33.75	27.01
2-3 times/week	1.57	1.55	10.62	15.12	31.83	18.14	29.01
Once a week	4.51	4.41	14.29	16.32	11.03	14.34	13.14
2-3 times/week	8.23	7.87	17.10	14.57	10.38	7.59	9.52
Once a month	21.1	20.71	18.19	13.41	3.76	9.43	4.95
<1 /month	18.71	18.53	11.84	13.19	1.22	13.07	3.65
Never	45.35	46.53	26.49	19.91	1.92	3.69	12.72

With regard to frequency of shopping for non-food products, Table 3.9 shows that small shops and wet markets were used most frequently on a daily basis while modern markets were used on a monthly basis. More than 14% of the consumers used small shops as their retail source to shop for non-food products on a daily basis. Less than 1% of the respondents used hypermarkets as their main shop on a daily basis. However, over 16% of the consumers went shopping at minimarkets 2-3 times per week and 21% of the consumers shopped at hypermarkets once a month. Few respondents (13%) never used traditional wet markets for shopping for non-food products, yet 40% of the shoppers never used hypermarkets as a retail format for purchasing non-food items.

Table 3.9 Households' frequency (%) of shopping for non-food products at various retail formats (n=1180)

	Hyper-markets	Super-markets	Mini-markets	Semi-permanent stands	Small shops	Wet markets	Peddlers
Daily	0.58	0.92	1.12	1.43	14.87	4.46	1.46
2-3 times/week	0.68	1.38	6.01	1.60	22.67	3.75	1.44
Once a week	3.06	6.41	9.02	4.98	19.20	12.24	3.65
2-3 times/week	5.93	8.8	16.55	9.35	15.93	11.28	7.38
Once a month	20.82	31.9	31.33	27.71	17.31	29.35	26.39
<1 /month	24.92	24	15.56	22.81	6.17	26.46	29.07
Never	44.02	26.70	20.42	32.11	3.86	12.46	30.62

Table 3.10 shows that most respondents required the use of a private or public vehicle to reach hypermarkets, supermarkets and minimarkets. On the other hand, the majority of the consumers walked to get to the nearest traditional food retailers – small shops (warung). Approximately 17% consumers reached the nearest minimarket by foot.

Table 3.10 Frequency (%) of transport mode getting to the nearest retail formats

	Hyper-markets	Super-markets	Mini-markets	Semi-permanent stands	Small shops	Wet markets	Peddlers
On foot	4.35	5.13	17.01	28.58	44.56	24.20	42.96
Bicycle	1.11	1.18	2.34	2.39	1.76	4.44	0.65
Motorcycle	61.53	58.10	55.65	46.47	34.87	44.75	36.72
Car	15.22	13.20	10.27	9.36	8.50	8.10	8.89
Public transport	14.11	18.70	10.79	9.71	8.17	15.64	8.30
Taxi or ojek[8]	0.91	0.79	1.38	1.35	0.50	0.61	0.54
Other	2.79	2.94	2.55	2.14	1.64	2.25	1.93

[8] Ojek (motorbike taxi) is unlicensed form of transport in Indonesia. The ojek especially brings one or more passengers, who ride as the seating behind the motorcycle driver.

Table 3.11 presents a summary of the main reasons consumers purchased food from a particular retail format. This question was only asked to the respondents who indicated earlier in the survey that they purchased food at this type of retail format. The respondents were asked to use their own words to explain the main reason they purchased food at each outlet they used. For hypermarkets and supermarkets, 'wide variety of food products' and 'offers low prices' was reasons most frequently cited. The reasons for shopping at these two types of outlets varied much more than those mentioned for mini-markets, semipermanent stands, small shops and peddlers where 'easy to get to was the primary reason mentioned by the majority of the respondents, 48%, 49%, 77%, and 71%, respectively. Interestingly, the largest share of the respondents (46%) stated that 'low prices' was the main reason they shopped at wet markets. The consumers also considered the attribute of 'close to entertainment and social opportunities' as important when visiting hypermarkets and supermarkets. Interestingly, fewer than 5% of the respondents indicated that 'cleanliness of store' (including good shopping environment) was an important reason for shopping at a retail outlet.

Table 3.11 The main reasons consumers shopped for food at retail outlets (% indicating reason)

Attributes	Hyper-markets (n=716)	Super-markets (n=700)	Mini-markets (n=849)	Semi-permanent stands (n=919)	Small shops (n=1117)	Wet markets (n=1013)	Peddlers (n=1013)
Wide variety of food products	27.77	22.73	11.83	9.54	1.32	21.48	1.99
Offers low prices	18.57	27.93	19.98	25.97	11.03	45.61	9.55
Store is easy to get to	10.80	15.58	48.42	48.57	77.34	18.78	70.66
Store is close to entertainment	14.11	7.13	0.74	1.08	0.13	0.46	0.14
Store provides discount	11.89	6.00	2.38	0.02	0.05	0.00	0.25
High-quality food products	3.87	5.28	2.65	2.24	0.04	1.06	0.43
Cleanliness of store	2.60	1.67	1.86	0.62	0.00	0.04	0.00
Fixed price	1.82	3.18	2.26	0.06	0.19	0.18	0.16
Flexible prices	0.12	0.00	0.00	2.48	0.38	2.59	1.14
Food products are fresh	2.25	5.57	0.71	3.52	0.54	7.73	1.89
Can purchase small amounts	0.00	0.87	3.17	2.98	6.28	0.83	5.78
Fast service	0.11	0.13	2.25	1.37	0.84	0.13	5.19
Ability to purchase on credit	0.17	0.00	0.00	0.05	1.03	0.18	1.37
Product is unpackaged (can see and feel)	0.00	0.00	0.00	0.02	0.06	0.24	0.00
Other attributes	5.92	3.93	3.75	1.48	0.77	0.69	1.45

Table 3.12 Share (%) of households in sample indicating per capita consumption of food product decreased, remained constant or increased compared to five years ago (2005 vs. 2010)

Food product	% of households indicating ...		
	Decrease in per capita consumption	Constant per capita consumption	Increase in per capita consumption
Rice	15.00	42.60	42.40
Bread & cereals	26.60	44.00	29.40
Noodles	31.30	44.90	23.80
Maize & grain	38.30	48.40	13.30
Tubers	29.25	53.45	17.30
Beans	33.43	53.96	12.61
Tofu & tempe	5.59	53.01	41.40
Fresh dairy	36.12	45.08	18.80
Other milk	23.98	49.97	26.05
Eggs	11.50	48.45	40.05
Processed meats	30.30	42.59	27.12
Fresh meats	27.94	44.97	27.08
Fresh fish	35.37	40.98	23.65
Processed fish	25.65	56.30	18.04
Fresh vegetables	38.62	24.54	36.84
Canned vegetables	36.71	59.86	3.43
Fresh fruit	44.90	30.41	24.69
Other fruit	36.48	58.06	5.47
Oils	24.74	48.48	26.78
Coconut oil	31.18	53.54	15.28
Spreads	38.91	52.82	8.27
Sweets	26.70	46.29	27.01
Sugar	14.05	56.85	29.10
Spices	28.84	45.27	25.89
Bottled water	13.89	43.69	42.42
Soda, fruit juice	33.22	53.02	13.76
Coffee & tea	14.51	59.74	25.75
Alcoholic beverages	53.94	33.56	12.49
Snacks	25.72	50.64	23.64
Nutritional products & vitamins	23.45	47.56	28.99
Food away from home	37.11	38.16	24.73

3.4.4 Household food consumption and food expenditure

The respondents were asked a series of questions in order to understand household food expenditure shares with respect to 67 types of food products and whether per capita consumption in their household was changing. Food products were aggregated into relevant groups (e.g., fresh fruits, fresh meat, fresh dairy).

A summary of respondents' answers to the question "*Are members of your household consuming smaller or larger quantities of [...] on a per person basis than 5 years ago?*" are displayed in Table 3.12. The columns indicate the share of the respondents indicating that per capita consumption of food products in their households had either decreased, remained relatively constant, or increased relative to five years ago (2005 versus 2010), respectively.

It is interesting to consider the relative share of households increasing versus decreasing their consumption of certain categories of food products. For example, nearly 30% and 33% of the households indicated their per capita consumption of tubers and beans had decreased, respectively. These are traditional food products or considered to be staples in the Indonesian diet. This is not surprising, because when income increases, the demand of inferior goods such tubers and beans are expected to decrease. However, at the same time, a large share (42%) of the households indicated their consumption of rice had increased. Rice is another product usually considered to be a traditional food product for Indonesians; so the large share of the households increasing consumption of rice is somewhat surprising. For example, papers by Pingali (2007), Hoddinott and Yohannes (2002), and Mendez and Popkin (2004) all suggest that when disposable income increases, households tend to diversify their diets away from staples, such as rice. A possible explanation for the large share of the households indicating an increase in rice consumption might be that for the poor households in this study, rice is not seen as a

staple, rather beans and tubers are staples; and as such, households tend to increase their demand for rice when incomes increase initially. There does appear to be a shift among some households to diets higher in protein, as evidenced by the fact that a large share of households is increasing their consumption of high protein products such as tempe and tofu (41%) and eggs (40%); furthermore, 27% of the households indicated an increase in consumption of fresh meat.

Interestingly, a large share of households indicated that their per capita consumption of fresh fruit (45%) and fresh vegetables (39%) had decreased over the past five years. This is both surprising and concerning and is evidence of a possible shift in Indonesian diets towards less healthy consumption behaviour, which is the focus of the Chapter 6. For example, as I will discuss in Chapter 6, fruits and vegetables, are considered to be "healthy" food products and increasing per capita consumption is generally encouraged. Additionally, other concerning statistics from a diet-related health standpoint are the share of households that indicated their consumption of processed food items such as processed meats (27%), breads and cereals (29%), sweets (27%), sugars (29%), and oils (27%) have increased.

Table 3.13 shows where the respondents typically purchased different types of food products. Small shops and wet markets still appear to be the main source for traditional Indonesian food products (rice, maize, tubers, grain). More than 50% of the consumers indicated that small shops (warung) were their main retail source for noodles and eggs. Shoppers preferred to purchase tofu and tempe in wet markets and from peddlers. More than 50% of the consumers reported that they purchased fresh fruit, fresh vegetables, fresh meat and fresh fish in wet markets.

Table 3.13 Retail formats used to purchase various food products

Product Name	Percentage at								
	Hyper-markets	Super-markets	Mini-markets	Semi-permanent stands	Small shops	Wet markets	Peddlers	Other	Total
Rice	1.66	0.81	0.79	0.05	50.57	22.64	0.93	22.56	100
Bread & cereals	4.81	6.32	13.48	0.69	43.24	6.29	19.90	5.26	100
Noodles	9.26	7.46	11.79	0.39	61.06	8.36	0.35	1.34	100
Maize & grain	2.55	2.53	1.53	0.60	53.85	29.43	8.35	1.17	100
Tubers	0.16	0.61	0.07	7.36	18.03	49.12	23.54	1.10	100
Beans	3.00	2.57	2.85	1.46	34.55	42.93	12.50	0.14	100
Tofu & tempe	0.02	0.18	0.00	2.96	18.56	39.88	38.39	0.01	100
Fresh dairy	17.61	7.64	28.59	8.10	13.20	5.50	8.42	10.94	100
Other milk	14.74	13.24	24.70	0.63	40.48	4.34	0.79	1.07	100
Eggs	2.38	1.98	1.50	0.36	61.53	29.58	1.61	1.05	100
Processed meats	0.20	0.64	0.46	1.26	25.01	51.21	21.05	0.15	100
Fresh meats	1.83	0.58	0.00	1.34	8.93	60.14	25.62	1.55	100
Fresh fish	1.97	0.48	0.47	4.07	5.80	61.55	22.10	3.57	100
Processed fish	17.94	7.58	9.25	2.22	29.22	18.17	15.23	0.38	100
Fresh vegetables	0.43	0.23	0.04	2.81	19.06	53.84	23.38	0.21	100
Canned vegetables	44.19	11.09	0.00	4.91	12.49	16.69	10.63	0.00	100
Fresh fruit	7.42	6.27	2.00	17.80	6.34	45.59	14.06	0.53	100
Other fruit	24.57	11.45	1.10	10.59	24.50	8.77	18.82	0.20	100
Oils	18.35	9.88	12.62	0.34	39.33	17.62	0.46	1.41	100
Coconut oil	1.44	1.05	1.64	1.24	29.82	44.03	20.77	0.00	100
Spreads	35.18	20.10	23.07	1.01	6.92	13.61	0.00	0.10	100
Sweets	7.31	8.43	20.82	1.63	42.40	13.88	4.65	0.88	100
Sugar	11.50	7.05	7.01	0.00	58.63	14.90	0.34	0.57	100
Spices	6.57	4.18	4.42	0.32	48.56	32.44	3.47	0.06	100
Bottled water	0.52	0.70	5.91	0.96	67.92	1.59	4.15	18.24	100
Soda, fruit juice	14.63	11.55	20.46	6.44	41.49	3.98	0.57	0.88	100
Coffee & tea	10.93	7.80	9.91	0.87	54.01	15.42	0.17	0.89	100
Alcoholic beverages	1.69	8.70	60.87	0.00	28.73	0.00	0.00	0.00	100
Snacks	7.35	7.26	23.42	0.57	49.51	6.69	4.64	0.57	100
Nutritional items & vitamins	13.46	15.04	13.76	0.48	17.00	5.33	12.98	21.95	100
Meal away from home	1.50	1.43	0.71	31.78	43.44	3.13	10.18	7.83	100

Less than 5% of the consumers indicated that they shopped for fresh vegetables, fresh meat and fresh fish at modern food retailers (hypermarkets, supermarkets and minimarkets). Small shops were also a popular place for purchasing spices, sweets, sugar, bottled water, coffee and tea, with more than 40% of those foods being purchased at small

shops. However, modern food retail outlets (hypermarkets, supermarkets and minimarkets) are now, for over half of households, the main source for dairy products (53%), canned vegetables (55%) and spreads (78%). Specifically, 29% of the households purchase dairy products at minimarkets. Interestingly, over one-third of households purchase processed fish, fruit products (not fresh), oils (41%), sweets (37%), soft drinks (e.g. soda and fruit juice, 47%), snacks (38%), and nutritional items (42%) at modern retail outlets.

Table 3.14 shows the pattern of consumer shopping frequency for a variety of foods. Table 3.14 indicates that consumers purchased tofu and tempe as well as fresh vegetables almost on a daily basis, while rice, bread, cereal, noodles, spices and sugar were purchased by consumers on a weekly basis. In terms of fresh meat and fish and fresh fruit, Table 3.14 indicates that the consumers also purchased those foods on a weekly basis. Households seldom purchased canned vegetables and other fruit. The frequency of purchasing prepared food away from home was relatively high with an average of 2-3 times per week.

Regarding household expenditure on food per year, Table 3.15 shows that households spent an average of 17,700,000 IDR or US$ 1958.83[9] per year on food. A surprising finding relates to expenditures on food prepared away from home (FAH) and rice. Table 3.15 shows that the average expenditure on FAH accounts for the largest amount of household food expenditures. It seems that there is a change in food consumption demand in Indonesia. The results of the current study are consistent with those Pingali (2007) and Timmer (2014) who found that there was an increase in the level and share of food prepared away from home in Asian countries.

[9] The exchange rate is based on official website the Indonesia Bank of Indonesia (US$ = 9036 IDRs)

Table 3.14 Descriptive statistics for the frequency of purchasing food products during the past month

Food product	Mean	Std. Dev.	Min	Max	Obs.
Rice	7.47	10.84	0	75	1179
Bread & cereals	5.63	7.27	0	30	1155
Noodles	5.15	7.00	0	60	1168
Maize & Grain	2.66	4.39	0	30	1120
Tubers	2.19	3.75	0	30	1078
Beans	1.73	3.69	0	30	1024
Tofu & tempe[10]	19.77	10.67	0	40	1170
Fresh dairy	2.80	5.89	0	30	793
Other milk	3.56	6.72	0	45	913
Eggs	4.99	6.02	0	30	1174
Processed meats	2.81	5.13	0	30	867
Fresh meats	4.35	5.21	0	30	1176
Fresh fish	4.59	6.01	0	30	1109
Processed fish	4.15	6.37	0	30	978
Fresh vegetables	18.79	10.38	0	30	1179
Canned vegetables	0.40	1.12	0	8	124
Fresh fruit	4.51	5.42	0	30	1178
Other fruit	0.32	1.47	0	15	359
Oils	4.58	6.38	0	30	1178
Coconut oil	3.61	4.23	0	30	1108
Spreads	0.42	1.41	0	24	715
Sweets	5.73	7.92	0	40	1150
Sugar	3.68	5.19	0	30	1175
Spices	4.45	6.81	0	34	1179
Bottled water	4.68	4.48	0	30	954
Soda, fruit juice	1.77	4.38	0	30	850
Coffee & tea	4.67	7.90	0	30	1133
Alcoholic beverages	1.56	3.39	0	16	46
Snacks	4.42	7.97	0	90	1016
Nutritional items & vitamins	3.72	6.19	0	30	978
Food away from home	11.67	13.26	0	100	1148

[10] Tempe is a traditional soy product originally from Java, Indonesia.

Rice accounts for the next largest amount of household food expenditures, suggesting that not surprisingly, rice is still an important item in Indonesian's food consumption basket. The facts seem to be consistent with other research in Asian countries, including as India, Thailand and China, which found that rice is still considered an essential part of the diet (Reardon & Timmer 2014). Another interesting fact is that the shares of staples, including fresh meat, fresh fruit, and fresh vegetables, are also relatively large.

Table 3.15 shows that spending on nutritional items and vitamins was more than spending on fresh meat and fresh fruit as well as fresh fish. Table 15 also shows that household expenditure on fresh dairy products was relatively low compared to household expenditure on bottled water and coffee and tea. Consumers spent an average of 1,312,899 IDR on nutritional items and vitamins per year. In addition, the mean household expenditure on noodles was more than expenditure on bread, cereals, maize and spreads. However, the average household expenditure on canned vegetables and alcoholic beverages was low at 2,689 and 10,043 IDR, respectively.

Table 3.15 Descriptive statistics for household expenditure (1000 IDRs) on food products per year

Food product	Mean	Std. Dev.	Min	Max
Rice	2076.43	1206.61	0	17300
Bread & cereals	155.51	298.93	0	7800
Noodles	605.27	1141.48	0	16700
Maize & grain	422.39	968.08	0	64800
Tubers	75.34	158.94	0	3000
Beans	93.33	251.74	0	9600
Tofu & tempe	828.8	1241.80	0	36000
Fresh dairy	193.37	582.46	0	10900
Other milk	407.12	1038.94	0	17600
Eggs	447.76	537.56	0	8400
Processed meats	210.88	530.78	0	7200
Fresh meats	1152.45	1555.38	0	39600
Fresh fish	846.14	1381.81	0	21600
Processed fish	211.35	525.23	0	7848
Fresh vegetables	1766.52	1165.95	0	16500
Canned vegetables	2.69	25.29	0	600
Fresh fruit	1081.62	1482.50	0	42600
Other fruit	16.83	159.59	0	4680
Oils	498.66	535.89	0	8400
Coconut oil	99.93	156.37	0	4320
Spreads	29.53	172.07	0	12000
Sweets	489.41	758.27	0	22500
Sugar	410.81	728.52	0	13200
Spices	340.89	292.35	0	4200
Bottled water	460.13	922.49	0	13500
Soda, fruit juice	115.06	302.38	0	14400
Coffee & tea	229.60	317.13	0	6120
Alcoholic beverages	10.04	211.99	0	9000
Snacks	251.54	722.19	0	13500
Nutritional items & vitamins	1312.9	3001.85	0	48000
Food away from home	2840.53	5649.36	0	150000
Total food expenditure	17,700.00	14000	0	241000

3.4.5 Descriptive statistics for non-food expenditure

The descriptive statistics for household expenditure on non-food items per year is summarised in Table 3.16.

Table 3.16 Descriptive statistics for household expenditure on non-food items per year (1000s IDRs)

Variable Name	Description	Mean	Std. Dev.
Equipment	The value of household non-food expenditure on household equipment in a year	208.61	2152.63
Housing maintenance	The value of household non-food expenditure on housing maintenance and minor renovation in a year	758.30	10892.05
Electricity	The value of non-food expenditure household on electricity, water, gas, and kerosene in year	2570.02	2504.67
Telephone	The value of non-food expenditure household on telephones in year	1750.32	2786.30
Body products	The value of non-food expenditure household on body products, cleaning supplies, cosmetics, tissues, etc.) in year	1239.96	1577.58
Health expenditure	The value of non-food expenditure household on health (hospital, clinic, doctor, medicine, etc.) in year	1261.08	5024.55
Health insurance	The value of non-food expenditure household on health insurance in year	360.37	2277.78
Education	The value of non-food expenditure household on education in year	3360.93	8626.49
Transportation	The value of non-food expenditure household on transportation (bus fare, petrol, etc.) in year	2927.22	5108.21
Domestic employees	The value of non-food expenditure household on domestic employees (housekeeper, driver, etc.) in year	862.88	3316.19
Clothing	The value of non-food expenditure household on clothing (including shoes and head cover) in year	1207.39	3803.12
Tobacco	The value of non-food expenditure household on tobacco (cigarettes, cigars, leaves, etc.) in year	1541.55	2554.55
Celebrations and ceremonies	The value of non-food expenditure household on celebrations and ceremonies in year	1370.39	14875.32
Other leisure	The value of non-food expenditure household on other leisure spending (sports, movies, internet, magazines, etc.) in year	821.84	2936.99
Other non-food consumption	The value of non-food expenditure household on other non-food items (e.g. gifts, life insurance) in year	918.71	2532.81
Total non-food expenditure	The value of non-food expenditure household in year	21159.56	31147.52

Table 3.16 shows that the mean household expenditure on non-food items per year are 21 million IDRs. Expenditure on education was the highest, with a mean expenditure of 3.36 million IDRs per year. This was followed by expenditures on transportation, electricity and telephones of 2.97 million, 2.57 million, and 1.75 million per year,

respectively. The combined expenditure on these items was 51% of total expenditure on non-food items. The mean expenditure on 'other leisure' was 0.82 million per year. This value was greater than expenditure on body products or clothing. Interestingly, the mean expenditure on tobacco was greater than the mean on health expenditure, with mean expenditure of 1.54 million per year, and 1.26 million per year, respectively.

The mean expenditure on celebrations and ceremonies was 1.37 million per year. This mean expenditure was bigger than the expenditure on health insurance, with a mean total of 0.360 million per week. The lowest non-food expenditure was expenditure on equipment, with a mean of 0.219 million per year.

3.4.6 Descriptive statistics for factors in food choice

The descriptive statistics for the attributes influencing consumers' food purchasing decisions are summarised in Table 3.17. Table 3.17 shows that 34% of the consumers indicated that price was the most important attribute to consider when purchasing food in general, followed by quality and freshness with percentages of 32%, and 15%, respectively. However, the consumers indicated that the attribute of freshness was the most important influence on their shopping choices for fresh vegetables, poultry, meat, shrimp as well as chilli with percentages of 66%, 59%, 50%, 49% and 46%, respectively.

Table 3.17 The most important attributes influencing consumers' food purchasing decisions

Attribute Name	Percentage								
	Food	Mango	Other fresh fruit	Chilli	Shallot	Other fresh vegetables	Shrimp	Poultry	Meat
Price	33.89	12.48	15.18	17.87	18.06	10.91	11.94	13.32	13.61
Nutritional content	1.87	0.70	0.71	0.42	0.65	0.95	0.36	0.41	0.48
Food safety	5.76	0.35	0.74	0.24	0.29	1.13	0.31	0.53	0.34
Quality	31.70	12.23	13.14	15.82	21.09	10.21	5.83	10.03	11.08
Taste	4.92	21.47	16.79	1.94	0.67	0.35	0.29	0.30	0.43
Freshness	14.95	26.66	35.74	46.49	23.51	65.95	48.67	58.85	50.40
Easy to prepare	0.43	0.23	0.08	0.28	0.07	0.07	0.05	0.07	0.00
Production method	0.04	0.13	0.08	0.06	0.10	0.27	0.00	0.15	0.00
Brand	0.01	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00
Origin (country or region)	0.00	0.17	0.19	0.36	0.65	0.17	0.00	0.00	0.00
Grade, Class	0.12	1.29	0.72	1.77	20.75	1.02	5.33	0.45	0.01
Diversity	0.00	0.07	0.13	0.00	0.00	0.00	0.00	0.00	0.00
Smell	0.13	3.51	1.99	0.06	0.10	0.07	3.38	1.18	0.95
Colour	1.16	6.37	6.36	7.76	3.95	5.59	2.35	6.95	10.99
Appearance	2.34	5.44	5.67	4.26	7.75	1.98	1.22	1.55	1.64
Firmness/texture	0.00	0.84	0.65	0.34	0.44	0.19	0.58	3.16	3.94
Variety	0.08	5.76	1.37	1.18	0.72	0.04	0.01	0.11	0.02
Package size	0.04	0.00	0.15	0.06	0.38	0.00	0.53	0.00	0.00
Expiry date	2.36	0.08	0.00	0.00	0.04	0.00	0.00	0.00	0.00
Other labelling info	0.20	2.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Never purchase this item	0.00	0.00	0.00	1.10	0.80	1.10	19.02	2.94	6.11

With respect to the attribute of quality, the consumers indicated that this attribute was the second most important attribute affecting their decisions when shopping for shallots and chillies, by 21% and 16% of the households, respectively. Less than 2% of the consumers indicated that food safety was the most important attribute to consider when purchasing fresh produce. Moreover, less than 1% of the consumers considered nutritional content, expiry date, or country-of-origin or region-of-origin to be the most important attributes influencing their food purchases.

Table 3.18 shows the descriptive statistics for the type of nutrition information consumers read when purchasing food. Only 15% of the consumers always read the food ingredients and nutrition labels when purchasing food, while 32% of the consumers indicated that they sometimes read the food ingredients and nutrition labels. About 37% of the total sample indicated that they never read or looked for the food ingredients and nutrition labels when purchasing food.

In terms of what type of nutrition information consumers read or looked for, 71% of the consumers said that they looked for ingredient information when purchasing food, while 53%, 51%, and 55% of the respondents indicated they read or look for information about calories, sugar and fat, respectively. Only 46% of the total sample indicated they read or looked for salt information, compared to the 65% of the consumers who read or looked for protein information or the 51% of the sample who looked for information about fibre. Nearly 72% of the consumers reported that they used or looked for vitamin information when shopping for food.

Table 3.18 Descriptive statistics for type of nutrition information that consumers read

Variable Name	Description	Percentage	N
Information used	Frequency of household using food ingredients and nutrition information when shopping for food		1,180
	3=Always	14.79	
	2=Often	16.15	
	1=Sometimes	32.11	
	0=Never	36.95	
Ingredients information	Ingredients information read or looked for		857
	1=Yes, looks for info	70.80	
	0=No, does not look for info	29.20	
Calorie information	Calorie information read or looked for		857
	1=Yes, looks for info	52.61	
	0=No, does not look for info	47.39	
Sugar information	The type of nutritional information used or looked for sugar		857
	1=Yes, looks for info	50.88	
	0=No, does not look for info	49.12	
Salt information	The type of nutritional information used or looked for salt		857
	1=Yes, looks for info	45.74	
	0=No, does not look for info	54.26	
Fat information	The type of nutritional information used or looked for fat		857
	1=Yes, looks for info	54.89	
	0=No, does not look for info	45.11	
Vitamins information	The type of nutritional information used or looked for vitamin		857
	1=Yes, looks for info	71.76	
	0=No, does not look for info	28.24	
Protein information	The type of nutritional information used or looked for protein		857
	1=Yes, looks for info	65.38	
	0=No, does not look for info	34.62	
Fibre information	The type of nutritional information used or looked for fibre		857
	1=Yes, looks for info	51.35	
	0=No, does not look for info	48.65	
Other information	The type of nutritional information used or looked for other		857
	1=Yes, looks for info	58.26	
	0=No, does not look for info	41.74	

3.4.7 Food and nutrition attitudes

To understand respondents' attitudes towards nutrition and food concerns they were asked to indicate their level of agreement to a series of 16 questions using a 5-point Likert scale (strongly disagree (0) to strongly agree (4)). Tables 3.19 and 3.20 provide descriptive statistics summarising their general level of agreement. The results showed that the mean score for level of agreement with 'healthy attitude' was 3.3. This means that most consumers agreed to strongly agree with the statement that they were concerned about whether or not food products are healthy. The majority of respondents also agreed with the statements that diet and nutrition play a major role in their health, regular exercise would improve health, avoiding smoking would improve health. However, the respondents indicated that they disagreed with having very little control over their health in general. Furthermore, in terms of attitudes towards fat diet, salt diet, and sugar diet Table 3.19 shows that the mean scores for level of agreement with avoiding such diets were relatively high, namely, 2.951, 2.855, and 2.836, respectively. This means that they agreed that avoiding high amounts of those ingredients when purchasing food would improve their health or family's health. Furthermore, the respondents also agreed that reading nutrition labels was useful and reading food labels made it easier to choose foods.

Table 3.19 Average level of agreement (0 = strongly disagree and 4 = strongly agree) with statements about diet and nutrition attitudes and behavior

Variable Name	Description	Mean	Std. Dev.	N
Healthy attitude	Concerned about whether or not the product is healthy	3.33	0.59	1180
Increased risk attitude	Consuming some foods can increase the risk of developing certain diseases	2.92	0.98	1180
Decreased risk attitude	Consumption of certain foods can decrease the risk of certain diseases	2.76	0.88	1180
Diet attitude	Diet and nutrition play a major role in my health and the health of my family	3.30	0.65	1180
Control over health attitude	I have very little control over my health	0.87	0.97	1180
Exercise attitude	Regular exercise would improve health or the health of family members	3.28	0.62	1180
Smoking behaviour	Avoiding smoking would improve my health or the health of family members	3.36	0.73	1180
Maintaining good health	To maintain good health it is important to eat a wide variety of food products	2.77	0.94	1180
Fat diet behaviour	I avoid purchasing food containing high amounts of fat or cholesterol	2.95	0.82	1180
Salt diet behaviour	I avoid purchasing food containing high amounts of salt	2.86	0.79	1180
Sugar diet behaviour	I avoid purchasing food & drinks with high amounts of sugar	2.84	0.86	1180
Recommendations label	There are so many recommendations about healthy ways to eat that I do not know what to do.	2.05	0.95	1180
Nutrition label	The nutrition information on food labels is useful to me.	2.87	0.84	1180
Knowledge of labels	I feel confident that I know how to use food labels	2.63	0.85	1180
Read label	Reading food labels makes it easier to choose foods	2.81	0.87	1180
Try new food	Sometimes I try new foods because of the information on food labels	2.25	0.99	1180

With respect to food concerns, Table 3.20 presents the descriptive statistics for the level of agreement with food concerns. The mean level of agreements to statements tend to suggest that most respondents appear to be concerned about food safety, nutrition, use of pesticide, use of additives, contamination of food, and heavy metals or toxic chemicals in

food, having access to enough food, and the accuracy of halal certification. However, the respondents were not highly concerned about imported products.

Table 3.20 Mean level of agreement with statements regarding food concerns (0=strongly disagree and 4=strongly agree)

Variable Name	Description	Mean	Std. Dev.	N
Access concern	Concerned about having enough food available (adequate access to food and /or affording food)	2.97	0.69	1180
Safety concern	Concerned about the safety of food	3.29	0.57	1180
Nutrition concern	Concerned about the nutritional content of food	3.15	0.62	1180
Pesticides concern	Concerned about the use of pesticides to produce food	2.94	0.81	1180
Additives concern	Concerned about the use of additives, preservatives and artificial colours in food	3.04	0.85	1180
Contamination concern	Concerned about bacterial contamination of food	2.94	0.81	1180
Toxic concern	Concerned about heavy metals or toxic chemicals in food	2.96	0.86	1180
Accuracy concern	Concerned about the accuracy of information on food labels and food displays	2.73	0.83	1180
Halals concern	Concerned about the accuracy of information regarding halals certification	3.16	0.75	1180
Imported concern	Concerned about food imported from outside Indonesia	1.98	1.07	1180
Storage concern	Concerned that the food was not stored properly (not kept refrigerated)	2.43	0.99	1180

3.4.8 Household diet-related health concerns and management

This study also included some questions regarding diet-related health and management. The first question addressed respondents' concerns about different diseases and how they may affect them or their family (obesity, diabetes, high blood pressure, heart disease, and cancer), which required respondents to point to a level of agreement with a response scale ranging from "not at all concerned =1" to "extremely concerned =5". Question two addressed health history (yes/no responses) and questions 3 and 4 addressed the duration of time watching television for adults and children in the household. Questions 5 and 6 addressed the time spent exercising by adults and children. A summary of the descriptive statistics for diet related health and management are presented in Tables 3.21, 3.22 and 3.23.

Table 3.21 provides the descriptive statistics for level of agreement with disease concerns. About 28% of the respondents indicated that they were extremely concerned about either themselves or a family member becoming obese or overweight. Approximately 42% of the respondents reported that they were extremely concerned about diabetes. Over 40% of the respondents indicated that they were extremely concerned about high blood pressure and heart disease. Less than 10% of the respondents indicated that they were only a little or not at all concerned about these diseases.

Table 3.22 provides the history of respondents' health in relation to different diseases that medical professionals had diagnosed in any member of households. About 10%, 9%, 29%, and 9% of the respondents indicated a member of their household had been diagnosed as being obese, having diabetes, having high blood pressure, or having heart disease, respectively. Only 2% of the respondents reported that a member of their household had been diagnosed with some type of cancer.

Table 3.21 Respondents' concerns about various diet-related diseases

Variable Name	Description	Percentage	N
Obesity concern	On a scale of 1 to 5, how concerned are you that obesity or overweight may affect you or your family		1180
	0=Not at all or do not know	0.00	
	1=Little	10.46	
	2=Moderately	11.65	
	3=Concerned	50.64	
	4=Extremely	27.25	
Diabetes concern	On a scale of 1 to 5, how concerned are you that diabetes may affect you or your family		1180
	0=Not at all or do not know	2.34	
	1=Little	3.51	
	2=Moderately	7.91	
	3=Concerned	44.98	
	4=Extremely	41.26	
High blood pressure concern	On a scale of 1 to 5, how concerned are you that high blood pressure may affect you or your family		1180
	0=Not at all or do not know	1.90	
	1=Little	4.46	
	2=Moderately	6.01	
	3=Concerned	46.88	
	4=Extremely	40.75	
Heart disease concern	On a scale of 1 to 5, how concerned are you that heart disease may affect you or your family		1180
	0=Not at all or do not know	2.21	
	1=Little	5.60	
	2=Moderately	6.93	
	3=Concerned	43.32	
	4=Extremely	41.94	
Cancer concern	On a scale of 1 to 5, how concerned are you that cancer may affect you or your family		1180
	0=Not at all or do not know	2.21	
	1=Little	5.60	
	2=Moderately	6.93	
	3=Concerned	43.32	
	4=Extremely	41.94	

Table 3.22 Household family health history

Variable Name	Description	Percentage	N
Obesity	Any members of the household diagnosed by a medical professional as having obesity or being overweight		1180
	1=Yes	10.44	
	0=No	89.56	
Diabetes	Any members of the household diagnosed by a medical professional as having diabetes		1180
	1=Yes	9.38	
	0=No	90.62	
High blood pressure	Any members of the household diagnosed by a medical professional as having high blood pressure		1180
	1=Yes	29.20	
	0=No	70.80	
Heart disease	Any members of the household diagnosed by a medical professional as having heart disease		1180
	1=Yes	8.52	
	0=No	91.48	
Cancer	Any members of the household diagnosed by a medical professional as having cancer		1180
	1=Yes	1.87	
	0=No	98.13	

Table 3.23 shows the amount of time adults and children in the household spent watching television and the number of hours per week that each adult and child exercised. The mean time spent watching television for adults and children was 3.5 hours and 3.4 hours per day, respectively. The mean time spent exercising for adults was only 2.2 hours per week, compared to children who exercised 9.9 hours per week. Table 23 shows that 54% of the households had a member that smoked cigarettes daily.

Table 3.23 Descriptive statistics for duration of time spent watching television and exercising

Variable Name	Description	Hours	N
Watch TV Adult	The number of hours per day adults (18 and over) in your household spend watching TV, videos, or are on the internet for entertainment	3.51	1179
Watch TV Children	The number of hours per day children (5-17 years) in your household spend watching TV, videos, or are on the internet	3.37	742
Exercise Adult	The number of hours per week each ADULT in the household does exercise (e.g. sports, bike riding)	2.11	1179
Exercise Child	The number of hours per week each CHILD in the household does exercise (e.g. sports, physical education at school, bike riding, playing outside)	9.92	829
Smoking	Member of the household smoking cigarettes daily		1180
	1=Yes	54.32	
	0=No	45.68	

3.4.9 Household changes in health status and standard of living

Table 3.24 presents descriptive statistics summarising changes in household health status and standard of living over the last five years. Roughly 58% of the respondents said their households' health status had not changed over the past five years, but 22% of the households said the health status of their households had improved. When the respondents were asked what was the primary reason for their health status changed, 39% of the respondents answered because of a change in their lifestyle. On the other hand, 8% of the respondents answered due to household member's disease.

In terms of change in subjective standard of living[11], 37% of the respondents indicated that their standard of living had not changed over the last five years, while 15% of the respondents' standard of living had deteriorated somewhat. Only 3% of the respondents

[11] This is the respondent's opinion or perception of changes in standard of living. In the analysis, two measures of living standard are utilized: per capita consumption expenditures and per capita net income.

reported their standard of living had deteriorated significantly. Most of the respondents indicated that household member(s) earning more/less from the same job(s) was the main reason for the change in their standard of living.

3.5 Summary

This chapter provided a summary of the household and individual data used in subsequent chapters of this thesis. In total 1180 households from three cities, Surabaya, Bogor, and Surakarta, were interviewed and provided data used in this study. The sample was selected using systematic random sampling after stratifying by income and distance to the nearest hypermarket or supermarket.

Although the primary aim of this chapter was to provide the reader with a general overview of the data used in the following analytical chapters, the summaries highlighted several interesting points of discussion with respect to socio-demographics, household food shopping and consumption behaviour as well dietary patterns.

First, the data showed that a significant proportion of female respondents are employed in the labour market. This suggests that demand for food with shorter preparation time is likely to increase and this also is likely to impact consumer food shopping and consumption behaviour as well as dietary patterns.

Second, the data presented that small shops and wet markets were used most frequently on a daily basis while modern markets were used primarily on a monthly basis. Wet markets are generally the main source for purchasing fresh foods, with the exception of fresh dairy products, while, small shops and modern markets are the main sources for processed foods.

Third, the data showed that the majority of respondents believed traditional food retailers and markets offered some advantages to modern outlets, particularly, wet markets

were believed to offer food at low prices, semi-permanent stands, traditional small shops and peddlers were considered to be relatively easy to access physically. However, some of these same characteristics were associated with modern food retail outlets. Nearly 28% of the respondents believed that supermarkets offered low prices and mini-markets were considered easy to access by 48% of the respondents. Hypermarkets and supermarkets were considered to be an outlet providing a wide variety of food products by 28% and 23% of the respondents. This implies that if the traditional markets can maintain their ability to be competitive on price, then they may be able to maintain a place in the market alongside modern retail outlets. However, on some aspects, such as convenience, minimarkets may become serious competitors for traditional markets.

Fourth, the consumption data indicated that on average, households' per capita rice consumption is increasing over time. This could be because household income was relatively low so increases in standard of living are leading to increasing demand for normal staples such as rice. Interestingly, the data also suggested that consumption of eggs, breads and cereals, oils, dairy products, sugar, and sweets was increasing for the majority over households. Yet vegetable and fruit consumption was decreasing over time. Furthermore, the food expenditure data indicated that meals-away-from home and processed food account for a large share of the income spent on food. Finally, considering respondents' level of agreement with a number of attitudinal statements, it appears that there is generally a high degree of concern about diet and nutrition, and food safety. The implications of food shopping and consumption behaviour, dietary concerns and attitudes about food quality and safety will be further analysed in Chapters 4 to 6.

Chapter 4: Indonesian Consumers' Choice of Food Retail Formats: Are Traditional Food Retailers being Crowded Out?

4.1 Introduction

In Indonesia, modern food retailers, which include hypermarkets, supermarkets and mini-markets, have been gaining an increasing share of the food retail market during the past two decades. Initially, modern food retailers focused mainly on servicing the needs of upper-class consumers and expatriates in major cities and were mainly domestically owned and managed. This situation changed dramatically after the Indonesian government signed a Letter of Intent (LoI)[12] in 1998 with the International Monetary Fund (IMF), which allowed Foreign Direct Investment (FDI) in food wholesaling and retailing (Natawidjaja et al. 2007). Modern food outlets began to spread rapidly, expanding their target market from high-income households in urban locations to middle- and lower-income households in suburban and rural areas (Nielsen 2007; Suryadarma et al. 2010).

Patterns of supermarket diffusion in Indonesia are generally similar to what researchers have found in other areas of Southeast Asia, for example Thailand (Reardon, Henson & Gulati 2010; Reardon et al. 2003; Reardon, Timmer & Minten 2012; Roslin & Melewar 2008; Schipmann & Qaim 2011a). For example, similar to the pattern of supermarket diffusion in Thailand, in Indonesia, supermarkets initially sold primary processed and staple food items (World Bank 2007). However, modern food retailers now also offer fresh food produce, including fruit, vegetables, meat, poultry, and seafood. Hence, as Schipmann and Qaim (2011a) suggest, this strategy is likely to increase competition between modern and traditional outlet formats over time, particularly if modern retailers

[12] Letter of Intent (LoI) represents the policies Indonesia that intends to implement in the context of its request for financial support from the IMF. The financial support is needed to overcome financial crisis in 1997 in Indonesia.

are able to compete with traditional retailers on product attributes such as low price and higher quality.

Modern food retailers are owned by both domestic and multinational companies such as France's *Carrefour* and Malaysia's *Giant* (Natawidjaja et al. 2007; Rangkuti & Slette 2010). In fact, in 2008 75% of the hypermarkets in Indonesia were owned by multinational companies, while only around 25% were owned by domestic companies (Rangkuti & Slette 2010).

FDI in food retailing by multinationals has led to the development of modern supermarkets, as well as other modern formats such as convenience stores/minimarkets and hypermarkets. The diversification of formats is in response to unique consumer needs (Reardon, Henson & Berdegué 2007; Reardon, Henson & Gulati 2010). For example, to expand market share city centre locations where population density is high and where available land is limited, PT *Hero* (owned by Dairy Farm Group of Hong Kong established mini-markets). On the other hand, in order to reach a large consumer base in peri-urban and suburban areas where transportation access is available, *Carrefour* uses hypermarkets. These firms have attempted to compete with traditional food retailers by offering food products that are sold at lower or competitive prices, and assuring customers that products are higher quality and/or safer than products sold at other outlets. Additionally, modern outlets focus on other attributes that may be of interest to consumers, such as increased convenience, more variety (e.g. both domestic and imported produce), and a high level of customer service. Thus, modern food retailing in Indonesia has evolved from focusing only on a small, high-income, niche market to addressing the food needs of a larger share of the Indonesian population through a variety of modern retail formats (Suryadarma et al. 2010).

The penetration and diversification strategies of modern food retailers in Indonesia have resulted in ongoing concerns among scholars, government officials and policymakers,

that supermarket growth may have negative impacts on the Indonesian food supply chain. There is also a fear that undesirable social consequences will occur if traditional food retailers are crowded out of the market. In particular, researchers have suggested that if traditional food retailers are crowded out of the market, smallholder farmers will lose market access resulting in income loss (Chowdhury, Gulati & Gumbira-Sa'id 2005; Suryadarma et al. 2010). Additionally, there is concern that consumers' access to fresh, affordable produce will decrease if traditional markets or domestic smallholder farmers are "crowded out of the market". If fresh food is less affordable, diet quality may be adversely affected. For example, changes in price and availability in modern retail outlets may reduce the consumption of fresh fruit and vegetables while increasing that of highly processed food (Hawkes 2008).

Several previous studies have investigated the impact of modern food retail penetration on consumer food outlet choice, especially on traditional food retailers in Asia (Goldman & Hino 2005; Gorton, Sauer & Supatpongkul 2011; Maruyama & Trung 2007). However, these studies have focused only on supermarkets and wet markets. As Oghojafor, Ladipo, and Nwagwu (2012) suggest, most of the previous studies did not consider all possible sources of competition across retail formats that exist in developing countries. For example, Suryadarma et al. (2010) found that peddlers compete with traditional wet markets for market share. In addition, most of the previous research was based on small non-representative samples of consumers. For example, Gorton, Sauer, and Supatpongkul (2011) interviewed only 200 consumers in two cities (Bangkok and Chachoengsao) in Thailand.

The research presented in this chapter focuses on understanding consumers' use of several food retail formats, which exist in Indonesia: hypermarkets, supermarkets, minimarkets, semi-permanent stands, wet markets, and peddlers. This study is based on a

large[13] sample of urban households (1180 households) randomly selected from three cities in Indonesia, Surabaya, Bogor and Surakarta, that represent large, medium, and small cities, respectively.

The objectives of this chapter are: (1) to provide information on the food shopping patterns of urban Indonesian consumers in order to understand how they use various modern (hypermarkets, supermarkets and mini-markets) and traditional (semi-permanent stands, wet markets, small shops and peddlers) retail outlet formats; (2) to explore consumers' perceptions of each retail format in various dimensions (e.g., value of products, quality, safety and trustworthiness of information); and (3) to determine the factors which help explain consumers' shopping behaviour with respect to frequency of shopping for food at modern and traditional retail outlet formats. This information is important for understanding the likely implications of modern retail penetration on Indonesian food systems, including the role of traditional wet markets as a source of food and the role of government in regulating food quality and food safety.

Multivariate probit analysis is used to accommodate the potential cross-choice correlations, which may exist for the same consumers. This issue has been neglected by most of the previous studies in this area. The remaining sections of the paper include an overview of the data and methods used to address the main objectives, and the main findings of the research as well as its policy implications.

[13] Previous study by Gorton, Sauer, and Supatpongkul (2011); Maruyama and Trung 2007 only used samples less than 500 samples.

4.2 Data and Methods

4.2.1 Data from the Indonesian survey of urban consumers

The analysis in this chapter uses data from the Indonesian Survey of Urban Consumers conducted from November 2010 to February 2011. The sample consisted of 1,180 households from three cities: Surabaya, Bogor and Surakarta. These cities and households were selected using systemic random sampling methods based on population, income and distance to the nearest hypermarket or supermarket. The surveys were conducted via face-to face interviews with the person responsible for purchasing food for the household using a structured questionnaire.

The survey instrument was developed after reviewing the relevant literature, interviewing key informants from government, food wholesalers and food retailers, and completing three focus groups in each of the cities. The survey assessed respondents' frequency of shopping for food at the seven retail formats (modern and traditional outlets) considered, as well as distance and travel time to each retail format. Information was gathered on respondents' attitudes regarding the quality, safety, value and trustworthiness of products sold at each retail format and the most important attributes when purchasing various categories of food products. Additional information was obtained regarding the household's frequency of using each retail format for purchasing an extensive list of food products, as well as household members' health status and in-depth socio-demographic information.

4.2.2 Empirical model

Only a few studies (Bai, Wahl & McCluskey 2008; Madhavan-Nambiar et al. 2015; Manchanda, Ansari & Gupta 1999) have used multivariate probit analysis as a method to examine consumers' format retail choice. Rather, most of the previous work focused on

two retail formats (Goldman & Hino 2005; Gorton, Sauer & Supatpongkul 2011; Maruyama & Trung 2007) and used univariate probit/logit models (Goldman & Hino 2005; Maruyama & Trung 2007; Maruyama & Wu 2014; Sinha & Banerjee 2004; Terano et al. 2015) to explore consumers' frequency of using food retail formats.

The main weakness of previous studies is their failure to accommodate the fact that most urban households in developing countries use more than one type of retail format (Maruyama & Wu 2014) for purchasing food. In addition, most of the previous studies used univariate probit/logit models that did not accommodate the potential cross-choice correlations across the various retail formats that are likely to exist for individual households. Therefore, unlike previous studies, this research does not aggregate retail formats into two categories, i.e. modern retail outlets or traditional retail outlets only, rather I consider shopping behaviour at seven different types of retail formats. As Fox, Montgomery, and Lodish (2004) suggest, disaggregation of outlet type may allow researchers to better capture households' shopping behaviour across multiple retail formats in food markets. As a result, the multivariate probit model was chosen to accommodate the potential cross-choice correlations that may exist when attempting to explain individual households' use of various retail formats. This correlation is unobserved or essentially ignored by univariate probit models. Yet, due to unobserved characteristics such as consumer attitudes, lifestyle, and cultural background, food retail format choices can be related through error terms. Therefore, use of a multivariate probit model eliminates the potential loss of cross-retail outlet information.

To begin to shed light on the factors that help explain consumers' use of food retail formats I consider the following empirical model. First, households located in the urban Indonesian cities I sampled have a variety of outlets to choose from (j = hypermarkets, supermarkets, minimarkets, semi-permanent stands, small shops, wet markets and

peddlers). Consumers' decisions to use each type of retail format are characterized by the following multivariate probit model (Greene 2011):

$$y_{ij}^{*} = x_i'\beta_{ij} + \varepsilon_{ij} \quad (i = 1,2,\dots N;\ j = 1,2,\dots,7) \qquad (4.1)$$

$$y_{ij} = 1 \; if \; y_{ij}^{*} > 0, and \; 0 \text{ otherwise}$$

$$E\left[\varepsilon_j | x_1,\dots,x_7\right] = 0, \quad Var\left[\varepsilon_j | x_1,\dots,x_7\right] = 1$$

$$Cov\left[\varepsilon_j, | x_1,\dots,x_7\right] = 1, \quad \left(\varepsilon_1,\dots,\varepsilon_7\right) \sim N_j[0,R]$$

Where $\boldsymbol{y_{ij}^{*}}$ is an unobservable latent variable denoting the *i*th consumers' decision to use the *j*th food outlets for purchasing food. Since $\boldsymbol{y_{ij}^{*}}$ cannot be observed, it can be empirically specified to be 0 for *i*th shopper never visiting the *j*th outlet, and 1 for the shopper visiting the *j*th outlet at least monthly. Meanwhile, $\boldsymbol{x_i'}$ and $\boldsymbol{\beta_{ij}}$ are $kx1$ column vectors. The matrix column $\boldsymbol{x_i'}$ contains variables which represent consumer and household characteristics.

Consumer characteristics considered in the model are the respondent's gender, age, and education, whether the respondent was employed outside of the household, and household income (where household expenditures are used as a proxy for household income). These are variables that previous researchers, e.g. Neven et al. (2006), Gorton, Sauer, and Supatpongkul (2011) and Maruyama and Wu (2014) found to be significant in their models of consumer food retail format choice. I also include variables that may influence a household's ability to access certain types of markets, including: relevant household assets (ownership of a car, refrigerator and credit card), and time to get different types of retail outlets; as well as variables representing consumers' attitudes and concerns regarding food safety and nutrition, and the usefulness of food labels. Finally, I included variables to represent consumers' responses when asked to indicate the importance of store attributes related to product quality, providing trustworthy information, service,

convenience and value for money. Previous studies found these variables influenced consumers' decision to use a particular type of food retail outlet (Goldman & Hino 2005; Gorton, Sauer & Supatpongkul 2011; Maruyama & Wu 2014). $\boldsymbol{\beta_{ij}}$ represents the parameters to be estimated, and $\boldsymbol{\varepsilon_{ij}}$, j = 1,…,7 are error terms which jointly follow a multivariate normal distribution, $(\boldsymbol{\varepsilon_1}, \dots, \boldsymbol{\varepsilon_7}) \sim \boldsymbol{N_j}[\mathbf{0}, \boldsymbol{R}]$, The variance-covariance matrix, R, is below:

$$\boldsymbol{R} = \begin{bmatrix} \mathbf{1} & \boldsymbol{\rho_{12}} & \boldsymbol{\rho_{13}} & \boldsymbol{\rho_{14}} & \boldsymbol{\rho_{15}} & \boldsymbol{\rho_{16}} & \boldsymbol{\rho_{17}} \\ \boldsymbol{\rho_{21}} & \mathbf{1} & \boldsymbol{\rho_{23}} & \boldsymbol{\rho_{24}} & \boldsymbol{\rho_{25}} & \boldsymbol{\rho_{26}} & \boldsymbol{\rho_{27}} \\ \boldsymbol{\rho_{31}} & \boldsymbol{\rho_{32}} & \mathbf{1} & \boldsymbol{\rho_{34}} & \boldsymbol{\rho_{35}} & \boldsymbol{\rho_{36}} & \rho_{37} \\ \boldsymbol{\rho_{41}} & \boldsymbol{\rho_{42}} & \boldsymbol{\rho_{43}} & \mathbf{1} & \boldsymbol{\rho_{45}} & \boldsymbol{\rho_{46}} & \boldsymbol{\rho_{47}} \\ \boldsymbol{\rho_{51}} & \boldsymbol{\rho_{52}} & \boldsymbol{\rho_{53}} & \boldsymbol{\rho_{54}} & \mathbf{1} & \boldsymbol{\rho_{56}} & \boldsymbol{\rho_{57}} \\ \boldsymbol{\rho_{61}} & \boldsymbol{\rho_{62}} & \boldsymbol{\rho_{63}} & \boldsymbol{\rho_{64}} & \boldsymbol{\rho_{65}} & \mathbf{1} & \boldsymbol{\rho_{67}} \\ \boldsymbol{\rho_{71}} & \boldsymbol{\rho_{72}} & \boldsymbol{\rho_{73}} & \boldsymbol{\rho_{74}} & \boldsymbol{\rho_{75}} & \boldsymbol{\rho_{76}} & \mathbf{1} \end{bmatrix} \quad \text{.....(4.2)}$$

where $\boldsymbol{\rho_{ij}}$ is the correlation of $\boldsymbol{\varepsilon_{ij}}$ and $\boldsymbol{\varepsilon_{jk}}(\boldsymbol{j}, \boldsymbol{k} = \mathbf{1}, .., \mathbf{7}; \boldsymbol{j} \neq \boldsymbol{k})$. Under these assumptions, equation (4.1) gives a multivariate probit model that can be used to jointly estimate consumers' use of all seven types of food retail formats. The multivariate probit model can be estimated by maximizing the log-likelihood function as shown by Cappellari and Jenkins 2003:

$$\boldsymbol{L} = \sum_{\boldsymbol{i}=\mathbf{1}}^{\boldsymbol{N}} \boldsymbol{w_i log \Phi_j}(\boldsymbol{\mu_i}; \boldsymbol{\Omega}) \quad \text{.....(4.3)}$$

where $\boldsymbol{w_i}$ is optional weight for sample $\boldsymbol{i} = \mathbf{1}, \dots, \boldsymbol{N}$, and $\boldsymbol{\Phi_j}$ (.) is *J*-variate standard normal distribution with arguments $\boldsymbol{\mu_i}$ and $\boldsymbol{\Omega}$, where:

$$\boldsymbol{\mu_i} = (\boldsymbol{K_{i1} x'_{i1} \beta_1}, \dots, \boldsymbol{K_{i71} x'_{i7}} \beta_7)$$

and where $\boldsymbol{K_{ik}} = \mathbf{2}\boldsymbol{y_{ij}} - \mathbf{1}$, for each $\boldsymbol{i}, \boldsymbol{k} = \mathbf{1}, \dots, \mathbf{7}$. Matrix $\boldsymbol{\Omega}$ has component element $\boldsymbol{\Omega_{jk}}$, where

$$\Omega_{jk} = 1 \text{ for } j = k \text{ and } \Omega_{jk} = \Omega_{kj} = K_{ij} K_{ik} \rho_{jk} \text{ for } j \neq k, \quad j, k = 1, \dots, 7$$

The simulation method for evaluating the multivariate normal distribution function is Geweke-Hajivassiliou-Keane (GHK) smooth recursive conditioning simulator. As suggested by Cappellari and Jenkins (2003) this approach to calculating the multivariate normal distribution gives results that are relatively efficient.

A factor analysis, specifically principle component analysis with varimax rotation was used to reduce the number of variables considered in the estimation, particularly those that may be highly correlated. Only factors having Eigen values above 1 were extracted and those with factor loadings above 0.5 were subsequently retained. The Kaiser-Meyer-Olkin measure of sampling adequacy was used to examine the appropriateness of factor analysis. Cronbach's alpha is used to test for internal consistency or reliability of scales for outlet attributes.

4.2.3 Analytical methods

The primary purpose of this research is to explore whether socio-demographic characteristics, consumer attitudes towards food and nutrition, and consumer perceptions of retail format types help to explain Indonesian households' use of seven types of retail formats.

The following equation (4.4) was used to estimate the multivariate probit regression:

$$\text{Use of Outlet}_{ij} = f(\text{Resp\_female, Resp\_age, Resp\_edu, Resp\_work, Child0to5, Child6to12, D\_employee, Percap2, Percap3, Percap4 Percap5, Car\_motor, Refrigerator, Credit\_card, Timemodern, Timeminimkt, Timewetmkt, Surabaya, Bogor, Safety, Label, Nutrition, Riskaverse, Service, Convenience, Price sensitive}) \quad (4.4)$$

Tables 4.1 and 4.2 provide definitions and summary statistics for each of the variables used in the analysis. The dependent variables in the multivariate probit model represent

whether or not the household *i* used outlet *j* (where *j* = hypermarkets, supermarkets, minimarkets, semi-permanent stands, small shops, traditional wet markets, peddlers), to purchase food at least once per month.

Resp_female is a dummy variable equal to one if the respondent is female. The sign of the coefficient on this variable was expected to be positive for both modern and traditional food retailers because women are primarily responsible for shopping for food for their households. *Resp_age* is a continuous variable representing the age of the respondent. It was expected to be negative for all types of modern food retailers and positive for traditional food retailers as Li and Houston (2001) have suggested. *Resp_edu* is a continuous variable representing years of education completed by the respondent. This variable was expected to be positive for modern food retail models, and negative for traditional retailers as indicated in the results of studies by Li and Houston (2001), Shiu and Dawson (2001), Zang (2002), D'Haese, Van den Berg, and Speelman (2008), and Neven et al. (2006), which found that higher educated consumers are more likely to shop at modern retail outlets.

Resp_work is a dummy variable equal to one if a respondent works outside the household. The sign of this coefficient was also expected to be negative for modern food retailers and positive for traditional food retailers. Respondents who work outside the household usually prepare and cook food for their families early in the morning. In Indonesia, modern food retail outlets, particularly hypermarkets and supermarkets open relatively later in the morning, whereas traditional food retail outlets are generally open very early in the morning (i.e. before 8 a.m.).

Child0to5 and *Child6to12* are dummy variables equal to one if a household has children up to 5 years of age and two if children in the household are between 6 to 12 years of age, respectively. The coefficient for *Child0to5* and *Child6to12* was expected to be

positive for modern food retail outlets because these outlets tend to carry certain products such as infant formula and dairy products, which may be more frequently purchased by households with younger children.

D_employee is a dummy variable equal to one if a household has a domestic employee. It was expected to carry a positive coefficient since the presence of domestic employees provides the head of the household with more free time. Consequently, they will have more time shopping if they chose to do so (Goldman, Ramaswami & Krider 2002).

Percap2, *Percap3*, *Percap4* and *Percap5* are dummy variables equal to one if a household is in the second-quintile, the third-quintile, the fourth-quintile, the fifth-quintile for expenditure per capita, respectively. The coefficient of these variables was expected to be positive for modern food retailers and negative for traditional food retailers because previous literature suggests that higher-income consumers are more likely to shop at modern food retail outlets rather than traditional outlets (Narayan, Rao & Sudhir 2012).

Car_motor, *Refrigerator*, and *Credit_card* are binary variables and can be considered measures of affluence and also represent having improved access to modern retail outlets. It was expected that the coefficient of these variables would be positive for specific modern food retailers (hypermarkets and supermarkets) and negative for traditional food retail outlets. Households that own a refrigerator may be more likely to purchase food at hypermarkets and supermarkets where products are often sold in bulk packages. Having a car may improve access to supermarkets and hypermarkets as these shops are generally farther and less accessible than local shops such as warungs and semi-permanent stands. Consumers who have a credit card and want to use it would only be able to do so at modern food retail outlets as they are more likely to accept credit cards. The expected sign of these variables is based on previous studies (Bai, Wahl & McCluskey 2008; Farhangmehr, Marques & Silva 2001; Neven et al. 2006; Rodriguez et al. 2002).

Timemodern, *Timeminimkt*, and *Timewetmkt* are continuous variables for the time needed to get to the nearest hypermarket/supermarket, minimarket or traditional wet market, respectively. The coefficient of the variable of *Timemodern* was expected to be negative for both hypermarkets and supermarkets and positive for traditional outlet formats, as shopping cost at a particular retail outlet is not just about the price of the product, but also about the cost to travel to the nearest store. Therefore, consumers generally prefer to shop at a closer store (Arnold, Oum & Tigert 1983; Bell & Lattin 1998; Hino 2014).

Surabaya and *Bogor* are dummy variables equal to one if the respondent lives in Surabaya city or Bogor city. The coefficients of both variables were expected to be positive for the modern outlet formats since households in metropolitan areas such as Surabaya city and Bogor city tend to have higher standards of living. In addition, access to public transport is better and distance to modern food retailers is closer in those cities than in Surakarta. Therefore, it would be expected that people who live in those cities would be more likely to shop at modern food retailers.

The variable *Safety* is a dummy variable equal to one if the respondent indicated that safety is the most or second-most factor influencing their food purchase decisions. It was expected that the coefficient of this variable would be positive for modern food retailers as focus groups suggested that one reason for using modern retail outlets was that they believed the outlet offered additional food safety assurances. The variables *Label* and *Nutrition* are factor scores representing consumers' attitudes to label use and concerns about fat, cholesterol, salt and sugar in food, respectively. It was expected that the coefficient of the *Label* and *Nutrition* variable would be positive for modern food retailers since modern food retailers are more likely to carry products with labels and products which provide information about origin, brand and also nutrition information. However,

the coefficient on *Nutrition* could also be positive for wet markets if nutrition concerned respondents are knowledgeable about the importance of consuming fresh fruits and vegetables.

The variable of *Riskaverse* is a factor score representing the relative importance respondents placed on food outlet attributes related to providing food products that are high quality, safe, fresh and also provide truthful information. The sign of the *Riskaverse* variable is indeterminate. Consumers who prefer fresh food may tend to shop at traditional food retailers. On the other hand, consumers who are concerned about food quality and safety and trusted information are more likely to shop at modern food retailers (Maruyama & Trung 2007; Rodriguez et al. 2002). *Service* is a factor score representing the variable of outlet attributes as follows: fast service, a clean shopping environment and friendly staff. The expected sign of this variable was indeterminate, as a consumer who thinks that cleanliness is the most important attribute when deciding where to purchase food are likely to prefer to purchase food at modern markets. On the other hand, a consumer who thinks that fast service and friendliness are the most important attributes may be more likely to purchase food at traditional food retailers.

The variable of *Convenience* is also a factor score representing the importance of outlet attributes including: close to non-food shops, close to entertainment, having air conditioning, and offering a delivery service. These are characteristics mostly associated with modern retail outlets, thus the sign for this variable was expected to be positive for both hypermarket and supermarket outlet formats and negative for all traditional formats. The variable of *Price sensitive* is a factor score representing the importance respondents placed on the following retail outlet characteristics: low price, flexible price and discount prices. The coefficient of this variable was expected to be positive for traditional food

retailers and negative for modern food retailers because traditional markets are more likely to offer lower and negotiable prices (Maruyama & Trung 2007).

4.3 Results and Discussion

As mentioned earlier, Tables 4.1 and 4.2 provide the descriptive statistics for each of the dependent and independent variables used in the multivariate probit model. Tables 4.1 and 4.3 show that even though over one-half of households shop at hypermarkets (55%) and supermarkets (54%) at least monthly, there is still a large share of households that never use these retail formats for food purchases. On the other hand, nearly all households use small shops (98%) and wet markets (96%) to shop for food at least once per month.

Table 4.1 Descriptive statistics for dependent variable in the multivariate probit (N=1180)

Variable	Descriptions	Mean	Std. Dev.	Min	Max
Hypermarkets	1=Respondent indicated that he/she visited a hypermarket at least once a month to shop for food; 0=Otherwise	0.36	0.48	0	1
Supermarkets	1= Respondent indicated that he/she visited a supermarket at least once a month to shop for food; 0=Otherwise	0.35	0.48	0	1
Minimarkets	1= Respondent indicated that he/she visited a minimarket at least once a month to shop for food; 0=Otherwise	0.62	0.49	0	1
Semi-permanent stands	1= Respondent indicated that he/she visited to a semi-permanent stand at least once a month; to shop for food; 0=Otherwise	0.67	0.47	0	1
Small shops	1= Respondent indicated that he/she visited a small shop at least once a month to shop for food; 0=Otherwise	0.97	0.17	0	1
Wet markets	1= Respondent indicated that he/she visited a wet market at least once a month to shop for food; 0=Otherwise	0.83	0.37	0	1
Peddlers	1= Respondent indicated that he/she visited a peddler at least once a month to shop for food; 0=Otherwise	0.84	0.37	0	1

Table 4.2 Descriptive statistics for independent variables in multivariate probit (N=1180)

Variable	Descriptions	Mean	Std. Dev.	Min	Max
Resp_female	Sex of respondent (0=Male; 1=Female)	0.89	0.32	0	1
Resp_age	Age in years of respondent	43.02	12.4	15	83
Resp_edu	Years of education completed by respondent	9.35	4.52	0	22
Resp_work	1=Respondent works outside home; 0=Otherwise	0.49	0.5	0	1
Child0to5	1=Yes, household has children 5 or younger; 0=Otherwise	0.34	0.47	0	1
Child6to12	1=Yes, household has children between the ages of 6 and 12; 0=Otherwise	0.42	0.49	0	1
D_employee	1=Household has a domestic employee; 0=Otherwise	0.08	0.28	0	1
Percap2	1=Household in the second-quintile expenditure; 0=Otherwise	0.24	0.43	0	1
Percap3	1=Household in the third-quintile expenditure; 0=Otherwise	0.22	0.41	0	1
Percap4	1=Household in the fourth-quintile expenditure; 0=Otherwise	0.18	0.39	0	1
Percap5	1=Household in the fifth-quintile expenditure; 0=Otherwise	0.11	0.31	0	1
Car_motor	1=Household owns at least 1 car or motorbike; 0=Otherwise	0.73	0.44	0	1
Refrigerator	1=Own at least 1 refrigerator; 0=Otherwise	0.64	0.48	0	1
Creditcard	1=Own at least 1 credit card; 0=Otherwise	0.11	0.31	0	1
Timemodern	Time needed to get to the nearest hypermarket or supermarket (Minutes)	18.98	10.45	1.5	120
Timeminimkt	Time needed to get to the nearest mini-market (Minutes)	8.75	6.21	0	153
Timewetmkt	Time needed to get to the nearest wet market (Minutes)	13.49	10.7	1	60
Surabaya	1=Surabaya, a large city; 0=Otherwise	0.61	0.49	0	1
Bogor	1=Bogor, a medium-sized city; 0=Otherwise	0.21	0.41	0	1
Safety	1=Respondent indicated that safety was the first or second most important factor influencing their food purchasing decisions; 0=Otherwise	0.13	0.41	0	1
Label	Factor score representing level of concern about food labels, knowing how to use label, read label	-0.07	1.06	-4.94	2.42
Nutrition	Factor score representing level of concern about fat, cholesterol, salt and sugar in food	-0.07	0.95	-4.4	2.26
Riskaverse	Factor score representing the level of importance placed on outlet attributes: high quality, safe food, freshness and product information	-0.14	1.03	-4.19	2.34
Service	Factor score representing the level of importance placed on outlet attributes: fast service, cleanliness and friendly staff	-0.07	1.04	-4.4	3.12
Convenience	Factor score representing the level of importance placed on outlet attributes: close to non-food shop, close to entertainment, air conditioning and delivery service	-0.01	0.98	-2.81	2.84
Price sensitive	Factor scores representing the level of importance placed on outlet attributes: low price, flexible price and discount	0.16	0.92	-3.75	1.86

Table 4.2 also provides a summary of households' assets such as ownership of credit cards or debit cards, a refrigerator or a car or motorbike. The study assumed that ownership of such assets influences food retailer choice. Nearly 64% of the households owned refrigerators, and more than 73% owned a car or motorbike. Interestingly, credit card ownership was starting to become popular among respondents seen in Table 4.2. When considering the frequency of shopping across outlet formats, it is also interesting to consider the travel time to modern food retailers. Table 4.3 shows that the travel time to the nearest hypermarket or supermarket was longer than that for minimarkets. Interestingly, the travel time to the nearest minimarket was shorter than that for the nearest traditional wet market. Table 4.2 also provides a summary of outlets' attributes which respondents considered when purchasing food. Table 4.2 indicates that respondents considered that low price, flexible price and discount were the most important attributes when deciding where they would purchase food.

4.3.1 Perception of and frequency of use of modern versus traditional retail outlets

Table 4.3 provides an overview of how often households shop for food products at various outlet formats. It appears that respondents use a variety of outlet formats to shop for food products. Small shops, traditional wet markets and peddlers are used daily by 40%, 34%, and 27% of the households respectively. On the other hand, less than 1% of the respondents said they used hypermarkets and supermarkets, daily. The dominance of traditional outlets as those that are most frequently by consumers is consistent with the findings of Goldman, Krider, and Ramaswami (1999), Shiu and Dawson (2001), and Maruyama and Trung (2007). However, minimarket, appear to be growing in popularity as approximately 25% of the households indicated they used minimarkets at least weekly (Table 4.3).

Table 4.3 Frequency (%) of shopping for food products at various retail format types

	Hyper-markets	Super-markets	Mini-markets	Semi-permanent stands	Small shops	Wet markets	Peddlers
Daily	0.54	0.38	1.48	7.47	39.87	33.75	27.01
2-3 times per week	1.57	1.55	10.62	15.12	31.83	18.14	29.01
Once a week	4.51	4.41	14.29	16.32	11.03	14.34	13.14
2-3 times per month	8.23	7.87	17.1	14.57	10.38	7.59	9.52
Once a month	21.1	20.71	18.19	13.41	3.76	9.43	4.95
Less than once a month	18.71	18.53	11.84	13.19	1.22	13.07	3.65
Never	45.35	46.53	26.49	19.91	1.92	3.69	12.72

In the current debate regarding the supermarket revolution in Asia, sceptics of the supermarket revolution thesis claim that the traditional market in Asia still dominates and endures in the market place because such outlets have advantages both in terms of price and quality (Goldman & Hino 2005; Goldman, Krider & Ramaswami 1999; Goldman, Ramaswami & Krider 2002; Maruyama & Trung 2007). This survey confirmed the claims of Goldman, Krider, and Ramaswami (1999), Goldman, Ramaswami, and Krider (2002) that traditional markets outperform modern markets in terms of perceptions of both price and quality of fresh food as can be seen in Tables 4.4 and 4.5. Table 4.4 also indicates that traditional markets had more advantages in terms of the consumers' perception of fresh food safety. However, modern markets have enjoyed high acceptance because they provide fresh milk and yogurt and processed food, which have high safety and quality attributes. Furthermore, consumers perceive the modern outlets as those providing trusted product information. A possible explanation for this might be that consumers think that the food labelling is more regulated by the government on the modern food retailers rather that on the traditional food retailers.

Table 4.4 Percentage of consumers who believe retail format is best for price

	Hyper-markets	Super-markets	Mini-markets	Semi-permanent stands	Small shops	Wet markets	Peddlers	Other
Fresh meat & poultry	3.84	1.41	0.05	1.67	2.28	81.24	5.26	4.27
Fresh fish and seafood	1.90	1.58	0.28	1.58	2.47	81.34	6.11	4.75
Fresh fruit	5.50	6.80	0.45	10.58	1.17	69.75	4.59	1.16
Fresh vegetables	1.57	0.36	0.00	2.24	4.51	82.31	8.08	0.92
Fresh milk and yogurt	17.87	16.37	7.12	8.45	4.38	12.58	10.43	22.81
Processed food items	16.12	14.22	6.20	0.37	16.69	40.00	4.42	1.99
Rice	2.87	0.51	0.20	0.50	25.39	43.87	1.03	25.62

Table 4.5 Percentage of consumers who believe retail format is best for quality

	Hyper-markets	Super-markets	Mini-markets	Semi-permanent stands	Small shops	Wet markets	Peddlers	Other
Fresh meat & poultry	16.91	13.61	0.08	0.58	1.44	58.81	3.43	5.14
Fresh fish and seafood	14.34	10.10	0.08	0.83	0.69	65.06	3.37	5.54
Fresh fruit	22.35	25.75	1.67	5.89	0.57	40.59	1.81	1.36
Fresh vegetables	15.75	14.14	0.11	1.77	2.32	60.80	4.02	1.09
Fresh milk and yogurt	26.72	28.35	5.60	7.53	1.56	5.34	4.90	20.00
Processed food items	31.15	28.91	7.16	0.12	10.09	20.28	0.92	1.38
Rice	13.29	9.18	0.41	0.25	20.26	34.36	0.33	21.93

Table 4.6 Percentage of consumers who believe retail format is best for safety

	Hyper-markets	Super-markets	Mini-markets	Semi-permanent stands	Small shops	Wet markets	Peddlers	Other
Fresh meat & poultry	18.61	13.98	0.08	1.13	1.63	53.77	4.35	6.46
Fresh fish and seafood	17.70	11.25	0.00	1.32	0.48	59.47	3.48	6.29
Fresh fruit	25.46	24.76	1.64	4.71	0.68	39.50	1.78	1.47
Fresh vegetables	18.39	14.98	0.12	1.96	2.47	56.78	4.52	0.78
Fresh milk and yogurt	30.86	24.60	5.99	7.47	1.81	4.53	4.84	19.92
Processed food items	32.72	26.76	6.85	0.12	9.93	20.85	1.18	1.59
Rice	15.74	9.48	0.40	0.45	20.08	32.14	0.46	21.25

Table 4.7 Percentage of consumers who believe retail format is best for trustworthy product information

	Hyper-markets	Super-markets	Mini-markets	Semi-permanent stands	Small shops	Wet markets	Peddlers	Other
Fresh meat & poultry	28.94	17.71	0.18	0.52	1.48	44.24	2.82	4.11
Fresh fish and seafood	27.97	15.60	0.00	0.95	1.16	47.00	2.84	4.48
Fresh fruit	31.98	26.86	1.43	2.92	0.63	34.39	0.87	0.92
Fresh vegetables	28.09	19.20	0.18	1.50	2.78	44.01	3.74	0.5
Fresh milk and yogurt	34.9	27.60	4.62	6.45	1.66	4.12	4.24	16.40
Processed food items	38.82	26.95	6.22	0.31	9.87	15.82	0.95	1.05
Rice	22.61	13.35	0.25	0.20	18.43	30.48	0.48	14.21

4.3.2 Multivariate probit model results

Factor analysis was used to reduce what consumers viewed as outlet's relatively important attributes when deciding where they would purchase food. The results of the factor analysis are provided in Table 4.9. There are five factors retained for further analysis. The five retained factors explain 47 % of the total variance of retailer attributes considered most important by consumers. The Kaiser-Meyer-Olkin KMO of all of the outlet attributes was above 0.50.

Table 4.8 provides the rotated factor loadings (pattern matrix) and unique variances for the four factors. Seven attributes were excluded as component factors because the attributes were insignificant in loading factors. These attributes were fixed price, purchase by credit, good display of products, wide variety of food products, easy to get to store, and better opening times. Fifteen outlet attributes were retained in five factors for use in the final varimax factor rotation.

The attributes that were significant in loading factors grouped into factor 1 were high quality, safe food, freshness and product information attributes. This factor was labelled as *Riskaverse*. A high score for this factor showed that consumers had positive perceptions

that the outlet format provided the best in terms of attributes of quality, safe food, freshness and good product information.

Table 4.8 The rotated factor loadings

			Number of obs.	= 1180
Factor analysis/correlation			Retained factors	= 5
Rotation: (un-rotated)			Number of params.	= 100
Factor	Eigen Value	Difference	Proportion	Cumulative
Factor1	4.606	2.709	0.201	0.209
Factor2	1.897	0.341	0.086	0.296
Factor3	1.556	0.371	0.071	0.366
Factor4	1.185	0.083	0.054	0.420
Factor5	1.102	0.126	0.050	0.470
Factor6	0.977	0.018	0.044	0.515
Factor7	0.959	0.066	0.044	0.558
Factor8	0.893	0.082	0.041	0.599
Factor9	0.811	0.037	0.037	0.636
Factor10	0.774	0.005	0.035	0.671
Factor11	0.769	0.026	0.035	0.706
Factor12	0.743	0.051	0.034	0.740
Factor13	0.692	0.027	0.031	0.771
Factor14	0.665	0.020	0.030	0.801
Factor15	0.645	0.054	0.030	0.831
Factor16	0.591	0.011	0.027	0.858
Factor17	0.580	0.021	0.026	0.884
Factor18	0.559	0.015	0.025	0.909
Factor19	0.544	0.018	0.025	0.934
Factor20	0.526	0.048	0.024	0.958
Factor21	0.478	0.031	0.022	0.978
Factor22	0.447	.	0.020	1

Table 4.9 Results of factor analysis of outlet attributes

Explaining variance: 0.470 KMO 0.854	Factor Loading
Factor 1 ***Risk Averse*** *Cronbach's Alpha: 0.672*	
High-quality food products	0.676
Food is safe to eat	0.751
Food products are fresh	0.696
Food product information (weight, label, expire, *etc.*)	0.509
Factor 2 ***Service*** *Cronbach's Alpha: 0.656*	
Fast service	0.693
Cleanliness (including environment) of store	0.631
Friendly staff	0.670
Factor 3 ***Convenient*** *Cronbach's Alpha: 0.643*	
Store is close other non-food shopping	0.575
Store is close to entertainment & social opportunities	0.711
Air-conditioning	0.655
Delivery Service	0.586
Factor 4 ***Price Sensitive*** *Cronbach's Alpha: 0.584*	
Low prices (good value)	0.732
Flexible prices (able to negotiate)	0.767
Store provides discount (sales)	0.647

Other factors retained were small amount, and unpackaged, and the last factors were a good display, easy to get to the store, fast service, cleanliness, better opening times, friendly staff and delivery service. This factor was labelled as the *Service* factor. Factor 3 in this analysis consisted of the attributes of close to non-food shops, close to entertainment, air conditioning and delivery service. This factor was labelled as the *Convenience* factor. Factor 4, that consisted of low price, flexible price and discount attributes, respectively, was labelled as *Price sensitive*. A low score in this factor indicated that consumers considered those attributes as less important when they chose outlet formats. A high score in this factor indicated that consumers considered those attributes more important when they chose outlet formats. The results of a reliability test using

Cronbach's Alpha showed that only four of the five factors should be retained for use. The fifth factor (the choice factor) was excluded from the analysis because the value of the Cronbach's Alpha was 0.337. The remaining four factors were then used as independent variables in multivariate probit models.

Multivariate probit models were used to determine the factors that explained consumers' shopping choice at modern versus traditional food outlets. The dependent variable in each model was the respondents' choice to shopping at least monthly at the retail outlet type. Independent variables included socio-demographic characteristics as well as attitudinal variables that were chosen based on the literature review discussed in Chapter 2. Summary statistics for each of the dependent and independent variables are shown in Tables 4.1 and 4.2. The estimated coefficients for the multivariate probit models with 35 replications are provided in Table 4.10. The correlation coefficients for the multivariate probit models are shown in Table 4.11.

Table 4.10 shows the results of the likelihood ratio test of the null hypothesis that all slope estimates are zero. The Chi-squared statistic with 182 degrees of freedom is 1091.42 and is statistically significant (p-value < 0.0001). This indicates that the null hypothesis that all slopes are zero is strongly rejected, implying a relatively good fitting model. Table 4.11 reports the likelihood ratio test of the null hypothesis that the off-diagonal element covariance matrixes of errors are equal to zero. The likelihood ratio test Chi-squared statistic is equal to 165.67 (p-value<0.001), which indicates I can strongly reject that error terms for models of retail choice are independent, which supports the use of multivariate probit models to accommodate cross choice correlations that standard probit estimations would not address. In other words, as I suspected, respondents' decision to a specific type of food retail format (e.g., supermarkets) is correlated or dependent on their decision to use another type of outlet (e.g., wet markets).

Table 4.10 Multivariate probit models: Use of retail outlet to purchase food

	Hyper-markets	Super-markets	Mini-markets	Semi-permanents	Small-shops	Wet-markets	Peddlers
Resp_female	0.19	0.12	0.03	0.01	-0.07	0.17	-0.12
	(0.15)	(0.14)	(0.14)	(0.13)	(0.19)	(0.16)	(0.15)
Resp_age	-0.01	0.00	-0.00	-0.01**	-0.00	-0.01*	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)
Resp_edu	0.08***	0.01	0.06***	0.01	-0.03	-0.03**	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
Resp_work	-0.09	0.06	0.11	0.21***	-0.06	0.35***	0.06
	(0.09)	(0.08)	(0.08)	(0.08)	(0.13)	(0.10)	(0.09)
Child0to5	0.14	0.24**	0.40***	-0.06	-0.03	-0.02	-0.08
	(0.10)	(0.09)	(0.09)	(0.09)	(0.15)	(0.11)	(0.11)
Child6to12	-0.01	0.27***	0.16*	0.02	0.24*	0.07	0.06
	(0.10)	(0.09)	(0.09)	(0.08)	(0.14)	(0.10)	(0.10)
D_exployee	0.21	0.21*	-0.21	-0.23*	-0.12	-0.06	-0.11
	(0.13)	(0.13)	(0.13)	(0.12)	(0.15)	(0.15)	(0.15)
Percap2	0.29*	0.29**	0.09	0.20	-0.22	0.06	0.03
	(0.16)	(0.14)	(0.13)	(0.13)	(0.35)	(0.15)	(0.15)
Percap3	0.59***	0.62***	0.17	0.13	-0.33	0.10	0.11
	(0.16)	(0.15)	(0.14)	(0.14)	(0.34)	(0.16)	(0.16)
Percap4	0.65***	0.46***	0.38**	0.17	-0.92***	0.43**	-0.04
	(0.17)	(0.16)	(0.15)	(0.15)	(0.33)	(0.19)	(0.17)
Percap5	0.91***	0.85***	0.26	0.15	-0.93***	0.02	0.03
	(0.20)	(0.18)	(0.18)	(0.17)	(0.35)	(0.21)	(0.20)
Car_motor	0.30**	0.36***	0.15	0.29***	-0.11	0.47***	0.22*
	(0.14)	(0.12)	(0.11)	(0.11)	(0.23)	(0.13)	(0.13)
Refrigerators	0.31**	0.24**	0.20*	-0.10	-0.20	0.29**	0.24*
	(0.13)	(0.12)	(0.11)	(0.11)	(0.25)	(0.13)	(0.13)
Creditcard	0.31**	0.21	-0.09	-0.27**	-0.22	-0.07	0.11
	(0.14)	(0.13)	(0.13)	(0.13)	(0.16)	(0.15)	(0.15)
Timemodern	-0.02***	-0.02***	0.02***	0.01	0.02**	0.00	0.00
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
Timeminimk	0.01	0.01*	-0.03***	-0.00	-0.03***	0.01	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Timewetmkt	0.01	-0.01*	0.00	0.00	0.01	-0.02***	0.02***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)

Note: ***, **, * indicate statistical significance at the level 1%, 5%, 10%, respectively. Standard errors are in parenthesis.

Table 4.10 Multivariate probit models: Use of retail outlet to purchase food (Cont.)

Variables	Hyper-markets	Super-markets	Mini-markets	Semi-permanents	Small-shops	Wet-markets	Peddlers
Surabaya	0.58***	-0.35***	0.67***	-0.03	0.09	0.04	0.72***
	(0.11)	(0.11)	(0.10)	(0.10)	(0.16)	(0.13)	(0.11)
Bogor	0.07	0.31**	0.35***	-0.14	-0.07	-0.29**	0.52***
	(0.14)	(0.13)	(0.12)	(0.12)	(0.20)	(0.14)	(0.14)
Safety	0.20	0.11	0.38***	0.32**	0.12	0.06	-0.16
	(0.13)	(0.13)	(0.13)	(0.13)	(0.19)	(0.15)	(0.14)
Label	0.09*	0.12***	0.11***	0.09**	0.04	-0.06	0.08*
	(0.05)	(0.05)	(0.04)	(0.04)	(0.07)	(0.05)	(0.05)
Nutrition	0.12***	0.08**	0.07*	0.04	-0.09	0.12**	0.02
	(0.05)	(0.04)	(0.04)	(0.04)	(0.07)	(0.05)	(0.05)
Riskaverse	0.05	0.05	0.01	0.03	0.05	-0.07	0.02
	(0.05)	(0.04)	(0.04)	(0.04)	(0.07)	(0.05)	(0.05)
Service	0.01	0.02	0.06	-0.03	0.06	-0.04	0.02
	(0.05)	(0.04)	(0.04)	(0.04)	(0.06)	(0.05)	(0.05)
Convenience	0.17***	0.11***	-0.05	-0.01	-0.13*	0.04	-0.07
	(0.05)	(0.04)	(0.04)	(0.04)	(0.07)	(0.05)	(0.05)
Price sensitive	-0.05	-0.04	0.08*	0.02	0.14**	0.09*	0.07
	(0.05)	(0.04)	(0.04)	(0.04)	(0.06)	(0.05)	(0.05)
Constant	-2.29***	-1.40***	-1.50***	0.22	2.62***	1.04***	0.08
	(0.38)	(0.34)	(0.33)	(0.32)	(0.57)	(0.39)	(0.37)
LogLo	-3852.21						
LogLog(β)	-3769.38						
McFadden R^2	0.022						
Wald $Chi^2(182)$	1091.42						
Observations	1180						

Note: ***, **, * indicate statistical significance at the level 1%, 5%, 10%, respectively. Standard errors are in parenthesis.

As reported in Table 4.10, the coefficient on the *Resp_female* variable was not significant. The variable *Resp_age* was only significant in the explaining use of semi-permanent shops and wet markets. In general, older consumers are less likely to shop at these two types of traditional food outlets. *Resp_edu* was positive and highly significant for the hypermarket, and minimarket models. On the other hand, *Resp_edu* was negative and significant for the wet market model. This finding suggests that more educated respondents are more likely to shop at modern food retail outlets, particularly those that

offer certain other attributes such as a "one-stop-shop" (e.g. hypermarkets) or convenient to get to (e.g. minimarket); and they are less likely to shop regularly at wet markets. The variable representing respondents who work outside of the home (*Resp_work*) was significant and positive for the models for semi-permanent stands and wet markets. This suggests that working respondents were also more likely to shop at traditional markets (semi-permanent stands and wet markets) compared to respondents who are not employed outside of the household. This is not surprising, considering that these two types of traditional outlets generally offer the earliest opening hours, allowing respondents who work to purchase fresh products before going to work.

The variables *Child0to5* and *Child6to12* were positive and strongly significant for the supermarket and minimarket models. The *Child6to12* coefficient was also positive and significant in explaining use of small shops. Perhaps these results suggest that these shops offer food products (e.g. baby formula, dairy products, processed foods and snacks), which are of particular interest to respondents with relatively young children in the household that are not offered at other shopping locations. As expected, the coefficient of the variable *D_employee* was positive and significant for supermarkets, but was negative and significant for semi-permanent stands and negative for all other types of traditional retail outlets, this suggests that households with a domestic employee are more likely to shop for food at supermarkets relative to traditional retail outlets.

In terms of household economic status, total household expenditures were used as a proxy for permanent income and four dummies were created representing quintiles of total household expenditures (*Percap2*, *Percap3*, *Percap4* and *Percap5*). Interestingly, the coefficients for *Percap2*, *Percap3*, *Percap4* and *Percap5* were positive and highly significant for the hypermarket and supermarket models and *Percap4* was positive and statistically significant for the minimarket model. Thus, it appears that middle and high-

income households are more likely to patronize modern food retail outlets in urban areas in Indonesia.

Households that owned a car and/or a motorbike were more likely to use larger format modern retail outlets, which tend to take longer to get to, but interestingly people with a car and/or motorbike were also more likely to use semipermanent stands, wet markets and peddlers. The respondents with a refrigerator were also more likely to shop at modern retail outlets, but also wet markets and peddlers.

As expected, the coefficient of the variable *Timemodern* was negative for the hypermarket and supermarket models, and positive for the minimarket and small shop models. This suggests that respondents are less likely to shop at a larger format modern retail outlet if these modern outlets are less accessible from a time standpoint; rather respondents are more likely to use minimarkets or traditional small shops instead. The signs and significance of the *Timeminimkt* and *Timewetmkt* coefficients are also somewhat interesting, most notably, respondents are more likely to use a peddler for purchasing food if the time to the nearest wet market is long.

Regarding the city variables, people who lived in a big city (Surabaya or Bogor) are significantly more likely to shop for food at modern food retail outlets, but the type of outlets differ for each city. The respondents from Surabaya are more likely than respondents in Surakarta to use hypermarkets and minimarkets but less likely to use supermarkets. This seems plausible because the penetration of hypermarkets in Surabaya is significantly higher than in Surakarta. The respondents from Bogor are more likely than Surakarta respondents to use any type of modern retail format (only the coefficients on the supermarket and minimarket variables were significant) and less likely to use wet markets. Additionally, the respondents from Surabaya and Bogor are more likely to use peddlers.

The consumers concerned about food safety were more likely to purchase food at minimarkets or semi permanent stands. The coefficient for *Label* was positive and highly significant for all three types of modern retail outlets, but also for semipermanent stands and peddlers. This result indicates that the consumers who indicated they used food labels were more likely to prefer modern retailers and outlets such as semipermanent stands and peddlers where they may be able to develop a relationship with the food retailer. As expected, the consumers who were concerned about nutrition tended to shop more frequently at modern retail outlets and wet markets. Modern outlets are more likely to provide products with nutrition information, and wet markets offer a relatively large selection of fresh fruit and vegetables. The *Convenience* variable, which represents the importance placed on store attributes such as being close to non-food shopping and entertainment and the store having air conditioning and a delivery service, was positive and a significant factor for both the hypermarket and supermarket models and negative and significant for the small shop model. This means that the consumers who are more concerned about these types of store attributes are more likely to shop at modern retailers. In contrast, the consumers who were *Price sensitive* tended to shop more frequently at minimarkets, small shops and wet markets. A possible explanation for this might be that most of price sensitive respondents are from lower income households. They purchase small amounts of food products frequently, thus they may perceive modern food retailers to offer fewer benefits.

Table 4.11 reports the correlation of the error terms across models of food retail format choice. Interestingly, the correlation coefficients for supermarkets, minimarkets, wet markets and semi-permanent stands are all positive and significant. This would tend to suggest that the respondents who shop at supermarkets and minimarkets are also more likely to shop at wet markets and semi-permanent stands. Although several of the studies

discussed earlier suggest that modern food retailers are becoming major competitors for traditional food retailers' share of the market in Asia, this study confirms that in Indonesia, modern and traditional retail outlets are complementary. Bai, Wahl, and McCluskey (2008) reported similar results for China, where modern markets did not appear to be capturing the traditional food retailers' share of the market. Another interesting finding is that the correlation between peddlers and wet markets was negative; however, not statistically significant. This may suggest that peddlers are beginning to compete with wet markets, which is what Suryadarma et al. (2010) found.

Table 4.11 Matrix correlation for multivariate probit models

	Hyper-markets	Super-markets	Mini-markets	Semi-permanent Stands	Small-shops	Wet-markets	Peddlers
Hypermarkets	1						
Supermarkets	0.23***	1					
	(0.06)						
Minimarkets	0.19***	0.18***	1				
	(0.06)	(0.05)					
Semi-permanent stands	0.16***	0.18***	0.36***	1			
	(0.06)	(0.05)	(0.05)				
Small shops	0.04	0.11	0.15**	0.24***	1		
	(0.09)	(0.08)	(0.08)	(0.08)			
Wet markets	0.10	0.23***	0.11*	0.20***	0.12	1	
	(0.07)	(0.07)	(0.06)	(0.06)	(0.09)		
Peddlers	0.07	0.04	0.15***	0.26***	0.21**	-0.06	1
	(0.07)	(0.06)	(0.06)	(0.06)	(0.09)	(0.07)	
Likelihood ratio test of *rho21,..., rho67*=0							
Chi2 (21):		165.67					
Prob. > chi2:		0.00					

Note: ***, **, * indicate statistical significance at the level 1%, 5%10%, respectively. Standard errors are in parenthesis.

4.4 Conclusions and Implications

Debate regarding the impact of modern market penetration on traditional food markets in developing countries has continued for two decades. Scholars contend that policy-makers need more information to determine policies that would aid the development of both traditional and modern food retail outlets and also improve consumers' access to safe, high quality, nutritious and affordable food products. This research attempts to shed light on these issues in Indonesia.

The findings of this study suggest that traditional food retailer outlets are still an important source of food for urban Indonesian households. Traditional food retailers are still used most frequently for food shopping by the majority of urban households in this study. In general, they are the preferred type outlet to use when buying fresh meat, fish, fruits and vegetables. There are several possible explanations for this result. First, they may be preferred because they are the traditional source of these food products and respondents may simply be accustomed to the habit of shopping for fresh produce in traditional markets. Second, they may be preferred because they are open earlier in the morning (usually wet markets, street vendors, and peddlers open or are accessible from 5am) and this allows consumers to purchase fresh food before going to work.

Although traditional food retailers currently dominate the market for fresh foods, modern retailers are gaining market share in the fresh fruit and processed food categories. In addition, modern food retailers were perceived as the "best" type of outlet to buy food that is safe and provides trustworthy product information. This result may be explained by the fact that consumers indicated that they consider modern retailers are more heavily regulated by the government with respect to food safety and quality.

The results of econometric analysis suggest that Indonesian consumers more likely to shop frequently at modern food retail outlets include those who have higher incomes, more

assets (e.g. car, motorcycles, refrigerator), a credit card, higher educated, and also those who show higher levels of concern about nutritional and safety aspects of food. Conversely, price-sensitive consumers are more likely to shop at traditional food retail formats. The time to the nearest supermarket or hypermarket also decreased the probability that consumers shopped frequently at larger format modern retail outlets. From these results, it appears that a particular socio-economic niche tends to use modern food retailers.

At the same time, this study also confirmed that modern food markets were not major competitors with traditional food retailers. Different food retail formats serviced different segments or they were complementary to each other. However, the results of our study suggest that the growing interest and concerns of consumers about nutritional information, safe products and convenience will result in modern retail outlets capturing a new customer base. This may allow modern food retailers to capture traditional food retailers' markets if the traditional outlets cannot adapt and cater for consumers' changing needs. Therefore, traditional retailers will need to be innovative to maintain their market share.

The government may have a role to play in helping traditional retailers develop innovative strategies. For example, they could invest in initiatives to improve the infrastructure of traditional retail formats to make them more comfortable for consumers who are concerned about the hygiene of facilities and aspects such as air conditioning. Second, the government could offer assistance with financing or business training to improve the entrepreneurial capacity of traditional retailers so they could compete with modern retailers. Finally, they could regulate or restrict the development of new modern retail outlets or introduce acts to protect traditional retailers.

The following chapter (Chapter 5) will explore if consumers' frequency of visiting modern versus traditional retail outlets is associated with their share of household food

expenditures at modern and traditional outlets; and if so, what factors help explain higher consumer expenditures on food at each type of retail outlet?

Chapter 5: Determinants of Indonesian Urban Household Expenditures Food at Modern and Traditional Food Outlets

5.1 Introduction

Over the last two decades, food supply chains in many Asian countries have undergone significant transformation. Increasing in foreign direct investment, the economic growth, rising disposable incomes and urbanization have contributed to this transformation. One example of the transformation is the rapid increase of supermarkets' share of national retail food sales in some Asian countries. For instance, in China, South Korea, Thailand, and South Korea, supermarkets now account for more than 50% of total national food retail sales (Reardon, Timmer & Minten 2012). Even though the increase of market share of modern food retailers in Indonesia is not dramatic when compared with those countries, Indonesia's modern food retailers' sales are increasing significantly. Rangkuti and Slette (2010) found that in 2004 modern food retailers' share of total food sales was only 7% but in 2012 it had increased to 11% of total food sales in Indonesia.

There is no doubt that the penetration of supermarkets has changed market conditions for both producers and traders. This penetration has also influenced consumer behaviour, including changes in food demand and their shopping. Now, consumers have many options for purchasing food, not only at traditional food retailers but also at modern food retailers. Modern food retailers now also offer fresh food produce, including fruit, vegetables, meat, poultry, and seafood that were once only available from traditional food retailers. Along with the changes in food consumption and expenditures, it appears that consumers may be increasingly concerned about safety and health in their regular shopping (Herrmann & Roeder 1998; Lippe, Seebens & Isvilanonda 2010). However, few studies have examined the impact of the rapid rise of modern food retailers on changing food

expenditure patterns, particularly in relation to growing consumers' food safety and health concerns. The literature on the transformation of food systems in Asia has mainly focused on smallholder producers (Moustier et al. 2010; Reardon et al. 2009; Reardon, Timmer & Minten 2012; Schipmann & Qaim 2011b; Stringer, Sang & Croppenstedt 2009), on regional development (Neven et al. 2009; Rao & Qaim 2011), on traditional food retailers (Goldman, Krider & Ramaswami 1999; Gorton, Sauer & Supatpongkul 2011; Minten & Reardon 2008) and on food consumption (Asfaw 2008; D'Haese, Van den Berg & Speelman 2008; Kristal et al. 1997; Rischke et al. 2015).

The existing literature on supermarkets and food consumption and shopping behaviour change is dominated by studies of consumer use of various retail formats (Bai, Wahl & McCluskey 2008; Cutler & Lleras-Muney 2010; Hsu & Chang 2002; Shiu & Dawson 2001) or on expenditures using disaggregate demand systems (Lippe, Seebens & Isvilanonda 2010; Mergenthaler, Weinberger & Qaim 2009). Mergenthaler, Weinberger, and Qaim (2009) estimated household expenditure on fruit and vegetables using household survey data in Vietnam. Studies conducted by Gorton, Sauer, and Supatpongkul (2011) and Narayan, Rao, and Sudhir (2012) specifically examined household expenditure on various commodities at both traditional and modern food retailers in Thailand and India respectively. Despite relatively robust analytical techniques, this research did not incorporate variables related to nutrition and health concerns. As noted by some researchers (Capps Jr & Schmitz 1991; Herrmann & Roeder 1998; Nayga, Tepper & Rosenzweig 1999; Øvrum et al. 2012; Park & Davis 2001), the inclusion of such variables as nutrition information and health concerns in demand analysis contributes significantly to explaining changing food expenditure patterns. In addition, the above studies used only relatively small samples, for example Gorton, Sauer, and Supatpongkul (2011) and

Narayan, Rao, and Sudhir (2012) only used 200 respondents in Bangkok and Chachoengsao, Thailand and Mumbai, India.

Dissimilar to previous studies, the current study included nutritional and label use concerns variables as well as safety concerns to accommodate gaps in previous studies, and used a sample of 1,180 Indonesian urban consumers. Fractional logit models were used to accommodate consumers' shopping behaviour across various food retailers and the expected zero expenditure observation.

The objective of this study was to address the gaps in the literature by investigating determinant factors of household food expenditure shares at both modern and traditional food retailers in Indonesia. No literature exists that examines the relationship between supermarkets and food expenditure behaviour in Indonesia. Thus, this is the first study to explore this relationship for Indonesian households. To explore this issue, a fractional logit model was used to estimate the share of household food expenditures at both modern and traditional food retailers. The next section presents the estimation techniques, empirical models and the characteristics of the respondents referred to in this chapter, followed by a presentation of the main findings of the research as well as a summary.

5.2 Methodology

5.2.1 Estimation techniques

This study investigated the pattern of disaggregate food expenditure through the share of household expenditure allocated to various food items at modern and traditional food retailers. The dependent variable in each of the food items was limited to (0,1) interval. The most practical procedure to estimate data confined to (0,1) has been to model the log-odds ratio as a linear function (Papke & Wooldridge 1996). If the dependent variable is limited to between zero and one then OLS regression can be used to estimate the parameter estimation after transforming value of dependent variables (Gould & Villarreal 2006;

Wooldridge 2002). However, as Papke and Wooldridge (1996) have suggested, the procedure has several problems. First, the log-odds ratio procedures cannot be true if dependent variables take on the values 0 or 1 with positive probability. Second, it may be reluctant to adjust the highly values in the dependent variable if a large percentage is extreme.

An alternative approach to estimating data bounded between 0 and 1 is the use of two-limit tobit models. For example, in a recent study by Gorton, Sauer, and Supatpongkul (2011) bivariate tobit models were used. However, the use of tobit models to analyse data bounded between zero and one is criticized by Ramalho, Ramalho, and Henriques (2010), Ramalho, Ramalho, and Murteira (2011), and Murteira and Ramalho (2014). When data is censored between zero and one, tobit models can be appropriate, but are not easy to apply because fractional variables are a natural consequence of respondents' choices and are not actually a type of censoring. Additionally, the assumptions used in tobit models are very stringent, as they require normality and heteroskedasticity of the dependent variable prior to censoring. The estimation of the model is relatively difficult and often charged with computational complexity. As a consequence, the researcher may tend to use contentious assumptions.

As an alternative, fractional logit regression as proposed by Papke and Wooldridge (1996) can be used. Fractional logit models have been used by Gould and Villarreal (2006), Hinde and Dixon (2005) and Guzman, Morrison, and Sjöblom (2008). This study adopted the fractional logit regression model of Papke and Wooldridge (1996). The model can be represented as follows:

$$E(P|X) = \frac{\exp(X\beta)}{[1=\exp(X\beta)]^2} \quad \text{.....(5.1)}$$

This procedure limited the predicted value of P to be strictly between zero and one and the influence of any independent variables on $\mathrm{E}(\mathrm{P}|\mathrm{X})$ diminished as $\mathrm{X}\beta \rightarrow \infty$. The complete model can be seen as follows:

$$\mathrm{E}(P|X) = \beta_i \frac{\exp(X\beta)}{[1=\exp(X\beta)]^2} \quad \text{(5.2.)}$$

To obtain robust estimation of the fractional logit model, the quasi-maximum likelihood method (QML) of Papke and Wooldridge (1996) is used. The quasi-maximum likelihood method (QML) was originally based on the work of Gourieroux, Monfort, and Trognon (1984) and McCullagh and Nelder (1989) using the Bernoulli log-likelihood function, given by

$$L_i(\beta|X) = P_i \ln[E(P|X)] + (1 - P_i) \ln[1 - E(P|X)] \quad \text{(5.3)}$$

where the $E(P|X)$is defined as equation (5.1). This log-likelihood function is similar to that utilized in the standard maximum likelihood estimation of binary response index models, except P_i is continuous over the unit interval. Equation (5.3) is estimated using the QML estimator (QMLE) for the fractional logit models using Stata 12.

5.2.2 Empirical estimation

The following equation (5.4) was used to estimate the fractional logit regression:

W_{ijh}= f(Resp_female, Resp_age, Resp_edu, Resp_work, Child0to5, Child6to12, D_employee, Percap2, Percap3, Percap4 Percap5, Car_motor, Refrigerator, Credit_card, Timemodern, Timeminimkt, Timewetmkt, Surabaya, Bogor, Safety, Label, Nutrition, Riskaverse, Service, Convenience, Price sensitive) ..... (5.4)

where W_{ijh} is the share of the expenditure on commodity *i* at retail format *j* (j= modern food retailers, traditional food retailers) by household *h*. Table 5.1 provides the definitions of the dependent variables used in this study. The independent variables used in the fractional logit model are defined in Table 5.2. *Resp_female* is a dummy variable indicating that the respondent is female. *Resp_age* represents the age of the respondent measured in years. Previous research has suggested that older consumers are more likely to use traditional versus modern retail outlets; therefore, I expect older respondents to spend more at traditional retail outlets compared to modern retail outlets (Bai, Wahl & McCluskey 2008). *Resp_edu* is the number of years of education that the respondent has completed. The coefficient on this variable is expected to be positive for share of expenditures on food at modern food retailers because previous studies suggest that consumers with more education are likely to spend more on food at modern food retailers (D'Haese, Van den Berg & Speelman 2008; Neven & Reardon 2006). *Resp_work* is a dummy variable equal to one if a respondent works outside the home. It was expected to carry a positive coefficient for share of food expenditure at traditional retailers as respondents working outside of the home are expected to have more time constraints than respondents who are not employed outside of the home. Whilst traditional food retailers open early in the morning, modern food retailers are open late in the morning.

Consequently, it is likely respondents who work outside the home will spend more at traditional outlets rather than modern outlets.

Child0to5 and *Child6to12* are dummy variables equal to one if children younger than 5 and children between 6 to 12 years of age live in the household, respectively, and zero otherwise. It was expected the coefficient of both variables will be positive for share of food expenditure at modern retail formats because households with children living at home may be more concerned about labels and healthiness of food or they may purchase certain processed food products (e.g. infant formula or snacks) for the their young children, and modern outlets are more likely to carry these products. *D_employee* is a dummy variable equal to one if a household has a domestic employee. The household help was expected to be positively related to the share of food expenditure at modern food retailers since domestic employees make it possible for households to have low opportunity cost of time (Goldman, Ramaswami & Krider 2002).

Percap2, *Percap3*, *Percap4* and *Percap5* are equal to 1 if a household is in the second-quintile, the third-quintile, the fourth-quintile and the fifth-quintile expenditure per capita, respectively. It was expected the coefficient of both Percap4 and Percap5 would be positive for the share of food spending at modern outlets because the previous literature has suggested that households with high income are more likely to spend more on all food categories (except meals outside the home) in modern food retailers (Narayan, Rao & Sudhir 2012). *Car_motor*, *Refrigerator*, and *Credit_card* are binary variables and are a measure of wealth/affluence. It was expected that these variables would have a positive coefficient for the share of food expenditures at modern food retailers as previous studies have shown that consumers from higher socio-economics or more affluent households are more likely to use modern food retail formats and use of credit cards at modern retail formats (Narayan, Rao & Sudhir 2012).

Timemodern, *Timeminimkt*, and *Timewetmkt* are continuous variables denoting the time needed to get to the nearest hypermarket/supermarket, minimarket and traditional wet market, respectively. The sign of the *Timemodern* coefficient for the various food categories was expected to be negative for modern food retailers as the longer time it takes to get to the nearest modern outlets makes low income households who are more likely to depend on public transportation reluctant to go these outlets. In terms of region, *Surabaya* and *Bogor* are likely to be positively related to greater expenditure on the various food categories (except on roots, tubers and pulses) at modern retail formats because those cities represent medium size and big cities where people on higher incomes live. The variable *Safety* is equal to 1 if consumers consider safety as the first or second most important factor influencing decisions on where to purchase food. The coefficient *Safety* was expected to be positive for all foods at modern food retailers. The variables of *Label* and *Nutrition* are variables representing factor scores for consumers' perception to label use and to high amounts of fat, cholesterol, salt and sugar in food, respectively. The *Label* and *Nutrition* coefficients were both expected to be positive for modern food retailers since modern food retailers are more likely to sell products that have both labels and nutrition facts.

The variable *Riskaverse* represents a factor score for the variable of outlet attributes as follows: high quality, safe food, freshness and product information. The expected sign of this variable was positive for fresh produce in traditional outlets, as households who prefer fresh food may tend to shop at traditional food retailers. On the other hand, it was also expected to be positive for processed food and other foods in modern format outlets since consumers who are concerned about food of high quality, safe food and trusted information are more likely to shop at modern food retailers (Maruyama & Trung 2007; Rodriguez et al. 2002)

Service is a factor score representing the variable of outlet attributes as follows: fast service, cleanliness and friendly staff. There were no a priori expectations for this variable as consumers who prefer cleanliness are more likely to buy food at modern markets. On the other hand, consumers who think that fast service and friendliness are the most important attributes could perceive some types of traditional retail outlets to be better and prefer to shop there. The variable of *Convenience* represents a factor score for the variable of outlet attributes as follows: close to non-food shops, close to entertainment, air conditioning, and delivery service. It was expected to be positive for all foods at modern formats and negative for all traditional formats.

The variable of *price sensitive* is a variable representing a factor score for the variable of outlet attributes as follows: low price, flexible price and discount. It was expected that the coefficient of this variable would be positive for all types of food products except milk and dairy and other food (processed foods) at traditional food retailers and negative for modern food retailers. As Maruyama and Trung (2007) have suggested, traditional markets are more likely to offer lower and negotiable prices for fresh produce and basic needs.

5.3 Results and Discussion

The descriptive statistics for the dependent and independent variables in the fractional logit models of food expenditures at modern and traditional food retail outlets are provided in Tables 5.1 and 5.2. A total of 89% of the respondents were female with an average age of 43 years. On average, the respondents had about 10 years of education. Twenty-three per cent of the respondents stated that they were working outside the household and 33% had children who were under 5 years old. About 41% of the respondents indicated that they had children who were from 6 to 12 years old. Approximately 8% of the respondent households had a domestic helper.

In terms of distribution of quintiles expenditure, Table 5.1 shows that 25% of the sample was in the poorest households, while only 11% of the respondents were in the richest classification. Table 5.2 reports the mean of households' assets. About 64% of the respondents indicated that they had refrigerators and 73% had cars or motorbikes. Interestingly, approximately 11% of the sample stated that they owned credit cards. On average, the time taken to get to the nearest modern retail format (hypermarket and supermarket), minimarket and wet market was 19, 9 and 13 minutes, respectively. In total, 1,180 households participated in the study, 600 respondents in Surabaya, 280 respondents in Bogor, and 300 respondents in Surakarta.

Table 5.1 also shows that 13% of the sample indicated that they considered safety as the first or second most important factor influencing their decisions to purchase food. In general, the attribute of price was one of the most important attributes considered by respondents when deciding where they would purchase food.

Table 5.1 Descriptive statistics for dependent variables in the fractional logit model of food expenditures at modern and traditional food retailers (N=1180)

Variable	Descriptions	Mean	Std. Dev.	Min	Max
Smfrgraexp	Share of expenditure on grain accounted for by modern retailers	0.11	0.20	0	1
Stfrgraexp	Share of expenditures on grain accounted for by traditional retailers	0.90	0.20	0	1
Smfrrtuexp	Share of expenditures on roots and tubers accounted for by modern retailers	0.01	0.07	0	1
Stfrrtuexp	Share of expenditures on roots and tubers accounted for by traditional retailers	0.58	0.49	0	1
Smfrpulexp	Share of expenditures on pulses accounted for by modern retailers	0.02	0.10	0	1
Stfrpulexp	Share of expenditures on pulses accounted for by traditional retailers	0.97	0.16	0	1
Smfrdaiexp	Share of expenditures on milk and dairy accounted for by modern retailers	0.21	0.32	0	1
Stfrdaiexp	Share of expenditures on milk and dairy accounted for by traditional retailers	0.78	0.33	0	1
Smfrmeaexp	Share of expenditures on meat and fish accounted for by modern retailers	0.05	0.15	0	1
Stfrmeaexp	Share of expenditures on meat and fish accounted for by traditional retailers	0.91	0.24	0	1
Smfrvegexp	Share of expenditures on vegetables accounted for by modern retailers	0.01	0.05	0	1
Stfrvegexp	Share of expenditures on vegetables accounted for by traditional retailers	0.99	0.09	0	1
Smfrfruexp	Share of expenditures on fruit accounted for by modern retailers	0.15	0.27	0	1
Stfrfruexp	Share of expenditures on fruit accounted for by traditional retailers	0.79	0.34	0	1
Smfrofdexp	Share of expenditures on other foods accounted for by modern retailers	0.26	0.27	0	0.99
Stfrofdexp	Share of expenditures on other foods accounted for by traditional retailers	0.75	0.27	0.02	1
Smfroutexp	Share of expenditures on meals outside home accounted for by modern retailers	0.03	0.18	0	1
Stfroutexp	Share of expenditures on meals outside home accounted for by traditional retailers	0.58	0.49	0	1
Smfrfoodexp	Share of expenditures on food accounted for by modern retailers	0.13	0.15	0	0.84
Stfrfoodexp	Share of expenditures on food accounted for by traditional retailers	0.87	0.15	0.13	1

Table 5.2 Descriptive statistics for independent variables in the fractional logit model of food expenditure at modern and traditional food retailers (N=1180)

Variable	Description	Mean	Std. Dev.	Min	Max
Resp_sex	Sex of respondent (0=Male; 1=Female)	0.89	0.32	0	1
Resp_age	Age (years) of respondent	43.02	12.4	15	83
Resp_edu	Years of education completed by respondent	9.35	4.52	0	22
Resp_work	1=Respondent works outside home; 0=Otherwise	0.49	0.5	0	1
D_employeee	1=Household has a domestic employee; 0=Otherwise	0.08	0.28	0	1
Child0to5	1=Yes, household has children 5 or younger; 0=Otherwise	0.34	0.47	0	1
Child6to12	1=Yes, household has children between the ages of 6 and 12; 0=Otherwise	0.42	0.49	0	1
Percap2	1=Household in the second-quintile expenditure; 0=Otherwise	0.24	0.43	0	1
Percap3	1=Household in the third-quintile expenditure; 0=Otherwise	0.22	0.41	0	1
Percap4	1=Household in the fourth-quintile expenditure; 0=Otherwise	0.18	0.39	0	1
Percap5	1=Household in the fifth-quintile expenditure; 0=Otherwise	0.11	0.31	0	1
Car_motor	1=Household owns at least 1 car or motorbike; 0=Otherwise	0.73	0.44	0	1
Refrigerator	1=Own at least 1 refrigerator; 0=Otherwise	0.64	0.48	0	1
Credit card	1=Own at least 1 credit card; 0=Otherwise	0.11	0.31	0	1
Surabaya	1= Surabaya, a large city; 0=Otherwise	0.61	0.49	0	1
Bogor	1=Bogor, a medium-sized city; 0=Otherwise	0.21	0.41	0	1

Table 5.2 Descriptive statistics for independent variables in the fractional logit model of food expenditure at modern and traditional food retailers (N=1180) continued..

Variable	Description	Mean	Std. Dev.	Min	Max
Timemodern	Time needed to get to the nearest hypermarkets or supermarkets (Minutes)	18.98	10.45	1.50	120
Timeminimkt	Time needed to get to the nearest mini-markets (Minutes)	8.75	6.21	1	153
Timewetmkt	Time needed to get to the nearest wet markets (Minutes)	13.49	10.7	1	60
Safety	1=Respondent indicated that safety was the first or second most important factor influencing their food purchasing decisions; 0=Otherwise	0.13	0.34	0	1
Label	Factor score representing level of concern about food labels, knowing how to use label, read label	-0.07	1.06	-4.94	2.415
Nutrition	Factor score representing level of concern about fat, cholesterol, salt and sugar in food	-0.07	0.96	-4.40	2.261
Riskaverse	Factor score representing the level of importance placed on outlet attributes: high quality, safe food, freshness and product information	-0.14	1.03	-4.19	2.335
Service	Factor score representing the level of importance placed on outlet attributes: fast service, cleanliness and friendly staff	-0.07	1.04	-4.40	3.122
Convenience	Factor score representing the level of importance placed on outlet attributes: close to non-food shop, close to entertainment, air conditioning and delivery service	-0.01	0.98	-2.81	2.84
Prices sensitive	Factor scores representing the level of importance placed on outlet attributes: low price, flexible price and discount	0.16	0.92	-3.75	1.855

5.3.1 Share of food expenditure by type of food outlet, socio-economic status and region

Table 5.3 provides the average food expenditure shares for various food products at both modern and traditional food retail outlets. Households spent an average of 28% on other foods, the highest total of all food expenditure types. Interestingly, 25% of the total of this expenditure was spent at modern food retailers. On average, Indonesian urban households in this study spent 21%, 6%, 0.5% of total food expenditure on grain, pulses, roots and tubers, respectively. For these products, consumers still shopped at traditional food retailers. In addition, traditional food outlets continue to be popular outlets for buying vegetables as well as meat and fish. Spending was less than 6% of total food expenditures for both the on dairy and fresh milk, and the fresh fruit categories. However, for these products, modern stores appear to gaining market share with 21% and 16% of total expenditures on fresh milk and dairy, and fresh fruit being spent at modern retail outlets, respectively. However, in general, Indonesian urban consumers in this study continued spend the largest share of their food expenditures on food at traditional food retailers. The results support the conclusion of the previous chapter and also confirm the view of Goldman, Krider, and Ramaswami (1999; 2002) who argued that traditional food retailers are likely to continue to dominate Asian food markets across different income segments and different product categories.

Table 5.3 Share of expenditure by commodity and type of food retail outlet

	Share of food expenditures (%)	Share of Expenditure (%)	
		Modern retailers	Traditional retailers
Food		13.39	86.61
Grain	22.41	10.68	89.32
Roots and Tubers	0.54	0.84	99.16
Pulses	6.27	1.77	98.23
Milk and Dairy	5.72	21.06	78.94
Meat and Fish	12.17	5.27	94.73
Vegetables	11.77	0.78	99.22
Fruit	5.50	15.78	84.22
Other Foods	28.21	25.46	74.54
Meals Outside Home	7.41	5.34	94.66

Table 5.4 presents the mean percentage expenditure on the 10 food category products for each type of product and income. On average, there were no significant differences in spending on 'traditional pulses, roots and tubers at each type of outlet across income levels. For example, the poorest households spent less than 1% (0.68%) of total expenditure on these products at modern markets, while the highest income households spent 2% at modern outlets. On the other hand, high-income households tended to spend more at modern food retailers for several types of products compared with low-income households. For example, for milk and dairy, high-income consumers spent more at modern outlets than at traditional outlets. Clearly, the results indicate that share of food expenditure at modern retail outlets has a positive relationship to income level. This finding supports the conclusion of the previous chapter that modern food retailers are popular with a specific socio-economic class.

Regarding the association between education level and food expenditure patterns, Table 5.5 shows the mean percentage of food spending for type of product, type of food outlet and education. Similar to the results for expenditure patterns of various income

classes, there was no significant association between education and spending on 'traditional food' and vegetables at each type of store. For example, the highest education group spent 3% of total expenditure on vegetables at modern markets, while the lowest spent 2.5% at modern outlets. However, there was a positive relationship between education and spending at modern stores for several types of products. For example, the highest education group spent 52% of total expenditure on dairy and milk in modern retail formats, while the lowest education group only spent 6% on those foods in modern retail formats. This finding concurs with those in the previous chapter that income and education affected consumer choice among retail formats.

Table 5.4 Share of food spending by type of food outlet and income (urban food expenditures)

	Quintile 1		Quintile 2		Quintile 3		Quintile 4		Quintile 5	
	Modern retailers	Traditional retailers	Modern retailers	Traditional retailers	Modern retailers	Traditional retailers	Modern retailers	Traditional retailers	Modern retailers	Traditional retailers
Food	3.31	96.69	8.87	91.13	14.47	85.53	22.51	78.49	29.38	70.62
Grain	3.21	96.79	7.20	92.8	7.91	92.09	13.23	86.77	35.42	64.58
Roots and Tubers	0.68	99.32	0.00	100.00	1.12	98.88	1.20	98.8	1.81	98.19
Pulses	0.13	99.87	0.26	99.74	0.61	99.39	1.93	98.07	10.48	89.52
Milk and Dairy	3.99	96.01	11.94	88.06	21.51	78.49	34.50	65.50	52.32	47.68
Meat and Fish	0.57	99.43	1.74	98.26	3.88	96.12	9.65	90.35	17.38	82.62
Fresh Vegetables	0.23	99.77	0.38	99.62	0.45	99.55	0.82	99.18	3.39	96.61
Fresh Fruit	2.00	98.00	8.07	91.93	13.94	86.06	25.76	74.24	43.77	56.23
Other Foods	7.68	92.32	18.42	81.58	29.27	70.73	39.04	60.96	49.09	50.91
Meals Outside Home	1.91	98.09	4.57	95.43	5.13	94.87	6.73	93.27	7.71	92.29

Table 5.5 Share of food spending by type of food, type of food outlet and education (years) (Percent of urban food expenditures)

	0-6 years		7-9 years		10-12 years		13-16 years		> 16 years	
	Modern retailers	Traditional retailers	Modern retailers	Traditional retailers	Modern retailers	Traditional retailers	Modern retailers	Traditional retailers	Modern retailers	Traditional retailers
Food	4.79	95.21	10.88	89.12	18.9	81.1	23.76	76.24	25.83	74.17
Grain	2.57	97.43	6.44	93.56	16.17	83.83	22.13	77.87	23.25	76.75
Roots and Tubers	0.76	99.24	0.03	99.97	1.04	98.96	1.11	98.89	2.58	97.42
Pulses	0.15	99.85	0.43	99.57	3.56	96.44	3.97	96.03	2.24	97.76
Milk and Dairy	6.17	93.83	13.73	86.27	29.18	70.82	41.4	58.6	53.32	46.68
Meat and Fish	0.58	99.42	2.31	97.69	6.89	93.11	13.00	87.00	20.35	79.65
Fresh Vegetables	2.48	99.76	0.16	99.84	0.86	99.14	2.17	97.83	2.99	97.01
Fresh Fruit	3.73	96.27	12.96	87.04	21.85	78.15	30.32	69.68	30.69	69.31
Other Foods	10.58	89.42	25.19	74.81	33.76	66.24	41.1	58.90	44.14	55.86
Meals Outside Home	0.76	99.24	6.27	93.73	8.14	91.86	7.64	92.36	4.26	95.74

Table 5.6 provides the average expenditure on product types, at types of food outlets and cities. Generally, households residing in the larger cities had slightly higher expenditures on food at modern outlets than those residing in smaller cities. However, it is very interesting that households in Bogor (medium city) spent more on dairy and milk, meat and fish at modern formats than in Surabaya (big city). The possible reason for this is that Surabaya is closer than Bogor to traditional producers of those products. For example, Surabaya has a traditional fishing port and is also close to big traditional fish and cattle producers at Madura Island.

Table 5.6 Share of spending by type of food outlet and city (percentage of urban food expenditure)

	Surabaya		Bogor		Surakarta	
	Modern retailers	Traditional Retailers	Modern retailers	Traditional retailers	Modern retailers	Traditional retailers
Food	14.49	85.51	13.01	86.99	9.99	90.01
Grain	10.79	89.21	11.17	88.83	9.69	90.31
Roots and Tubers	0.55	99.45	0.37	99.63	2.24	97.76
Pulses	1.24	98.76	3.95	96.05	0.98	99.02
Milk and Dairy	20.91	79.09	24.96	75.04	16.79	83.21
Meat and Fish	3.68	96.32	11.18	88.82	3.67	96.33
Fresh Vegetables	0.58	99.42	0.92	99.08	1.32	98.68
Fresh Fruit	18.05	81.95	15.37	84.63	8.15	91.85
Other Foods	27.74	72.26	24.78	75.22	18.21	81.79
Meals Outside Home	6.81	93.19	1.87	98.13	4.01	95.99

The previous literature suggests that in the early penetration of modern food retailers, they tend to operate in big cities and then gradually spread to medium and small cities. Table 5.6 provides the average expenditure on product types, at types of food outlets and cities.

5.3.2 Determinants of household food expenditure shares at modern and traditional food retailers

Fractional logit models were estimated to determine the factors that explain food expenditure shares at modern and traditional food retailers. The estimated coefficients for

the fractional logit models are provided in Appendix 1-5. The partial effects of explanatory variables on the probabilities and conditional means of each food category are presented in Tables 5.7 to 5.10. For ease of interpretation, I focus on the discussion presented in this results section on the significance and signs of the variables for the modern retail outlet models.

The results shown in Table 5.7 suggest that females spend proportionally more at modern retail formats relative to traditional markets when compared to males. This is also true for expenditures on grain products (rice, maize, other grain, bread, cereal and instant noodles) as well as milk and dairy. On the other hand, females spend proportionally less on roots and tubers, pulses and vegetables at modern formats. Age was only significant in the expenditure share models for grain, roots and tubers, meat and fish and "other food"; in all models, older respondents spent proportionately less of their expenditures on these food products at modern retail outlets.

As expected, the variable *Resp_edu* was statistically significant and positive for "all food", grain, pulses, milk and dairy, meat and fish, and fruit, "other foods" and meals outside of home. These results indicate that more highly educated respondents spent a larger share of their expenditures on these categories of food products at modern food retailers versus traditional outlets.

The sign of the coefficient of the variable *Resp_work* was significant and negative for "all food" pulses, fruit, and "other foods" for the modern retailer expenditure share models. Hence, it seems that employed respondents were likely to spend more on those types of food categories at traditional food retailers. This is not surprising because shopping at modern retail outlets may be inconvenient for employed respondents who want to purchase food for evening meals before they go to work in the morning – modern food retailers tend to open much later in the morning than traditional retail outlets.

The variable *Child0to5* was positive and significant in predicting consumers' expenditure shares on all foods, milk and dairy, vegetables, and other foods at modern food retailers. A possible explanation for this might be that the households with children less than 5 years old were more concerned about safety of food, especially food for babies. Therefore, they tended to shop at retail formats perceived to be best for safety. The previous results of this study confirm that modern outlets were perceived as outlets providing food safety. The variable *Child6to12* was only statically significant and negative for the share of food expenditures made at modern retailers on grain and meals outside the home at traditional markets. This finding suggests that the respondents who had children 6 and 12 years old in their home spent proportionally less on grain and food away from home at modern retail outlets.

Regarding the importance of household economic status, total household expenditure was used as a proxy for household income. Four dummies for quintile expenditure were created representing permanent income. The coefficients on *Percap2*, *Percap3*, *Percap4*, *Percap5* were positive and statistically significant for household expenditure shares on all food, grain, milk and dairy, meat and fish (only *Percap4*, *Percap5* were significant), fruit and other foods (fats, cake, pastries, processed food, etc.). This suggests that higher income households spend proportionally more at modern retail outlets on these products than at traditional retail formats, *ceteris paribus*. However, the results of the current study do not support previous research (Gorton, Sauer & Supatpongkul 2011; Narayan, Rao & Sudhir 2012), which has found that modern food retailers are not only used by a specific income class, but are patronized by all income classes. Not surprisingly, households with assets such as cars and motorbikes also tended to spend proportionally more at modern retail outlets for these items.

Additionally, the coefficient on the *Refrigerators* variable was significant and positive for modern food retail expenditure shares for the food, milk and dairy, and meat and fish. This may suggest that respondents from households with a refrigerator purchase larger quantities of these products because they are able to store them in the refrigerator. Overall, the findings showed that households with higher levels of assets and wealth spent proportionally more on most food products at modern outlets. This finding is also consistent with that reported by Bai, Wahl, and McCluskey (2008) and Rodriguez et al. (2002).

As expected, the sign of the coefficient for *Timemodern* was negative in all food categories for expenditure shares at modern markets (except for meals outside the home). However, the coefficient was only significant for the all foods, fruit and other foods models. Regarding location, the respondents residing in urban areas such as Surabaya or Bogor were spent proportionally more at modern retail outlets on all food, milk and dairy, fruit, and other foods. Although I focus the discussion on the modern retail outlet models, it is worth mentioning that compared to the respondents from smaller cities (Surakarta), the respondents from Surabaya spent a significantly higher proportion on meat and fish at traditional retail outlets than modern outlets. The reason for this result is not clear, but it may possibly be because Surabaya is close to more traditional fish markets than its counterparts.

Table 5.7 Partial effects - Fractional logit, by expenditure shares on food, grain and roots and tubers at modern and traditional retailers

Variable	Food		Grain		Roots and Tubers	
	Modern retailers	Traditional retailers	Modern retailers	Traditional retailers	Modern retailers	Traditional retailers
Resp_sex	0.024**	-0.024**	0.028**	-0.025	0.000	0.086*
	(0.010)	(0.010)	(0.014)	(0.016)	(0.000)	-0.051
Resp_age	-0.000	0.000	-0.001**	0.001	0.000	0.007***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)
Resp_edu	0.008***	-0.008***	0.006***	-0.005***	-0.000	0.008*
	(0.001)	(0.001)	(0.002)	(0.002)	(0.000)	(0.005)
Resp_work	-0.015**	0.015**	-0.002	0.001	-0.000	0.052*
	(0.007)	(0.007)	(0.010)	(0.011)	(0.000)	(0.031)
Child0to5	0.072***	-0.072***	0.004	-0.006	0.000	0.124***
	(0.009)	(0.009)	(0.012)	(0.012)	(0.000)	(0.033)
Child6to12	-0.004	0.004	-0.022**	0.024**	-0.000	-0.005
	(0.007)	(0.007)	(0.010)	(0.011)	(0.000)	(0.033)
D_exployee	0.011	-0.011	0.023*	-0.025*	-0.000	0.040
	(0.009)	(0.009)	(0.014)	(0.015)	(0.000)	(0.047)
Percap2	0.027*	-0.027*	0.023	-0.020	-0.000	-0.009
	(0.016)	(0.016)	(0.026)	(0.027)	(0.000)	(0.049)
Percap3	0.078***	-0.078***	0.087**	-0.085**	-0.000**	-0.002
	(0.019)	(0.019)	(0.037)	(0.038)	(0.000)	(0.052)
Percap4	0.098***	-0.098***	0.093**	-0.103**	0.000	0.053
	(0.020)	(0.020)	(0.036)	(0.040)	(0.000)	(0.055)
Percap5	0.112***	-0.112***	0.162***	-0.168***	0.000	-0.101
	(0.023)	(0.023)	(0.048)	(0.051)	(0.000)	(0.069)
Car_motor	0.034***	-0.034***	0.038**	-0.032*	0.000**	0.017
	(0.0119)	(0.012)	(0.018)	(0.019)	(0.000)	(0.043)
Refrigerators	0.053***	-0.053***	0.032*	-0.025	0.000	-0.004
	(0.010)	(0.010)	(0.016)	(0.017)	(0.000)	(0.042)
Creditcard	0.010	-0.0101	0.020	-0.022	0.000	-0.054
	(0.009)	(0.009)	(0.014)	(0.015)	(0.000)	(0.049)
Timemodern	-0.001***	0.001***	-0.001	0.000	-0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.002)
Timeminimkt	0.001	-0.001	-0.001	0.000	0.000	0.000
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.002)
Timewetmkt	0.000	-0.000	-0.000	0.000	0.000	0.001
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.002)

Note: ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively. Standard errors are in parentheses.

Table 5.7 Partial effects - Fractional logit, by expenditure shares on food, grain, and roots and tuber at modern and traditional retailers (continued)

Variable	Food		Grain		Roots and Tubers	
	Modern retailers	Traditional retailers	Modern retailers	Traditional retailers	Modern retailers	Traditional retailers
Surabaya	0.033***	-0.033***	0.019	-0.021	0.000	-0.039
	(0.009)	(0.009)	(0.013)	(0.014)	(0.000)	(0.039)
Bogor	0.037***	-0.037***	0.033*	-0.035*	0.000	-0.093*
	(0.013)	(0.013)	(0.019)	(0.020)	(0.000)	(0.049)
Safety	0.034***	-0.034***	0.034**	-0.033**	0.000	0.002
	(0.010)	(0.001)	(0.016)	(0.016)	(0.000)	(0.046)
Label	0.012***	-0.012***	0.011*	-0.008	0.000	0.028*
	(0.004)	(0.004)	(0.001)	(0.007)	(0.000)	(0.016)
Nutrition	0.008**	-0.008**	0.012*	-0.013*	0.000	0.000
	(0.004)	(0.004)	(0.001)	(0.007)	(0.000)	(0.015)
Riskaverse	0.010**	-0.010**	0.010	-0.006	0.000	-0.015
	(0.004)	(0.004)	(0.001)	(0.007)	(0.000)	(0.016)
Service	0.002	-0.002	0.005	-0.006	0.000	-0.025
	(0.003)	(0.003)	(0.005)	(0.006)	(0.000)	(0.015)
Convenience	-0.002	0.002	0.000	0.007	0.000	-0.013
	(0.003)	(0.003)	(0.005)	(0.006)	(0.000)	(0.015)
Price sensitive	-0.006*	0.006*	-0.016***	0.021***	0.000	0.020
	(0.003)	(0.003)	(0.005)	(0.006)	(0.000)	(0.016)

Note: ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively. Standard errors are in parentheses.

Table 5.8 Partial effects - Fractional logit, by expenditure shares on pulses, milk and dairy, and meat and fish

Variable	Pulses		Milk and Dairy		Meat and Fish	
	Modern retailers	Traditional retailers	Modern retailers	Traditional retailers	Modern retailers	Traditional retailers
Resp_sex	-0.010	0.058**	0.054*	-0.038	0.007	0.046
	(0.007)	(0.024)	(0.029)	(0.033)	(0.007)	(0.028)
Resp_age	0.000	0.000	0.000	-0.001	-0.000**	0.001
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
Resp_edu	0.000*	0.000	0.020***	-0.017***	0.003***	-0.005**
	(0.000)	(0.001)	(0.003)	(0.003)	(0.001)	(0.002)
Resp_work	-0.005**	0.018**	-0.029	0.03	-0.006	0.012
	(0.002)	(0.007)	(0.021)	(0.022)	(0.005)	(0.013)
Child0to5	0.000	-0.001	0.054**	-0.066***	0.003	0.005
	(0.002)	(0.009)	(0.024)	(0.025)	(0.006)	(0.015)
Child6to12	-0.001	-0.003	0.033	-0.024	0.002	0.001
	(0.002)	(0.007)	(0.022)	(0.023)	(0.005)	(0.013)
D_exployee	0.003	-0.002	0.004	-0.003	0.008	-0.031
	(0.002)	(0.009)	(0.028)	(0.030)	(0.007)	(0.019)
Percap2	-0.004	-0.032	0.075	-0.043	0.029	0.007
	(0.004)	(0.025)	(0.049)	(0.047)	(0.022)	(0.026)
Percap3	0.026	-0.027	0.135***	-0.095**	0.043	0.02
	(0.023)	(0.024)	(0.050)	(0.047)	(0.027)	(0.024)
Percap4	0.022	-0.032	0.201***	-0.171***	0.070**	-0.019
	(0.018)	(0.022)	(0.051)	(0.049)	(0.034)	(0.027)
Percap5	0.036	-0.112**	0.264***	-0.237***	0.092**	-0.062*
	(0.027)	(0.051)	(0.058)	(0.055)	(0.041)	(0.035)
Car_motor	0.000	-0.002	0.058*	-0.038	0.013	0.018
	(0.005)	(0.013)	(0.030)	(0.033)	(0.008)	(0.023)
Refrigerators	0.000	0.047**	0.069**	-0.046	0.020**	0.007
	(0.005)	(0.019)	(0.030)	(0.032)	(0.009)	(0.020)
Creditcard	0.006	-0.023	0.052*	-0.058*	0.017**	-0.033
	(0.005)	(0.016)	(0.028)	(0.031)	(0.008)	(0.020)
Timemodern	0.000	0.000	-0.002	0.003*	0.000	0.001
	(0.000)	(0.000)	(0.001)	(0.002)	(0.000)	(0.001)
Timeminimkt	0.000	0.000	0.002	-0.001	0.000	0.000
	(0.000)	(0.000)	(0.002)	(0.002)	(0.000)	(0.001)
Timewetmkt	0.000	0.001*	0.000	-0.001	0.000	0.001*
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
Surabaya	0.004	0.004	0.059**	-0.067**	-0.006	0.043**
	(0.003)	(0.011)	(0.027)	(0.029)	(0.007)	(0.018)
Bogor	0.015*	-0.028	0.143***	-0.145***	0.031**	-0.037
	(0.009)	(0.018)	(0.039)	(0.040)	(0.013)	(0.025)
Safety	-0.002	0.004	0.081**	-0.072**	0.012	0.018
	(0.002)	(0.010)	(0.032)	(0.032)	(0.009)	(0.020)
Label	0.001	0.003	0.000	0.007	-0.002	0.010
	(0.002)	(0.004)	(0.011)	(0.012)	(0.003)	(0.008)
Nutrition	-0.001	0.001	-0.009	0.015	0.008***	0.001
	(0.001)	(0.004)	(0.012)	(0.013)	(0.003)	(0.007)
Riskaverse	0.000	0.005	0.020*	-0.014	0.000	0.011
	(0.001)	(0.004)	(0.011)	(0.012)	(0.003)	(0.007)
Service	0.001	-0.001	0.009	-0.010	0.001	-0.009
	(0.001)	(0.003)	(0.010)	(0.010)	(0.003)	(0.007)
Convenience	0.000	0.002	0.014	0.012	0.005*	-0.009
	(0.001)	(0.004)	(0.011)	(0.011)	(0.003)	(0.006)
Price sensitive	-0.001*	0.007*	-0.014	0.020*	-0.002	0.004
	(0.001)	(0.004)	(0.010)	(0.011)	(0.002)	(0.006)

Note: ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively. Standard errors are in parentheses.

Table 5.9 Partial effects - Fractional logit, by expenditure shares on vegetables and fruit at modern and traditional retailers

Variable	Vegetables		Fruit	
	Modern retailers	Traditional retailers	Modern retailers	Traditional retailers
Resp_sex	-0.002	0.0196**	-0.017	0.036
	(0.004)	(0.009)	(0.025)	(0.035)
Resp_age	0.000	0.000	-0.001	0.001
	(0.000)	(0.000)	(0.001)	(0.001)
Resp_edu	0.000	-0.001**	0.009***	-0.007**
	(0.000)	(0.000)	(0.002)	(0.003)
Resp_work	-0.002	0.004	-0.032**	0.03
	(0.002)	(0.003)	(0.015)	(0.021)
Child0to5	0.004*	-0.004	0.022	-0.009
	(0.002)	(0.003)	(0.017)	(0.023)
Child6to12	-0.004**	0.004	-0.004	0.014
	(0.002)	(0.003)	(0.015)	(0.021)
D_exployee	0.002	-0.003	0.019	-0.0445*
	(0.003)	(0.004)	(0.018)	(0.027)
Percap2	-0.001	-0.005	0.083*	0.035
	(0.005)	(0.010)	(0.049)	(0.037)
Percap3	-0.001	-0.033	0.121**	0.037
	(0.004)	(0.023)	(0.050)	(0.036)
Percap4	0.002	-0.040	0.208***	-0.033
	(0.006)	(0.028)	(0.056)	(0.041)
Percap5	0.014	-0.091*	0.266***	-0.104**
	(0.011)	(0.053)	(0.065)	(0.052)
Car_motor	0.006**	0.005	0.029	0.021
	(0.002)	(0.007)	(0.027)	(0.033)
Refrigerators	0.002	0.008	0.037	-0.004
	(0.003)	(0.008)	(0.025)	(0.031)
Creditcard	0.002	0.001	0.036*	-0.042
	(0.003)	(0.003)	(0.021)	(0.029)
Timemodern	0.000	0.000	-0.003***	0.005***
	(0.000)	(0.000)	(0.001)	(0.001)
Timeminimkt	0.000	0.000	0.001	-0.002
	(0.000)	(0.000)	(0.001)	(0.002)
Timewetkt	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.001)	(0.001)
Surabaya	0.000	0.001	0.133***	-0.148***
	(0.002)	(0.004)	(0.021)	(0.027)
Bogor	0.006*	-0.003	0.105***	-0.129***
	(0.003)	(0.005)	(0.033)	(0.040)
Safety	0.007*	-0.015*	0.051**	-0.058*
	(0.004)	(0.008)	(0.025)	(0.033)
Label	0.001*	-0.001	0.000	0.004
	(0.001)	(0.002)	(0.008)	(0.012)
Nutrition	0.000	0.002	0.006	0.002
	(0.001)	(0.002)	(0.009)	(0.011)
Riskaverse	0.001	0.000	0.008	-0.008
	(0.001)	(0.002)	(0.008)	(0.012)
Service	0.001	-0.001	0.017**	-0.022**
	(0.001)	(0.001)	(0.007)	(0.011)
Convenience	0.000	0.001	0.013*	-0.024**
	(0.001)	(0.001)	(0.007)	(0.010)
Price sensitive	-0.002*	0.003**	-0.023***	0.028***
	(0.001)	(0.001)	(0.008)	(0.000)

Note: ***,**,*, indicate statistical significance at the 1%,5%,10%,respectively. Standard errors are in parentheses.

Table 5.10 Partial effects - Fractional logit, by expenditure shares on other foods and meals outside home at modern and traditional retailers

Variable	Other Foods		Meals Outside Home	
	Modern retailers	Traditional retailers	Modern retailers	Traditional retailers
Resp_sex	0.058***	-0.058***	0.003	-0.007
	(0.021)	(0.021)	(0.009)	(0.050)
Resp_age	0.001**	-0.00145**	0.000	-0.002
	(0.001)	(0.001)	(0.000)	(0.001)
Resp_edu	0.015***	-0.015***	0.001*	0.004
	(0.002)	(0.002)	(0.001)	(0.004)
Resp_work	-0.036**	0.036**	0.000	0.046
	(0.014)	(0.014)	(0.006)	(0.031)
Child0to5	0.144***	-0.144***	0.005	0.01
	(0.018)	(0.018)	(0.007)	(0.036)
Child6to12	0.009	-0.009	-0.014**	0.167***
	(0.015)	(0.015)	(0.006)	(0.032)
D_employee	0.019	-0.019	0.034**	-0.099*
	(0.019)	(0.019)	(0.014)	(0.053)
Percap2	0.041	-0.041	0.001	0.059
	(0.031)	(0.031)	(0.015)	(0.047)
Percap3	0.122***	-0.122***	0.004	0.075
	(0.033)	(0.033)	(0.016)	(0.050)
Percap4	0.153***	-0.153***	0.007	0.194***
	(0.035)	(0.035)	(0.018)	(0.048)
Percap5	0.150***	-0.150***	-0.003	0.320***
	(0.039)	(0.039)	(0.014)	(0.045)
Car_motor	0.078***	-0.078***	-0.001	0.131***
	(0.023)	(0.023)	(0.011)	(0.045)
Refrigerators	0.102***	-0.102***	0.023***	-0.067
	(0.021)	(0.021)	(0.009)	(0.041)
Creditcard	0.021	-0.021	-0.009	0.155***
	(0.019)	(0.019)	(0.006)	(0.047)
Timemodern	-0.002**	0.002**	0.000	-0.001
	(0.001)	(0.001)	(0.000)	(0.002)
Timeminimkt	0.001	-0.001	0.000	-0.003
	(0.001)	(0.001)	(0.000)	(0.002)
Timewetmkt	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.000)	(0.002)
Surabaya	0.054***	-0.054***	0.027***	0.034
	(0.018)	(0.018)	(0.010)	(0.039)
Bogor	0.060**	-0.060**	-0.001	0.094**
	(0.025)	(0.025)	(0.011)	(0.046)
Safety	0.065***	-0.065***	-0.009	0.164***
	(0.021)	(0.021)	(0.006)	(0.040)
Label	0.016*	-0.016*	0.008*	-0.017
	(0.009)	(0.009)	(0.004)	(0.017)
Nutrition	0.002	-0.002	0.003	-0.015
	(0.008)	(0.008)	(0.003)	(0.015)
Riskaverse	0.023***	-0.023***	0.010***	-0.0276*
	(0.008)	(0.008)	(0.004)	(0.017)
Service	-0.007	0.007	0.003	-0.003
	(0.007)	(0.007)	(0.003)	(0.016)
Convenience	0.006	-0.006	0.000	0.007
	(0.007)	(0.007)	(0.003)	(0.016)
Price sensitive	0.003	-0.003	0.003	0.016
	(0.007)	(0.007)	(0.003)	(0.017)

Note: ***,**,*, indicate statistical significance at the 1%,5%,10%,respectively. Standard errors are in parentheses.

The importance of food safety as a consideration for purchases (*Safety*) positively influenced the share of expenditure on all foods, grain, dairy and milk, vegetables, fruit and other food in modern food retailers. Thus, the respondents who considered safety to be an important factor when deciding where to purchase foods spent proportionally more at modern food retailers on most types of foods. These findings are also consistent with the findings of a previous study by Gorton, Sauer, and Supatpongkul (2011).

The *Label* variable was a significant factor and had positive correlation with higher food expenditure shares at modern retail outlets for the following models: all foods, grain, vegetables, other foods, and meals and beverages outside the home. This result may be explained by the fact that modern retailers generally provide labelled products so consumers who are highly concerned about label use are more likely to purchase food from modern food retailers. The sign of the coefficient for the variable *Nutrition* was mixed, it was only positive and significant in modern retail outlet models for all foods, grain, and meat and fish. A possible explanation for this might be that currently supermarkets have provided more variety meats, included low-fat meat products. In addition, the supermarkets also have offered a variety of fish imported. Hence, consumers who are highly concerned about nutrition are more likely to purchase meat and fish from the modern food retailers.

The empirical results also showed that the sign of the coefficient for the variable *Riskaverse* was mixed, but was only significant for the proportion of expenditure on all foods, dairy and milk, other foods and meals and beverages outside the home in modern food retail expenditure share models. The findings indicate that consumers who valued attributes of quality, freshness, and product information tended to spend a higher proportion on these foods at modern food retail outlets. This may be a plausible explanation for the finding that consumers are more likely trust to the modern food

retailers providing product information and quality assurance because they are more regulated and controlled by the government.

There were significant and positive relationships between service attributes (fast service, friendly staff, and cleanliness) and the share of food expenditure on fruit in modern food retail outlets. As expected, the coefficient of the variable *Price sensitive* was negative and significant in the modern retail expenditure share models for all food, grain, pulses, vegetables, and fruit. The results indicated that consumers who were *price sensitive* were more likely to purchase those foods at traditional food retailers. These results differ from the Thai study conducted by Gorton, Sauer, and Supatpongkul (2011), but they are broadly consistent with previous studies by Goldman, Krider, and Ramaswami (1999), and Goldman, Ramaswami, and Krider (2002). This results may be explained by the fact that traditional food market typically run their business under structures which allow them pricing advantages compared to modern food retailers. As Goldman, Krider, and Ramaswami (1999), and Goldman, Ramaswami, and Krider (2002) report that the traditional food retailers usually use simple building and equipment and use family labor or lower labor cost. As a result, the traditional food retailers have lower per-unit retailing cost. In contrast, the modern food retailers must bear extra service related to processing, sorting, repacking, refrigerating, distribution, and general overhead. Thus, they have less advantages in operating cost relative to the traditional food retailers.

5.4 Conclusions and Implications

The Indonesian food retail sector has undergone significant transformation, this is partially a result of increasing penetration of modern food retailers. No known studies exist to explain the relationship between the penetration of modern retailers in Indonesia and its effect on consumer food expenditure shares at both modern versus traditional food

retailers. This research attempted to assess the determinants of consumers' expenditure shares on food categories in both modern and traditional food retail formats.

The results show that in general, Indonesian urban consumers continue to purchase most of their food at traditional food outlets. This finding supports the conclusion of the previous chapter and also confirms the view that traditional food retailers still dominate food retail markets in Indonesia. However, as household disposable incomes increase, the share of food expenditures at modern retail outlets relative to traditional outlet also appears to increase for nearly all food product categories, except roots and tubers, vegetables and pulses.

These findings support the conclusion of the previous chapter that modern food retailers tend to cater to consumers from middle and high income households that exhibit strong concerns about quality, food safety and those consumers who value having access to product information (e.g., nutrition information) and the convenience aspects considered here. The results of the econometrics analysis confirm that consumers who have the highest probability of spending more on food at modern food retailers are higher educated females living in households with young children, relatively high household incomes, and assets. Additionally, the respondents living closer to modern retail outlets and in larger urban areas such as Surabaya and Bogor also tend to spend a proportionally higher amount on food at modern retail outlets. This is not surprising considering that the diffusion of modern retail outlets is higher in these urban locations compared to Surakarta.

Another interesting finding of this research was that consumers' attitudes towards food safety were a consistent influence on the share of expenditure on food at modern food retailers. In addition, the results of this study also revealed that consumers' perceptions on food label and nutrition positively exert influence on the share of expenditure on several food categories at modern retailers. This finding indicates that the rise of consumers' food

safety awareness, food label, and nutrition in Indonesia are likely to result in modern retail seizing a new consumer base.

The findings also indicated that price-sensitive consumers tended to spend proportionally more at traditional food retailers. This appears to imply that price-sensitive consumers are still very dependent on traditional food retailers. If traditional food retailers are crowded out of the market, consumers' access to affordable products might decrease. Therefore, research that sheds light on potential implications of penetration of modern markets on consumer behaviour in developing countries. However, this research is only based on a cross-sectional sample of households on the Java Island. Ideally, future research would explore buying behaviour at retail outlets for a longer period of time to understand the dynamic effects of modern retail penetration on consumer behaviour. Further work should also consider expanding the sample to other areas of Indonesia, particularly urban areas on other islands.

This chapter only provided evidence of how socio-economic and behavioural factors influenced household food expenditure shares at both modern and traditional food retail. The following chapter will expand upon the issue by analysing the effect of food expenditure shares at modern food retailers on the healthiness of food expenditure shares.

Chapter 6: Diet Transition and Supermarket Shopping Behaviour: Is there a Link?

6.1 Introduction

Economic growth, urbanization, and foreign direct investment (FDI) have all contributed towards the rapid rise of domestic and international chains of supermarkets in developing and emerging economies such as Indonesia (Faiguenbaum, Berdegué & Reardon 2002; Reardon et al. 2003). The transformation of the food retail sector often referred to as the "supermarket revolution" is having a profound effect on the market conditions faced by both producers and consumers in many countries (Faiguenbaum, Berdegué & Reardon 2002). Previous research on the emergence of supermarkets in developing countries has focused on their impact on small-holder farmers (Bignebat, Koc & Lemeilleur 2009; Hernández, Reardon & Berdegué 2007; Michelson, Reardon & Perez 2011), rural development (Dries et al. 2009; Hu et al. 2004; Neven et al. 2009; Rao & Qaim 2011; Reardon, Stamoulis & Pingali 2007; Reardon et al. 2003; Weatherspoon & Reardon 2003), small traders (Cadilhon et al. 2006; Faiguenbaum, Berdegué & Reardon 2002; Gorton, Sauer & Supatpongkul 2011; Schipmann & Qaim 2011a; Suryadarma et al. 2010; Zhang & Pan 2013), and consumer purchasing habits (Bai, Wahl & McCluskey 2008; D'Haese & Van Huylenbroeck 2005; Neven et al. 2006; Rodriguez et al. 2002).

Despite the important role of supermarkets in the transformation of food markets, only a handful of studies have considered their impact on food consumption patterns and the related health implications (Asfaw 2008; Banwell et al. 2013; Kelly et al. 2014a; Tessier et al. 2008; Zhang, van der Lans & Dagevos 2012). There is, however, increasing speculation that supermarket penetration is one cause of the dramatic shift in Asian diets towards more westernized diets, typified by increased consumption of refined

carbohydrates, fats and oils, at the expense of grains, fresh fruits and vegetables (Asfaw 2008; D'Haese & Van Huylenbroeck 2005; Mendez & Popkin 2004; Popkin 1999, 2006).

The World Health Organization is concerned about the impact of dietary changes on the health status of consumers in many developing Asian countries because consumption of highly processed foods has been linked to an increased risk of non-communicable chronic diseases (NCDs) such as cardiovascular disease and Type II diabetes (Asfaw 2008). The diffusion of supermarkets can have important dietary implications, which are both positive (e.g. increasing diet diversity, lower food prices and increased food accessibility) and negative (e.g. inequalities in food accessibility and increased consumption of nutrient-poor, highly-processed foods) (Banwell et al. 2013; Hawkes 2008).

Previous empirical studies using data from Tunisia, Guatemala, and Thailand, have examined the relationship between supermarket use and diet quality, but the results of these studies have been mixed (Asfaw 2008; Kelly et al. 2014a; Tessier et al. 2008). Additional research is needed to understand the implications of supermarket sector growth and diet transition in Indonesia. Therefore, I use household-level data from a survey of 1180 urban Indonesian households from Java Island to examine whether a higher share of food expenditures at modern food retail outlets ("supermarkets") are associated with greater consumption of specific "unhealthy" food products. I use methods similar to those used by Volpe, Okrent, and Leibtag (2013) to develop household-level measures for: 1) "healthy" and "unhealthy" food expenditure shares, and 2) food expenditure shares made in "supermarkets", which include all types of modern food retailers (hypermarkets, supermarkets, and mini-markets) found in Indonesia.

Indonesia, particularly Java Island, is an interesting setting in which to explore the relationship between supermarket use and diet quality. Indonesia has been undergoing

significant economic growth and urbanisation. Furthermore, food retailing has been transforming since 1998 when the Indonesian government began to allow foreign direct investment in food (Bank 2007; Reardon, Timmer & Minten 2012). Between 1999 and 2009, the number of supermarkets increased by 67% with the majority (roughly 75%) of those owned by multinational companies (Dyck, Woolverton & Rangkuti 2012). The growth was much more intense on Java Island, particularly around the greater Jakarta metropolitan area, Jabotabek, which has a population of around 18 million and includes the cities of Bogor, Depok, Bekasi and Tangerang.

6.2 Data and Methods

6.2.1 Data from the Indonesia survey of urban consumers

The analysis in this article uses data from the Indonesia Survey of Urban Consumers, which includes a sample of 1180 urban households in three cities in Indonesia: Surabaya, Bogor, and Surakarta, representing large, medium, and small cities, respectively. These three cities also represent different stages of "supermarket penetration" and urbanisation, with higher modern food retail penetration in Bogor and Surabaya compared to Surakarta. Additionally, there are likely ethnic and cultural differences in the populations these cities.

Within each city, I used a stratified random sampling approach to select households, while oversampling higher-income neighbourhoods and areas close to supermarkets. Sampling weights were calculated based on the inverse of the probability of selection, and were used in the calculation of all results presented here. The survey was implemented from November 2010 to February 2011 by trained and experienced enumerators. Enumerators conducted the interviews in-person at the homes of the respondents.

The questionnaire covered household composition, housing and asset ownership, shopping behaviour at different types of outlets, food expenditure patterns, and perceptions

of each type of food retailer. The food expenditure module collected information on the amount households spent on 67 food items and the most important type of retailer for each item. Shopping behaviour at seven types of food retail outlets were identified and considered: hypermarkets, supermarkets, convenience stores, small shops (warung), semi-permanent stands, traditional wet markets, and peddlers. In this study, "modern food retailers" or "supermarkets" are defined to include hypermarkets, supermarkets, and convenience stores.

6.2.2 Econometric approach

To explore the possible link between diet quality and supermarket use in Indonesia, I estimate the household-level share of food expenditures spent on "healthy" food products as a function of the household-level share of food expenditures at modern retail outlets. Similar to Volpe, Okrent, and Leibtag (2013), the United States Department of Agriculture's (USDA's) Guidelines for Healthy Eating USDA (2010) are used to categorise food items as either "healthy" or "unhealthy". According to the USDA (2010) classification, "healthy" items include grains, roots and tubers, fruit, vegetables, unprocessed meat, milk, and eggs. "Unhealthy" items include sugar, sweetened food and beverages, fats, oils, and processed foods such as snack food, processed meat, and ready-to-eat meals. The general form of the econometric model used in this study is presented below:

$$HealthyShare = f(\text{Pct\_modern, Female, Age, Age2, Education, Hourjob, Label, Income, Household\_size, Children5, Domestic, Activity, FAFH, Surabaya, Bogor}) \quad (6.1)$$

Table 6.1 provides the definitions, means and standard error of all variables. Following the approach of Asfaw (2008) and Volpe, Okrent, and Leibtag (2013), the dependent

variable, *HealthyShare*, is a continuous variable representing the share of household food expenditures considered to be healthy.

Pct_modern is the explanatory variable of interest. It is a continuous variable representing household share (%) of food expenditures taking place at supermarkets (hypermarkets, supermarkets, and convenience stores). Excluded are food expenditures made at traditional retail outlets, including small shops, semi-permanent stands, traditional wet markets, and peddlers. As discussed earlier, consumers who purchase a larger share of their food at modern retail outlets may purchase less healthy foods for their household.

The enumerators interviewed the primary person responsible for making food purchase decisions for the household. Therefore, I include several variables representing respondents' socio-demographic characteristics as these may influence household food expenditures on certain types of foods (Huston & Finke 2003; Schroeter, Anders & Carlson 2013; Umberger et al. 2015). *Female* is a dummy variable equal to one if the respondent was female. *Age* and *Age2* represent the age of the respondent and age of respondent squared, respectively. The partial effect of age on the share of healthy food expenditures is expected to be positive because previous studies have shown that individuals become more concerned about the healthfulness of their diet as they get older (Frazao & Allshouse 2003).

Table 6.1 Definitions and descriptive statistics for variables

Variable	Definition	Mean	Std. Dev.	Min	Max
HealthyShare	% of food expenditures classified as healthy	68.71	15.05	2.93	98.52
Pct modern	% of food expenditures made at modern retail outlets	13.39	14.97	0	83.714
Female	Gender (0 = Male; 1 = Female)	0.89	0.32	0	1
Age	Respondent's age in years	43.02	12.4	15	83
Age2	Respondent's age-squared	2004.36	1151.8	225	6889
Education	Years of education completed by respondent	9.35	4.52	0	22
Hourjob	Number of hours per week spent at respondent's job	21.11	25.01	0	130
Label	Factor scores representing respondents' nutrition concerns, food label use and perceived nutrition knowledge	-0.07	1.06	-4.94	2.42
Income	Household income (US$/year)	4932.07	4906.95	327.33	77730.45
Household_size	Number of family members living in household	4.41	1.76	1	12
Children5	Dummy for household with children under 5 years old (1=Yes; 0 = Otherwise)	0.58	0.49	0	1
Domestic	Dummy for households with a domestic employee (1 = Yes; 0 = Otherwise)	0.16	0.37	0	1
Activity	Average hours per week adults in the household exercise	2.11	3.13	0	35
FAFH	% of food expenditures spent on meals and beverages eaten outside of the home	7.41	10.75	0	95.39
Surabaya	Dummy for Surabaya (1 = Surabaya; 0 = Otherwise)	0.61	0.49	0	1
Bogor	Dummy for Bogor (1 = Bogor; 0 = Otherwise)	0.21	0.41	0	1
Time_modern	Time needed to get to the nearest modern food retailer (minutes)	18.98	10.45	1.5	120
Food_safety	Dummy variable (1 = respondent indicated that a retail outlet offering food safety assurances is important or extremely important when deciding where to purchase food; 0 = Otherwise)	0.96	0.19	0	1

Education is the number of years of education completed by the respondent. Respondents with higher education may be more aware of the relationship between diet, nutrition and health and thus decide to purchase healthier food for their households (Turrell & Kavanagh 2006). Also, more educated consumers may have a lower future discount rate, making them more likely to purchase healthy food as an investment in their family's future (Huston & Finke 2003; Schroeter, Anders & Carlson 2013).

Hourjob is the number of hours per week that the respondent spends at work. Respondents who work longer hours may have less time to spend on household food shopping and food purchase decisions Mancino and Kinsey (2004). Label is a factor score representing respondents' attitudes based on a Likert scale response to a series of questions related to their use of nutrition labels and preferences for nutrition information. Respondents with a larger positive factor indicated a preference for nutrition information and more frequent use of nutrition labels. Respondents who are more concerned about nutrition are expected to spend more on "healthy food" (Huston & Finke 2003).

Several household characteristics are included as they may also influence the share of total food expenditures on healthy food. The per capita household expenditures is used as a proxy for Income. Households with higher incomes may face fewer economic barriers to buying healthy food, particularly if healthy food is more expensive (Smith, Bogin & Bishai 2005). *Household_size* is included because households with more family members to support may have less disposable income (Schroeter, Anders & Carlson 2013). *Children5* is a dummy variable equal to one if there are children under five years of age living in the household. Households with young children may make different food purchasing decisions due to specific dietary needs of young children (Umberger et al. 2015). Domestic is a dummy variable equal to one if the household has a domestic employee that helps with

household duties, including shopping for food. This could have either a positive or negative impact on *HealthyShare*.

Activity is a continuous variable representing average hours per week adults in the household spend exercising. Households with adults who exercise more may place more value on foods that are healthy, and therefore, may have a higher share of food expenditures on healthy food (Huston & Finke 2003; Komlos, Smith & Bogin 2004; Mancino & Kinsey 2004). The variable FAFH is an additional measure of the impact of the food market environment on food consumption behaviour. It is the household's share of total food expenditures on food-away-from-home (FAFH), including meals and beverages prepared and eaten outside the home. Previous research has found that individuals who consume more FAFH tend to have poorer quality diets as a result of other food market environment factors (Bezerra & Sichieri 2009; Drichoutis, Nayga Jr & Lazaridis 2012).

Surabaya and *Bogor* are dummy variables representing city-level fixed effects. Compared to Surakarta, Surabaya and Bogor are more metropolitan with more mature modern food retailing sectors. There may also be unobservable city-level factors, such as social norms, cultural traditions, and climatic conditions, which have an effect on food expenditure shares (Umberger et al. 2015).

6.2.3 Estimation and instrumental variables

I first estimate Equation (6.1) using ordinary least squares (OLS) controlling for the set of observable factors (discussed above) that may influence food-purchasing decisions. However, using OLS, the coefficient on the modern-share variable (*Pct*_modern) may not accurately measure the effect of use of modern retailers on healthfulness of food consumption patterns for three reasons. First, there may be reverse causation: a household that prefers unhealthy food may decide to shop at supermarkets, resulting in over-

estimation of the effect of modern retailers on food consumption patterns. Second, an unobserved variable may be influencing both the modern share and the unhealthy share of food spending. For example, if watching television exposes viewers to advertisements for supermarkets as well as advertisements for unhealthy foods, OLS will over-estimate the effect of modern retailers by attributing the effect of advertising to supermarket shopping. Third, the estimates of food expenditures may be subject to measurement error (Gibson & Kim 2007). In this case, OLS will under-estimate the impact of modern retailer use on food consumption patterns. In all three cases, the explanatory variable is correlated with the error term, thus violating one of the assumptions behind OLS and resulting in biased and inconsistent estimates of the coefficient.

To address these problems, an instrumental variable (IV) technique can be used, in which the potentially endogenous explanatory variable, *Pct_modern*, is replaced by an estimated value of the variable. The estimated value is based on a supplementary regression of the potentially endogenous explanatory variable as a function of one or more IVs (or instruments). In the IV approach, the main equation is represented as:

$$y_i = \alpha_0 + \alpha_1 M_i + \beta_i X_i + \varepsilon_i \quad \text{.....(6.2)}$$

where y_i is the share of food expenditures for household *i* spent on healthy food, M_i is the estimated share of food expenditures for household *i* purchased at modern food retail outlets, X_i is a vector of the independent variables, α_0, α_1, and β_i are parameters to estimate and ε_i is the error term. M_i is estimated using the following equation:

$$M_i = \beta_i X_i + \gamma Z_i + \upsilon_i \quad \text{.....(6.3)}$$

where Z_i is a vector of instrumental variables, γ is an estimated parameter and υ_i is the error term.

A major challenge in implementing IV estimations is finding valid instruments. Instruments must meet the relevance condition, meaning that they must be strongly correlated with the potentially endogenous explanatory variable (*Pct_modern*). Additionally, instruments must meet the exclusion restriction, meaning they cannot be correlated with any omitted variable that may help explain the dependent variable (i.e. they must not be correlated with the error terms) (Stock & Watson 2012).

A standard IV, used for studying the impact of supermarket use, is distance to the nearest retail outlet (Volpe, Okrent & Leibtag 2013). However, in Indonesia, distance does not provide a good measure of access to shopping outlets and food markets due to the absence of good public transportation and related traffic congestion in urban areas. Rather, as suggested by Narayan, Rao, and Sudhir (2012), the cost of buying a product from a particular retail outlet is not just the price of the product, but also includes the cost of travelling to the store. This suggests that travel time to a particular type of outlet will be negatively related to the likelihood of using the outlet. Thus, a variable representing the time each respondent indicated it usually takes to get to the nearest modern retail outlet, *Time_modern*, is used as an IV in this study.

As an additional IV, I include the variable *Food_safety*, which is a dummy variable equal to one if the respondent indicated that a retail outlet offering food safety assurances is an important or extremely important attribute when deciding where to purchase food. I consider this to be a valid IV because previous studies suggest that consumer concerns about food safety are major drivers of the increased use of modern retail outlets in developing countries (Gorton, Sauer & Supatpongkul 2011; Minten & Reardon 2008).

Inappropriate IVs could potentially lead to estimations that are inferior to OLS results. To address this risk, I also use the two-stage, heteroskedasticity-based estimator developed by (Lewbel 2012). The Lewbel (2012) approach involves first creating "higher-moment"

internal instruments that are the product of a set of selected demeaned regressors and the residuals obtained from the first-stage regression. According to Lewbel (2012) these instruments should satisfy the exclusion restriction and meet the relevance condition if they are uncorrelated with the other regressors and if hetroskedasticty exists in the first-stage, respectively. Lewbel cautions that "…higher moments can lead to noisier, less reliable estimates than exclusion based on standard exclusion restrictions… (Lewbel 2012, p. 78)." However, they may be more appropriate to use if the usual instruments are determined to be weak.

I follow methods used by Emran and Shilpi (2012), Schroeter, Anders, and Carlson (2013), Volpe, Okrent, and Leibtag (2013), and Umberger et al. (2015). Equation (6.4) is estimated as follows:

$$M_i = \pi' Z_i + \xi_i \quad \text{.....(6.4)}$$

Where Z_i is a vector of internal instruments that, according to Lewbel (2012) can be either a subset of or identical to X_i ($Z_i = X_i$). In this analysis, I consider three exogenous variables (*Education*, *Income* and *Label*) for Z_i. I estimate Equation (6.4) regressing (M_i) on this subset of exogenous variables and I obtain the residual ξ_i. The estimated residual from Equation (6.4) is then used to generate the higher-moment instruments, $(Z_i - \bar{Z}_i)\hat{\xi}_i$ where $\bar{Z}_i$ is the mean of Z_i and $\hat{\xi}_i$ is the residual from Equation (6.4). $\tilde{Z}_i$ denotes the higher-moment instruments. I then use two-stage least squares and re-estimate Equation (6.3) substituting $\tilde{Z}_i$ for Z_i in Equation (6.3) in the first stage, followed by Equation (6.2). Finally, to test the robustness of the estimates, a fourth estimation is conducted using two-stage least squares where Equation (6.3) is estimated using both the original IVs

(*Time_modern* and *Food_safety*) and the higher-moment instruments ($\tilde{Z}_i$) in the first-stage. I test for heteroskedasticity ($\mathrm{Cov}(Z_i, \xi_i^2) \neq 0$) using the Breusch-Pagan test.[14]

6.3 Results

Table 6.2 reports the results of the estimations of the healthy expenditure share models. As discussed earlier, the *Pct_modern* variable may be endogenous, and the OLS results provided in column (1) of Table 6.2 may be biased. To address this issue, the coefficients estimated using the three IV methods are provided in columns (2) to (4) of Table 6.2. These results provide insight on potential biases that may result from endogeneity.

The results are similar across all four models, particularly the OLS, Lewbel, and IV-Lewbel (Table 6.2). Importantly, the coefficient for the main explanatory variable of interest, *Pct_modern*, is consistently statistically significant and negative. Thus, an increase in the share of food expenditures at modern retail outlets is associated with a decreased share of food expenditures on healthy food. There are some notable differences between the results of the standard IV estimation (column (2), Table 6.2) and the others. The estimated coefficient for *Pct_modern* from the standard IV regression is much larger than the OLS, IV-Lewbel and Lewbel coefficients. The results seem to be consistent with other studies (Gao & Smyth 2015; Sabia 2007),that found that the estimation using Lewbel approach is much lower than the standard IV estimates and is relatively similar in the estimated coefficient of OLS. Additionally, four variables: *Hourjob*, *Domestic, Surabaya* and *Bogor*, are only significant in the standard IV estimation.

Before further discussing additional significant covariates, I consider the validity of the results of the alternative IV approaches using several test statistics. The endogeneity test

[14] I use the ivreg2 command developed by (Baum, Schaffer & Stillman 2007)

result (2.78) is significant, indicating that the *Pct_modern* variable is indeed endogenous. The first-stage F-statistic from the standard IV estimation (column 2) is 7.22 and does not meet the conventional criterion that the F-statistic must exceed 10 (Staiger & Stock, 1997). Thus, it appears that *Time_Modern* and *Food_Safety* are relatively weak instruments. However, the instruments *Time_Modern* and *Food_Safety* are both statistically significant in explaining Pct_modern, suggesting they satisfy the relevance condition.

To support the use of the Lewbel and IV-Lewbel approaches, the results of two additional tests are considered. First, the Breusch-Pagan $\mathcal{X}^2$ statistic (189.06) is significant (Table 6.2, column (3)) and the null hypothesis of homoskedasticy of the error term (ξ_i) is rejected. Second, the Hansen J statistic, used to test for overidentification of all instruments for both the Lewbel and the IV-Lewbel models are not significant; confirming the sets of instruments included in these models are valid.

Table 6.2 Regression results: Estimation of expenditure shares on healthy food (HealthyShare)

	OLS [1]	**IV [2]**	**Lewbel [3]**	**IV-Lewbel [4]**
Pct_modern	-0.20***	-0.70**	-0.15**	-0.17**
	(0.03)	(0.31)	(0.07)	(0.07)
Female	1.83	3.69*	1.64	1.72
	(1.35)	(1.96)	(1.36)	(1.36)
Age	0.62***	0.59***	0.62***	0.62***
	(0.19)	(0.22)	(0.19)	(0.19)
Age2	-0.01***	-0.01**	-0.01***	-0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Education	0.04	0.76	-0.03	-0.00
	(0.01)	(0.47)	(0.13)	(0.13)
Hourjob	-0.02	-0.04*	-0.02	-0.02
	(0.01)	(0.02)	(0.01)	(0.01)
Activity	0.18*	0.24*	0.18*	0.18*
	(0.10)	(0.13)	(0.10)	(0.10)
Surabaya	0.74	3.08*	0.50	0.59
	(0.95)	(1.85)	(1.00)	(0.99)
Bogor	1.05	2.91*	0.86	0.94
	(1.03)	(1.66)	(1.06)	(1.05)
FAFH	-0.19***	-0.22***	-0.19***	-0.19***
	(0.04)	(0.05)	(0.04)	(0.04)
Label	0.12	0.70	0.06	0.08
	(0.42)	(0.60)	(0.42)	(0.423)
Income	0.00	0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Household_size	-0.39*	-0.40*	-0.39*	-0.39*
	(0.220)	(0.24)	(0.22)	(0.22)
Children5	1.19	1.25	1.19	1.19*
	(0.73)	(0.82)	(0.73)	(0.72)
Domestic	1.69	3.19**	1.54	1.60
	(1.05)	(1.52)	(1.07)	(1.07)
Constant	60.77***	57.92***	61.07***	60.95***
	(4.66)	(5.76)	(4.67)	(4.6690)
Observations	1,180	1,180	1,180	1,180
R-squared	0.13	-0.16	0.12	0.125
First-Stage regression				
Time_modern		-0.10 (0.05)*		-0.11(.06)*
Food_safety		4.71 (1.50)***		5.03(1.46)**
F-stats [p-value]		7.22[0.00]	60.21[0.00]	41.36[0.00]
Endogeneity test [p-value]		2.78[0.09]		
Breusch-Pagan χ^2[p-value]			189.06[0.00]	
Hansen J Statistic [p-value]			0.63[0.73]	5.33 [0.26]

Note:***,**,* indicate statistical significance at the 1%, 5% and 10% levels, respectively. Standard errors are in parentheses. IV is the regression estimated using two-stage least squares with *Time_modern* and *Food_safety* as external instrumentals. Lewbel is the regression estimated using heteroskedasticity-based estimator, which utilizes $(Z_i - \bar{Z}_i)\hat{\xi}_i$ as instruments, where Z_i is the variable of *Education*, *Income*, and *Label* (Lewbel approach). IV-Lewbel is the regression estimated using both the external instruments and the Lewbel approach.

To support the use of the Lewbel and IV-Lewbel approaches, the results of two additional tests are considered. First, the Breusch-Pagan $\mathcal{X}^2$ statistic (189.06) is significant (Table 6.2, column (3)) and the null hypothesis of homoskedasticy of the error term (ξ_i) is rejected. Second, the Hansen J statistic, used to test for overidentification of all instruments for both the Lewbel and the IV-Lewbel models are not significant; confirming the sets of instruments included in these models are valid.

These diagnostic test results support the use of the Lewbel and IV-Lewbel approaches as an alternative to the standard IV method. It is important to note that the coefficients estimated using the standard IV approach (column 2, Table 6.2) are not reliable due to weak instruments and they are only provided for comparison. As such, I focus the remaining discussion on the results from the estimations of the Lewbel and IV-Lewbel models (columns 3 to 4). Thus, after controlling for various respondent and household characteristics, I find that a one percentage-point increase in the share of food purchased at modern outlets (*Pct_modern*) results in a 0.15 to 0.17 percentage-point decrease in the share of food purchases that are classified as healthy. This finding supports the notion that increased use of supermarkets for food shopping may lead to less healthy household food purchasing behaviour.

In both models, the coefficient on *Age* is positive and significant, while the coefficient on *Age2* is negative and significant. This implies that the share of expenditures on healthy food rises and then falls with age of the person responsible for shopping for food for the household. More specifically, according to the coefficients for the Lewbel and IV-Lewbel models, the healthy share reaches a maximum at age at approximately 57[15]. Contrary to

[15] Taking the derivative of the regression equation with respect to age, the maximum occurs when b+2(a)(age)=0, where b is the linear coefficient and a is the quadratic coefficient. Rearranging terms, I get age = -b/2a = -0.622/0.011 = 56.5.

expectations, this study found that older people (above 57) spend less on healthy food for their household, other factors being equal.

The coefficients for *Activity* are positive and significant; a finding that is consistent with previous studies and suggests that households with active adults are also more likely to make healthier food purchases. As expected, *FAFH* was negative and highly significant in both models, implying that households spending more on food away-from-home tend to purchase less healthy foods.

The coefficient on Income was not significant in explaining healthy expenditure shares in either estimation. This result is somewhat surprising, but there are two possible explanations for this result. First, many low income households get food subsidies from the government, especially for rice, leading to improved spending on other healthy foods (e.g. unprocessed meats, fresh milk and eggs) [16]. Second, high-income households are better able to afford processed foods and convenience foods, which are considered to be less healthy.

A related variable, *Household_size* was negative and statistically significant in both models. A possible explanation for this might be that for a given income a larger household size results in less disposable income to spend on certain types of more expensive healthier food products (e.g. fruits, vegetables, unprocessed meats, fresh milk and eggs). As a result, members of the household may have lower diet quality. The coefficient on the *Children5* variable in column (4) of Table 6.2 is positive and statistically significant suggesting some evidence of a positive relationship existing between healthier household food expenditure shares and having young children in the household.

[16] Since 1998, the Indonesian government has provided food subsidies for low income households through a program known as Raskin (beras untuk orang miskin, rice for poor household) (Sumarto & Bazzi 2011).

There was no statistically significant difference in the share of healthy food expenditures across the three cities in the sample: Surabaya, Bogor, and Surakarta. Any differences across cities are the results of differences in other explanatory variables.

6.4 Conclusions and Implications

As discussed earlier, there is increasing speculation to suggest consumers' dietary practices and health outcomes can be affected by the strategic decisions of modern retailers. However, it is unclear from the literature whether there is a connection between the use of modern retail outlets and the emergence of unhealthy dietary patterns. For example, a Tunisia study (Tessier et al. 2008) determined that the diet quality of frequent users of supermarkets was slightly higher than less frequent supermarket users. On the other hand, studies conducted using Guatemalan, Thai, and Kenya data (Asfaw (2008), Kelly et al. (2014), Rischke et al. (2015), respectively) found higher supermarket use to be associated with increased consumption of highly processed foods, which are generally considered to be "unhealthy".

This research attempts to build on the previous empirical studies and shed light on the relationship between supermarket shopping behaviour and diet transition in Indonesia, a context that has not been previously researched. Using cross-sectional data from a survey of Indonesian urban households, this study found a negative and significant relationship between the share of food expenditures at modern food retail formats and the healthfulness of consumer food expenditures. Interestingly, our results tend to support those of Asfaw (2008), Kelly et al. (2014) and Rischke et al. (2015). Similar to Guatemala, Thailand and Kenya, supermarket penetration in urban areas of Indonesia is relatively high, and supermarkets are generally accessible to both low-income and high-income households. As Kelly et al. (2014) explain, modern food retailers, including hypermarkets,

supermarkets and convenience stores (mini-markets), may compete with traditional retailers by providing less expensive processed foods which tend to be high in fat, salt, and sugar content and fewer fresh foods, particularly fruits and vegetables. Therefore, it is not surprising that our results are comparable to those of Asfaw (2008), Kelly et al. (2014) and Rischke et al. (2015).

Another important finding was that diet quality was also negatively associated with higher food expenditure shares on meals and beverages purchased away from home. This implies that, in Indonesia, policy makers who are concerned about diet transition may want to consider other aspects of the food environment, which are transitioning and may impact diet-related health, not just supermarket penetration. For example, the development of 'one-stop shopping centres' (e.g. shopping malls where supermarkets are typically co-located with food courts) may further exacerbate the negative impact of 'supermarket penetration' on diet quality in Indonesia.

This study has several limitations that should be considered. First, I used cross-sectional data so I was unable to capture dynamic patterns of consumption. Through the use of panel data, future studies could provide more robust estimates of causal relationships. Second, this study did not measure the actual quantity of food consumed by individuals in households, making it difficult to isolate the effect of food expenditure shares on actual individual calories and nutrients consumed. Finally, this study only focused on urban households located on Java Island where modern retail penetration is much greater. Future research could be expanded to include households located in rural areas and beyond Java Island. More research on this issue needs to be undertaken before the relationship between modern food retail penetration and health outcomes is clearly understood.

Chapter 7: Summary, Conclusions and Implications

7.1 Summary and Conclusions

For more than four decades traditional food retailers have dominated food markets in Indonesia. However, over the last two decades, modern food retailers (e.g., hypermarkets, supermarkets and minimarkets) have begun to capture an increasing share of food market. The number of modern food retailers in Indonesia has increased dramatically from 1,176 outlets in 1999 to 11,342 outlets in 2009 (Dyck, Woolverton & Rangkuti 2012), however, estimates of modern food retailers' share of food sales suggest that the increase is less dramatic over this time period, 5% to 11%, respectively. The rapid rise of modern food retailers in Indonesia raises significant concerns about their impact on traditional food retailers' ability to compete because these retail outlets provide important markets for smallholders.

Additionally, traditional retailers, particularly wet markets, have been an important source of fresh food for Indonesian consumers, particularly for lower income households. Thus, there are also concerns about whether modern retail penetration will lead to a diet transition in Indonesia. Despite the importance of this issue, there is little evidence to shed light on the likely food system implications of increasing modern food retail penetration in Indonesia. Therefore, the main purpose of this thesis was to examine the relationship between the growth of the modern food retail sector in Indonesian and changes in households' food shopping behaviour and dietary patterns.

Therefore, the main contributions of this thesis are two-fold. First, it provides a methodological contribution to empirical studies on the effect of modern food retailers on consumer shopping behaviour and diet transition in developing countries. Second, it provides information, which is of interest to policy makers, about the possible implications

of modern retail penetration on changes in food consumption and shopping patterns as well as diet-related health outcomes in developing countries.

This study had three specific objectives. The first objective, addressed in Chapter 4, was to analyse the factors influencing consumers' shopping behaviour with respect to frequency of shopping for food at modern and traditional retail outlet formats. The second objective, addressed in Chapter 5, was to determine the factors influencing consumers' food expenditure shares at both modern and traditional food retail formats. The third objective, addressed in Chapter 6, was to analyse the effect of modern market penetration on the healthiness of food expenditure shares and health outcomes.

In order to achieve each of these objectives, data was obtained through a survey of 1,180 urban households conducted in the Indonesian cities of Surabaya, Bogor and Surakarta. These households were chosen using a stratified random sampling method. In order to focus on consumers' shopping and expenditure patterns at modern food retailers, higher income areas and neighbourhoods close to hypermarkets and supermarkets were over-sampled. Sampling weights were used in computing the results to compensate for this over-representation. Trained enumerators interviewed 1180 households from November 2010 to February 2011. The data from the survey were used to accomplish the three different analyses with the intention of addressing the three main objectives of this study.

The first analysis, presented in Chapter 4, focused on understanding determinants of consumers' decision to purchase food at seven types of modern and traditional food retail formats. Multivariate probit models were used to explore the factors related to frequency of food purchases at each of the seven types of modern and traditional food retailers. This study found that the majority of the consumers still used traditional food retailers for purchasing fresh produce and staple food. In general traditional food retailers were

perceived as the best type of outlet to buy fresh meat, fish, fruit and vegetables, particularly wet markets. However, it appears that modern retailers are now gaining market share in the fresh fruit market. Conversely, modern food retailers were perceived by the majority of the consumers as the best type of outlet to buy food that is safe and provides trustworthy product information. The results of multivariate probit analysis showed that higher educated consumers from households with relatively higher income, and assets (refrigerator, car/motorcycle, credit/debit card) were more likely to shop at modern retail formats. This indicates that a particular segment of consumers is more likely to patronize modern food retail formats. At the same time, this study confirmed that modern food retailers were not major competitors with traditional food retailers. Different food retail formats serviced different segments of consumers, or they offered consumers complementary sources of food. However, it appears that the growing interest of all consumers in outlets providing product information (e.g. nutritional information), verifications that products are safe to eat, and convenience (e.g. air conditioning, a one-stop-shop) will result in modern retail formats capturing a new customer base. This may allow modern food retailers to capture traditional food retailers' markets if the traditional outlets cannot adapt and cater for consumers' needs.

The second analysis of the research presented in Chapter 5 expanded upon the findings presented in Chapter 4 by analysing the determinants of consumers' expenditure shares on food categories in both modern and traditional food retail formats. Fractional logit analysis was used to determine the factors that explained proportions of food expenditures at modern and traditional food retailers. The results of the analysis suggest that food expenditure shares at modern retail outlets were positively associated with increasing education and income levels. Time to get to the nearest retail outlets also had a significant association with food purchasing decisions across outlets – not surprisingly consumers

spent a higher proportion of their income on food items if the retail outlet was relatively nearer to their home. The size of cities was also a significant influence on allocation of food budgets across outlets. Consumers residing in larger cities (Surabaya and Bogor) spent proportionally more on food in modern outlets than their traditional counterparts.

Interestingly, this study also found that consumers with increased concerns about food safety were more likely to spend more on food at modern food retailers. This finding suggests that as consumer concerns about food safety increase in Indonesia modern retail outlets may gain a larger segment of the market. However, the findings of this study showed that price-sensitive consumers were more likely to patronize traditional food retailers. This indicates that traditional outlets are still an important retail source for poor consumers. These findings support the conclusions of Chapter 4 and also confirm the view that traditional food retailers are still major players in the Indonesian food market structure as they service different income segments and different product categories. However, if traditional food retailers are crowded out of the market as incomes rise and concerns about food safety increase, poorer consumers' access to affordable products might decrease.

The third analysis that is presented in Chapter 6, explored the relationship between diet transformation and modern retail format usage by consumers in urban Indonesia and thus potentially with health outcomes. Ordinary Least Squares (OLS) regressions and Instrumental Variable (IV) regressions using Lewbel's approach (IV-Lewbel) were performed to examine the effect of modern market penetration on the healthiness of food expenditure shares. This study showed that the share of food expenditure at supermarkets negatively influenced the healthiness of consumer food purchases. The results of both the OLS and the IV-Lewbel regressions suggest a negative and significant relationship between the share of food expenditures at modern food retailers and the healthiness of consumer food purchases, even after controlling for other characteristics (e.g., age, gender,

education, income) that may also influence food consumption decisions. Another important finding was that diet quality was also negatively associated with higher food expenditure shares on meals and beverages purchased away from home. This suggests that the penetration of modern retail outlets, located within shopping centres that offer a "one-stop shopping centre" with other characteristics such as food courts may be associated with increasing diet-related health issues.

7.2 Implications

The results of the first and second analyses of this study indicated that consumers used traditional food retailers most frequently for daily shopping. A particular socio-economic class patronized modern food retailers. In addition, modern food markets were not major competitors with traditional food retailers. However, consumers' growing concerns about food safety and nutrition led to increased spending on food at modern food retail outlets. This will possibly allow modern food retailers to capture traditional food retailers' market share if the traditional outlets cannot adapt and cater for consumers' needs. Therefore, traditional retailers will need to be innovative in order to maintain market share because they are important markets for smallholders and low-income consumers. Thus, the Indonesian government may play a role in helping develop innovative strategies to address this change.

The results of the third analysis of this study provided evidence that penetration of supermarkets appears to influence the healthiness of food expenditure shares. This implies that, in Indonesia, policy makers who are concerned about diet transition may wish to consider other characteristics, not just supermarket penetration of Indonesian food markets, as markets are rapidly transitioning and these changes may impact diet-related health, For example, the development of 'one-stop shopping centres' (e.g. shopping malls where

supermarkets are typically co-located with food courts) may further exacerbate the negative impact of 'supermarket penetration' on diet quality in Indonesia

Although the results presented in this thesis are based on data from a large and relatively representative sample of consumers in three locations on Java Island, as well as rigorous econometric tools, there are still several limitations. First, this study utilized household food expenditures as a proxy for consumption, but of course, expenditures may not represent food consumption patterns or diet quality, particularly for individual members of households. Further research needs to be done to combine data on food expenditure and calorie count as well as nutrition attributes. Second, the study used cross-sectional data so I am unable to capture dynamic and difficult to assess information as to whether the results are changing over time. Finally, this study is limited to households in the Java Island and the urban context. Future research could be extended outside Java and to rural areas, considering the broader market scope of modern food outlets. Hence, more studies of these issues need to be undertaken before the relationship between modern food retailers' penetration, dietary patterns and diet-related health is clearly understood.

Appendix

Appendix 1 Fractional logit model, by expenditure shares on food and grain at modern and traditional food retailers

Variable	Food				Grain			
	Modern Retailers		Traditional Retailers		Modern Retailers		Traditional Retailers	
	Coeff.	St. Error	Coeff.	St. Error	Coeff.	St. Error	Coeff.	St. Error
Resp_sex	0.23**	0.11	-0.23**	0.11	0.35*	0.20	-0.30	0.20
Resp_age	0.00	0.00	0.00	0.00	-0.01**	0.01	0.01	0.01
Resp_edu	0.07***	0.01	-0.07***	0.01	0.06***	0.02	-0.06***	0.02
Resp_work	0.14	0.06	0.14**	0.06	-0.01	0.12	0.01	0.12
Child0to5	0.60***	0.07	-0.60***	0.07	0.05	0.13	-0.06	0.13
Child6to12	-0.03	0.06	0.03	0.06	-0.25**	0.12	0.26**	0.12
D_exployee	0.10	0.08	-0.10	0.08	0.25*	0.14	-0.253*	0.14
Percap2	0.23*	0.13	-0.23*	0.13	0.25	0.27	-0.20	0.27
Percap3	0.62***	0.13	-0.62***	0.13	0.81***	0.29	-0.76***	0.29
Percap4	0.75***	0.13	-0.75***	0.13	0.86***	0.28	-0.89***	0.29
Percap5	0.84***	0.15	-0.84***	0.15	1.33***	0.31	-1.32***	0.31
Car_motor	0.33***	0.12	-0.33***	0.12	0.48*	0.25	-0.37	0.24
Refrigerators	0.52***	0.11	-0.52***	0.11	0.38*	0.21	-0.29	0.21
Creditcard	0.09	0.08	-0.09	0.08	0.21	0.14	-0.22	0.14
Timemodern	-0.01***	0.00	0.01***	0.00	-0.01	0.01	0.00	0.01
Timeminimkt	0.01	0.00	-0.01	0.00	0.00	0.01	0.00	0.01
Timewetmkt	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
Surabaya	0.30***	0.08	-0.30***	0.08	0.21	0.15	-0.22	0.16
Bogor	0.31***	0.10	-0.31***	0.10	0.35*	0.19	-0.35*	0.19
Safety	0.28***	0.08	-0.28***	0.08	0.35**	0.15	-0.32**	0.15
Label	0.11***	0.04	-0.11***	0.04	0.12*	0.07	-0.09	0.08
Nutrition	0.07**	0.04	-0.07**	0.04	0.13*	0.07	-0.14*	0.08
Riskaverse	0.09**	0.04	-0.09**	0.04	0.09	0.07	-0.06	0.07
Service	0.01	0.03	-0.01	0.03	0.06	0.06	-0.07	0.06
Convenience	-0.02	0.03	0.02	0.03	0.00	0.06	0.01	0.07
Price sensitive	-0.05*	0.03	0.05*	0.03	-0.19***	0.06	0.22***	0.06
Constant	-4.20***	0.28	4.20***	0.28	-4.04***	0.53	3.91***	0.57
Chi2 (26)	712.70		712.70		341.20		301.39	
Prob> Chi2	0.00		0.00		0.00		0.00	

Note: ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Appendix 2 Fractional logit model, by expenditure shares on roots & tubers and pulses at modern and traditional food retailers

Variable	Roots and Tubers				Pulses			
	Modern Retailers		Traditional Retailers		Modern Retailers		Traditional Retailers	
	Coeff.	St. Error	Coeff.	St. Error	Coeff.	St. Error	Coeff.	St. Error
Resp_sex	0.50	0.91	0.35*	0.2	-1.07**	0.47	1.25***	0.35
Resp_age	0.01	0.02	0.03***	0.01	-0.01	0.01	0.00	0.01
Resp_edu	-0.02	0.13	0.03*	0.02	0.08*	0.04	0.00	0.04
Resp_work	-0.05	0.68	0.22*	0.13	-0.80**	0.33	0.64**	0.27
Child0to5	0.80	0.54	0.53***	0.14	0.02	0.33	-0.02	0.31
Child6to12	-0.59	0.74	-0.02	0.13	-0.13	0.31	-0.1	0.26
D_exployee	-0.41	0.65	0.17	0.2	0.38	0.31	-0.05	0.3
Percap2	-0.44	1.35	-0.04	0.2	-0.82	1.07	-0.87	0.53
Percap3	-14.93***	0.85	-0.01	0.21	2.02**	0.94	-0.76	0.53
Percap4	0.91	1.03	0.22	0.24	1.84**	0.87	-0.87*	0.49
Percap5	0.37	1.37	-0.41	0.28	2.36**	0.92	-2.03***	0.56
Car_motor	14.68***	0.81	0.07	0.18	-0.03	0.81	-0.07	0.47
Refrigerators	0.44	0.93	-0.02	0.17	0.08	0.84	1.25***	0.38
Creditcard	0.89	0.58	-0.22	0.20	0.73*	0.4	-0.66*	0.35
Timemodern	-0.01	0.04	0.00	0.01	-0.02	0.02	0.02	0.02
Timeminimkt	0.01	0.01	0.00	0.01	0.00	0.01	-0.01	0.01
Timewetmkt	0.04	0.02	0.00	0.01	-0.02	0.02	0.033*	0.02
Surabaya	-0.53	0.75	-0.16	0.16	0.6	0.53	0.14	0.39
Bogor	-1.07	0.94	-0.38*	0.2	1.49**	0.64	-0.79*	0.45
Safety	-0.70	1.21	0.01	0.19	-0.3	0.46	0.16	0.4
Label	0.30	0.42	0.12*	0.06	0.13	0.25	0.12	0.15
Nutrition	-0.24	0.3	0.00	0.06	-0.08	0.17	0.03	0.13
Riskaverse	-0.03	0.46	-0.06	0.07	0.03	0.18	0.16	0.13
Service	0.46	0.36	-0.1	0.06	0.15	0.14	-0.04	0.11
Convenience	0.09	0.32	-0.05	0.06	0.01	0.16	0.06	0.13
Price sensitive	-0.21	0.34	0.08	0.07	-0.30*	0.15	0.24*	0.13
Constant	-20.77***	2.96	-1.71	0.51	54.5***	1.2	1.90*	1.11
Chi2 (26)	3607		3470		127.31		116.84	
Prob> Chi2	0.00		0.00		0.00		0.00	

Note: ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Appendix 3 Fractional logit model, by expenditure shares on milk & dairy and meat & fish at modern and traditional food retailers

Variable	Milk and Dairy				Meat and Fish			
	Modern Retailers		Traditional Retailers		Modern Retailers		Traditional Retailers	
	Coeff.	St. Error	Coeff.	St. Error	Coeff.	St. Error	Coeff.	St. Error
Resp_sex	0.32*	0.18	-0.20	0.18	0.27	0.28	0.49*	0.26
Resp_age	0.00	0.01	0.00	0.01	-0.02**	0.01	0.01	0.01
Resp_edu	0.11***	0.02	-0.09***	0.02	0.11***	0.03	-0.06**	0.03
Resp_work	-0.16	0.12	0.15	0.11	-0.20	0.17	0.16	0.16
Child0to5	0.29**	0.13	-0.33***	0.12	0.10	0.18	0.06	0.19
Child6to12	0.18	0.12	-0.12	0.11	0.08	0.18	0.01	0.16
D_exployee	0.02	0.15	-0.02	0.15	0.26	0.20	-0.35*	0.19
Percap2	0.39	0.24	-0.21	0.23	0.78	0.49	0.08	0.33
Percap3	0.68***	0.24	-0.46**	0.22	1.06**	0.50	0.26	0.34
Percap4	0.98***	0.23	-0.79***	0.22	1.47***	0.49	-0.22	0.30
Percap5	1.25***	0.26	-1.08***	0.24	1.76***	0.50	-0.65**	0.32
Car_motor	0.34*	0.18	-0.20	0.18	0.47	0.36	0.22	0.26
Refrigerators	0.40**	0.19	-0.24	0.17	0.77*	0.41	0.09	0.24
Creditcard	0.28*	0.14	-0.28**	0.14	0.48**	0.20	-0.37*	0.20
Timemodern	-0.01	-0.01	0.01*	0.01	-0.02	0.01	0.01	0.01
Timeminimkt	0.01	0.01	-0.01	0.01	0.01	0.01	0.00	0.01
Timewetmkt	0.00	0.01	0.00	0.01	-0.01	0.01	0.017*	0.01
Surabaya	0.32**	0.15	-0.34**	0.15	-0.20	0.23	0.53**	0.21
Bogor	0.72***	0.18	-0.68***	0.18	0.84***	0.27	-0.42	0.26
Safety	0.41***	0.16	-0.35**	0.15	0.36	0.22	-0.22	0.22
Label	0.00	0.06	0.04	0.06	-0.06	0.09	0.13	0.10
Nutrition	-0.05	0.06	0.08	0.06	0.27***	0.10	0.01	0.09
Riskaverse	0.11*	0.06	-0.07	0.06	0.01	0.10	0.14	0.09
Service	0.05	0.05	-0.05	0.05	0.02	0.09	-0.12	0.08
Convenience	0.08	0.06	-0.06	0.06	0.16	0.10	-0.11	0.08
Price sensitive	-0.08	-0.06	0.10*	0.06	-0.07	0.08	0.05	0.08
Constant	-4.17***	-0.50	3.44***	0.49	-5.83***	0.71	1.57**	0.70
Chi2 (26)	294.50		235.80		257.70		130.31	
Prob> Chi2	0.00		0.00		0.00		0.00	

Note: ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Appendix 4 Fractional logit model, by expenditure shares on vegetables and fruits at modern and traditional food retailers

Variable	Vegetables				Fruits			
	Modern retailers		Traditional retailers		Modern retailers		Traditional retailers	
	Coef.	St. Error	Coef.	St. Error	Coef.	St. Error	Coef.	St. Error
Resp_sex	-0.33	0.45	1.17***	0.34	-0.14	0.19	0.20	0.19
Resp_age	-0.01	0.01	0.00	0.01	-0.01	0.01	0.00	0.01
Resp_edu	0.07	0.05	-0.09**	0.04	0.07***	0.02	-0.04**	0.02
Resp_work	-0.33	0.30	0.38	0.29	-0.27**	0.13	0.17	0.12
Child0to5	0.59**	0.28	-0.39	0.28	0.18	0.14	-0.05	0.13
Child6to12	-0.72**	0.34	0.45	0.33	-0.04	0.13	0.08	0.12
D_exployee	0.30	0.32	-0.28	0.34	0.16	0.14	-0.25*	0.14
Percap2	-0.18	0.80	-0.46	0.76	0.61**	0.32	0.21	0.23
Percap3	-0.14	0.68	-1.75**	0.76	0.85***	0.31	0.22	0.23
Percap4	0.34	0.68	-1.96**	0.79	1.33***	0.31	-0.19	0.23
Percap5	1.33*	0.70	-2.93***	0.81	1.62***	0.33	-0.56*	0.26
Car_motor	1.08**	0.44	0.42	0.53	0.26	0.25	0.12	0.18
Refrigerators	0.28	0.55	0.68	0.59	0.33	0.23	-0.02	0.18
Creditcard	0.24	0.35	0.13	0.32	0.28**	0.16	-0.24	0.15
Timemodern	-0.01	0.03	0.02	0.02	-0.03***	0.01	0.03***	0.01
Timeminimkt	0.01	0.01	-0.01	0.01	0.01	0.01	-0.01	0.01
Timewetmkt	-0.01	0.02	-0.01	0.02	0.00	0.01	0.00	0.01
Surabaya	-0.02	0.35	0.13	0.41	1.10***	0.18	-0.87***	0.17
Bogor	0.73*	0.38	-0.27	0.44	0.76	0.22	-0.68***	0.20
Safety	0.76**	0.33	-1.00***	0.36	0.38***	0.17	-0.32	0.17
Label	0.28	0.17	-0.10	0.18	0.00**	0.07	0.02	0.07
Nutrition	0.04	0.18	0.20	0.18	0.05	0.07	0.01	0.06
Riskaverse	0.18	0.14	-0.02	0.15	0.06	0.07	-0.05	0.07
Service	0.12	0.13	-0.05	0.13	0.14**	0.06	-0.13*	0.06
Convenience	0.06	0.13	0.06	0.13	0.11**	0.06	-0.14	0.06
Price sensitive	-0.26**	0.12	0.25***	0.11	-0.19**	0.06	0.17***	0.06
Constant	-6.36	1.30	4.97	1.14	-3.94	0.55	1.54	0.50
Chi2 (26)	167.60		127.60		306.70		186.60	
Prob> Chi2	0.00		0.00		0.00		0.00	

Note: ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Appendix 5 Fractional logit model, by expenditure shares on other foods and meal outside home at modern and traditional food retailers

Variable	Other Foods				Meal Outside Home			
	Modern Retailers		Traditional Retailers		Modern Retailers		Traditional Retailers	
	Coeff.	St. Error	Coeff.	St. Error	Coeff.	St. Error	Coeff.	St. Error
Resp_sex	0.34**	0.13	-0.34**	0.13	0.17	0.54	-0.03	0.21
Resp_age	0.01**	0.00	-0.01**	0.00	-0.01	0.01	-0.01	0.01
Resp_edu	0.08***	0.01	-0.08***	0.01	0.07*	0.04	0.02	0.02
Resp_work	-0.19**	0.08	0.194**	0.08	-0.02	0.30	0.19	0.13
Child0to5	0.73***	0.08	-0.73***	0.08	0.27	0.34	0.04	0.15
Child6to12	0.05	0.08	-0.05	0.08	-0.82**	0.36	0.72***	0.14
D_exployee	0.10	0.10	-0.10	0.10	1.20***	0.33	-0.41*	0.22
Percap2	0.21	0.16	-0.21	0.16	0.03	0.80	0.25	0.20
Percap3	0.61***	0.15	-0.61***	0.15	0.21	0.76	0.32	0.22
Percap4	0.75***	0.16	-0.75***	0.16	0.36	0.77	0.88***	0.24
Percap5	0.73***	0.18	-0.73***	0.18	-0.18	0.82	1.60***	0.29
Car_motor	0.45***	0.14	-0.45***	0.14	-0.06	0.60	0.54***	0.18
Refrigerators	0.59***	0.13	-0.59***	0.13	1.60*	0.86	-0.29	0.18
Creditcard	0.11	0.10	-0.11	0.10	-0.54	0.41	0.70***	0.23
Timemodern	-0.01**	0.01	0.01**	0.01	0.01	0.02	-0.01	0.01
Timeminimkt	0.01	0.00	-0.01	0.00	-0.01	0.02	-0.01	0.01
Timewetmkt	0.00	0.01	0.00	0.01	0.01	0.02	0.00	0.01
Surabaya	0.29***	0.10	-0.29***	0.10	1.36***	0.44	0.14	0.16
Bogor	0.31**	0.12	-0.31**	0.12	-0.08	0.63	0.40**	0.21
Safety	0.33***	0.10	-0.33***	0.10	-0.57	0.49	0.75***	0.21
Label	0.09*	0.05	-0.09*	0.05	0.41*	0.22	-0.07	0.07
Nutrition	0.01	0.04	-0.01	0.04	0.16	0.14	-0.06	0.06
Riskaverse	0.13***	0.04	-0.13***	0.04	0.53***	0.18	-0.12*	0.07
Service	-0.04	0.04	0.04	0.04	0.16	0.15	-0.01	0.07
Convenience	0.03	0.04	-0.03	0.04	-0.01	0.16	0.03	0.07
Price sensitive	0.02	0.04	-0.02	0.04	0.14	0.14	0.07	0.07
Constant	-4.19***	0.33	4.19***	0.33	-6.11***	1.28	-0.73	0.53
Chi2 (26)	562.60		562.60		82.37		148.80	
Prob> Chi2	0.00		0.00		0.00		0.00	

Note: ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

ICASEPS

INDONESIA SURVEY OF URBAN CONSUMERS
November 2010
IFPRI - UNIVERSITY OF ADELAIDE - ICASEPS

---CONFIDENTIAL---

IFPRI

THE UNIVERSITY OF ADELAIDE AUSTRALIA
School of Agriculture Food and Wine

Objective:	The purpose of th s survey s to mprove our understand ng of urban food consumpt on patterns, part cu ar y the ro e of supermarkets and other "modern" out ets.
Use of data:	The data co ected as part of th s survey are for research purposes **ONLY.** Househo d- eve data w not be shared w th non-research organ zat ons. . On y summary resu ts w be nc uded n pub shed report.

Household ID number

City	Kelurahan	RW number	RT number	Household number

City: 1. Surabaya, 2. Bogor, 3. Surakarta [Codes on back cover]

Enumerator code [Codes on back of cover]

Name of head family	
Name of respondent	
Address/location	
Phone number	
Name of kelurahan	

Hello, my name is _____. I work for a research institue in Bogor called ICASEPS and we are carrying out a survey on food shopping habits. The survey is intended to improve our understanding of how food shopping patterns are changing and how to help farmers adapt to those changes. You are one of 1200 household in three cities selected to participate. The individual results are confidential - only summary results will be included in the report. We would like about 90 minutes of your time to ask you some questions.

	Date			Name	Sign
	Day	Month	Year		
Interview			2010		
Field check			2010		
Check kantor			2010		
Data Entry - Start			2010		
Data Entry - Finish			2010		

Research funded by a grant from the Australian Centre for International Agricultural Research (ACIAR)

Australian Government
Australian Centre for International Agricultural Research

Back of cover page

Kelurahan codes

City of Surabaya

Code	Kelurahan
11	Jepara
12	Ketabang
13	Simolawang
14	Tegalsari
15	Krembangan Utara
16	Ujung
17	Rungkut Menanggal
18	Mulyorejo
19	Medoan Ayu
20	Klampis Ngasem
21	Tambaksari
22	Tenggilis Mejoyo
23	Pradah Kali Kendal
24	Kedurus
25	Pakis
26	Margorejo
27	Ngagel Rejo
28	Klakah Rejo
29	Sonokawijenan
30	Banjarsugihan

City of Bogor

Code	Kelurahan
41	Curug Mekar
42	Paledang
43	Panaragan
44	Babakan Pasar
45	Tegalega
46	Batu Tulis
47	Sukasari
48	Baranangsiang
49	Bantar Jati
50	KedungBadak
51	Bubulak
52	Gudang
53	Bondongan
54	KedungHalang
55	Menteng
56	Empang
57	Genteng
58	Rancamaya
59	Ciparigi
60	Kayu Manis

City of Surakarta

Code	Kelurahan
71	Purwosari
72	Sondakan
73	Jajar
74	Karangasem
75	Tipes
76	Jayengan
77	Semanggi
78	Kedung Lumbu
79	Tegalharjo
80	Jebres
81	Punggawan
82	Nusukan
83	Kadipiro
84	Banyuanyar

Enumerator codes

Code	Surabaya enumerator
01	Cirama Buavi
02	Deny Ismayanti
03	Destranto Wijanarko
04	Dwi Wahjuni
05	Eko Febriyanto H.
06	Hesti Anisanti
07	Inneke Kumalasari
08	Lintang Widya Retna
09	M. Nur Syamsu
10	Mugi Gumanti
11	Nurul Huda
12	Rohmat Subagyo
13	Ryan Hidayat
14	Slamet Hariyono
15	Himawan Setiajid

Code	Bogor enumerator
20	Atin Supriyatin
21	Dewi Amna
22	Dudi Lesmana
23	
24	Imam
25	Imron
26	Pitriati Solehah
27	Ruhmaniyati
28	Usep Santosa
29	Waluyo

Code	Surakarta enumerator
30	Budiarto
31	Dasriyanto
32	Nunuk Numaliningsih
33	Wahyu Erlianto
34	Temberyanto Setiawan
35	Azis Kuriawan
36	Priyo
37	Arief Kruniawan
38	Danny Ardiansyah

A. CHARACTERISTICS OF MEMBERS OF THE HOUSEHOLD

	Please list the names of members of this household. [list in order of age, from oldest to youngest]	Is [name] a male or female? 1. Male 2. Female	What is the relationship between [name] and the head of household? 1. Head 2. Spouse 3. Son/daughter 4. Son/daughter in law 5. Grandchild 6. Parent or in-law 7. Other related 8. Other unrelated 9. Domestic employee	How old is [name]? [age at last birthday, use 0 if less than 1 yearr old] Years	Ask this question only for members 6 years or older How many years of schooling has [name] completed? (Year)	Ask these questions only for members 17 years and older What is the marital status of [name]? [Select first correct response] 1. Single 2. Married 3. Separated or divorced 4. Widowed	What is the main activity of [name]? [See activity codes on back of page]	On average how many hours a week does he/she work in this activity? [Use 99 for housework, student, retired, & not working]	Is anyone in the household pregnant or lactating? [fill in each row] 1. Yes, pregnant 2. Yes, lactating 3. Yes, both 4. No
A1		**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**	**A9**
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									

Note: The household is defined as a group of people who live and eat together most of the time. Each member must live with others at least 6 months of the year or 4 days out of the week. The head of the household is defined as the member who makes most of the economic decisions.

AFTER COMPLETING A9, FOLD PAGE TO ← HERE, THEN COMPLETE A10 - A12

Back of Section A

	Record height and weight of each household member		Code whether height and weight are based on measurement or estimation. 1. Estimated by respondent 2. Provided by medical records 3. Measured by enumerator
	Height cm	Weight kg	
A1	**A10**	**A11**	**A12**
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

Activity codes for A7	
11	Farmer/fisherman
12	Self-employed commerce (e.g. trader, shop-keeper, vendor)
13	Self-employed service (e.g. barber, repairman, electrician, plumber, driver with vehicle)
14	Self-employed manufacturing (e.g. metalwork, carpenter, food processing)
21	Employee, professional active (e.g. doctor, nurse, teacher)
22	Employee, professional less active (e.g. manager, executive, administrator)
23	Employee, semi-skilled active (e.g. policeman, sales, food service, teller)
24	Employee, semi-skilled less active (e.g. secretary, book-keeper, receptionist, driver)
25	Employee, laborers (construction, cleaner, factory worker, security guard)
26	Domestic employee (maid, nanny, gardener, housekeeper)
31	Housework (housewife or other family member)
32	Student (including university)
33	Retired
34	Not working
41	Other (please specify)

Definitions:
Self-employed means the person is paid for each product or service sold
Salaried and laborers are paid by the length of time worked (day, month, or year)

B. HOUSING and ASSETS

Codes for B1	Codes for B2 & B3	
1. Muslim	1. Javanese	6. Balinese
2. Christian	2. Sundanese	7. Arabic
3. Bhuddhist	3. Madurese	8. Chinese
4. Confucious	4. Minangkabaus	9. Other
5. Hindu	5. Makasar	10. No spouse
6. Other		

What is the main religion of the household? ☐ B1

What is the ethnicity of the head of household? ☐ B2

What is the ethnicity of the spouse of the head of household? ☐ B3

What is the main source of drinking water for your household? ☐ B4

1. Indoor tap
2. Outdoor private tap
3. Outdoor shared tap
4. Covered well
5. Collected rainwater
6. River, lake, or pond
7. Water collected in a tank
8. Aqua/bottled water
9. Refill water

What is the main type of toilet used by your household? ☐ B5

1. Flush toilet
2. Latrine with pipe
3. Pit latrine
4. Latrine over canal/river
5. Public toilet
6. Other or none

What is the main type of lighting used by your household? ☐ B6

1. Electric lights
2. Oil lamps
3. Candles
4. Other
5. None

What type of fuel is used by your household for cooking? ☐ B7

1. Electricity
2. LPG
3. Biogas
4. Kerosene
5. Wood
6. Other

What is the distance (in meters) to the nearest public transport? =1)
That is ojek, angkot, bus, etc) B8
(Round to nearest km; e.g. 0.5km = 0; 1.2km =1) ☐ Meters

	B9. How many of each of the following items do members of your household currently own or have in household? [If household does not own, write "0"] Number		B10. What year did your household first own this type of asset? . [use two digits e.g. "04"] Year		
a refrigerator?		1			1
a microwave oven?		2			2
a rice cooker?		3			3
a stove		4			4
a bicycle?		5			5
a motorbike?		6			6
a car or truck?		7			7
a mobile phone?		8			8
a landline telephone?		9			9
a computer or laptop?		10			10
Internet access? (incl. mobile)		11			11
a radio?		12			12
a television?		13			13
cable television (e.g. Indovision)?		14			14
a fan?		15			15
an air-conditioner?		16			16
a washing machine?		17			17
a generator?		18			18
a debit card?		19			19
a credit card?		20			20

C COOKING AND SHOPPING ATTITUDES AND BEHAVIOUR

Does this household have a cook or housekeeper? [If no, fill in "3" for C1 and C2]

C 1	Does the domestic employee ever help with cooking?		C 1	1. Yes, at least sometimes
C 2	Does the domestic employee ever shop for food?		C 2	2. No, never , 3. Not applicable (no domestic employee)

Who in the household is primarily responsible for...

C 3	...deciding what food products to purchase for the family meals?		C 3	1. Adult male family member
C 4	...doing the majority of food shopping for family meals?		C 4	2. Female adult family member
C 5	...deciding what food the family will have for a meal?		C 5	3. Children in family
C 6	...cooking the majority of the family meals?		C 6	4. Domestic employee 5. No one

C 7	Does someone in the household make a written food shopping list?		C 7	1. Yes 2. No
C 8	How many times per week does the majority of your household eat dinner together? [Number should not be greater than 7]		C 8	0 to 7 (times)

In an average MONTH, how often is the food for the evening meal ...

C 9	..."ready-to-eat" meals purchased outside the house, brought home, and eaten at home?		C 9	1. Every day 2. 2-6 times per week 3. Once a week 4. 2-3 times per month 5. Once a month 6. Few times per year 7. Never
C 10	...purchased from a delivery service and eaten at home?		C 10	
C 11	...purchased and eaten at restaurants?		C 11	
C 12	...purchased from street stalls or vendors and eaten away from home?		C 12	

On a scale of 1 to 5, how important is each of the following characteristics when deciding where you will purchase food? (USE PINK CARD)

1 = Not at all important; 2 = Somewhat important; 3 = Moderately important; 4 = Important; 5 = Extremely important

		Importance				Importance	
C 13	Low prices (good value)		C 13	C 24	Can purchase small amounts		C24
C 14	Fixed price (no negotiation)		C 14	C 25	Product is unpackaged (can see and feel)		C25
C 15	Flexible prices (able to negotiate)		C 15	C 26	Store is easy to get to		C26
C 16	Store provides discount (sales)		C 16	C 27	Store is close to other non-food shopping		C27
C 17	Ability to purchase on credit		C 17	C 28	Store is close to entertainment & social opp		C28
C 18	High-quality food products		C 18	C 29	Fast service (no waiting in lines)		C29
C 19	Food is safe to eat		C 19	C 30	Cleanliness (including environment) of store		C30
C 20	Food products are fresh		C 20	C 31	Better opening hours		C31
C 21	Food product information (weight, labels, expiry, etc)		C 21	C 32	Air-conditioning		C32
C 22	Product display is good (easy to find products)		C 22	C 33	Friendly staff		C33
C 23	Wide variety of food products (good selection)		C 23	C 34	Delivery Service		C34

D. SHOPPING BEHAVIOUR

Code	Type of outlet	How much TIME does it take you to get to the nearest [outlet type]? (minutes)	What is the distance (km) to the nearest [outlet type]? (km) Code to nearest km (e.g. 0.5 = 0km) 999=don't know	How frequently does your household shop for **NON-FOOD** items at a [outlet type]? 1. Every day 2. 2-6 times per week 3. Once a week 4. 2-3 times per month 5. Once a month 6. Less than once a month 7. Never	How frequently does your household shop for **FOOD** at a [outlet type]? (**See Definition of Food Below) 1. Every day 2. 2-6 times per week 3. Once a week 4. 2-3 times per month 5. Once a month 6. Less than once a month 7. Never	**If household shops at outlet (D5 = 1-6)**		
						How do you normally get to the nearest […]? 1. On foot 2. Bicycle 3. Motorcycle 4. Car 5. Public transp. 6. Taxi or ojek 7. Other	What are the main reasons that you purchase food at this outlet? [Do NOT Prompt. Categorize response using codes on back of page. If cannot respond then show list. Ask if second reason, but do not force.]	
							1st reason	2nd reason
D1		**D2**	**D3**	**D4**	**D5**	**D6**	**D7**	**D8**
1	Hypermarket							
2	Supermarket							
3	Minimarkets/ convenience store							
4	Semi-permanent stand (e.g. fruit)							
5	Small shop (warung)							
6	Traditional wet market							
7	Peddler							

Definitions: **Food includes anything eaten or drunk, including unprocessed food, processed food, meals, and beverages. It does not include tobacco or betel nut.
Hypermarkets include Carrefour, Giant, Macro, & Hipermart (10 or more cash registers). Supermarkets include Hero, Matahari, Asia, & Yogya (2-9 cash registers).
Minimarkets include Alfa & Indomart and modern fruit stores (1-2 cash registers). Peddlers refer to vendors operating on foot, on bicycle, or by car/truck

Back of D

Codes for D7 and D8	
Note: Ask respondent questions without prompting answers. Then code using table below.	
1	Low price (good value)
2	Fixed price (no negotiation)
3	Flexible prices (able to negotiate)
4	Store provides discount (sales)
5	Ability to purchase on credit
6	High-quality food products
7	Food is safe to eat
8	Food products are fresh
9	Food product information (weight, labels, expiry, etc.)
10	Product display is good (easy to find products)
11	Wide variety of food products (good selection)
12	Can purchase small amounts
13	Product is unpackaged (can see and feel)
14	Store is easy to get to
15	Store is close to other non-food shopping
16	Store is close to entertainment & social opp.
17	Fast service (no waiting in lines)
18	Cleanliness of store (including good shopping environment)
19	Better opening hours
20	Air-conditioning
21	Friendly staff
22	Delivery service

E1. FOOD CONSUMPTION (staples and animal products)

				ASK ONLY IF E2 = 1		
		Food Consumption	Change in Consumption	Purchased food		
		During the past 12 months, has your household consumed any [...]? 1. Yes 2. No	Are members of your household consuming smaller or larger quantities of [...] on a per person basis than 5 years ago? 1. Smaller quantities 2. About the same 3. Larger quantities 4. Never consumed	During the past month, how many times did your household purchase [...]? Number of times	For each purchase, what is the normal value of [...] bought for household consumption? Value in Rupiah	Where do you buy most of the [...]? 1. Hypermarkets 2. Supermarkets 3. Minimarkets 4. Semi-perm. stand 5. Small shop (warung) 6. Traditional wet market 7. Peddlers , 8. Other
E1	Food product	E2	E3	E4	E5	E6
111	Rice					
112	Maize products					
113	Other grains & flour					
114	Bread and bread products (not cakes)					
115	Breakfast cereals (hot and cold)					
116	Instant noodles					
117	Other noodles (egg and rice) and pasta					
211	Tubers (cassava, sweet potato, taro, sago, etc)					
311	Beans, pulses, and nuts (e.g. kidney, soyabeans, & cashew)					
312	Tofu and tempe					
411	Fresh milk					
412	Other milk (powdered, UHT, long life, & canned)					
413	Other dairy products (e.g. yogurt, cheese, cream etc.)					
414	Eggs (chicken, duck, and other bird)					
511	Beef, lamb, and mutton (not processed)					
512	Poultry (e.g. chicken & duck, not processed)					
513	Other meats (e.g. goat, not processed)					
514	Fish (not processed)					
515	Shrimp (Fresh, not processed or breaded)					
516	Seafood (e.g. shellfish & squid, not Shrimp, not processed)					
517	Processed meat (e.g. sausages, breaded, seasoned, etc.)					
518	Processed fish and seafood (breaded, salted, dried, etc.)					

Note: Codes 511 to 516 refer to products that may be fresh, chilled, or frozen, but are not breaded, seasoned, salted, canned, dried, smoked, or semi-prepared.
Codes 517 and 518 refer to products that are breaded, seasoned, salted, canned, dried, smoked, or semi-prepared in other ways.

E2. FOOD CONSUMPTION (fruits and vegetables)

		Food	ASK ONLY IF E2 = 1			
			Change in Consumption	Purchased food		
		During the past 12 months, has your household consumed any [...]? 1. Yes 2. No	Are members of your household consuming smaller or larger quantities of [...] on a per person basis than 5 years ago? 1. Smaller quantities 2. About the same 3. Larger quantities 4. Never consumed	During the past month, how many times did your household purchase [...]? Number of times	For each purchase, what is the normal value of [...] bought for household consumption? Value in Rupiah	Where do you buy most of the [...]? 1. Hypermarkets 2. Supermarkets 3. Minimarkets 4. Semi-perm. stand 5. Small shop (warung) 6. Traditional wet market 7. Peddlers, 8. Other
E1	Food Product	E2	E3	E4	E5	E6
611	Chilies					
612	Sha ots					
613	On on					
614	Gar c					
615	Cucumber					
616	Leafy green vegetab es e.g Sp nach, Water Sp nach, Bok					
617	Green bean (bunc s)					
618	Tomato					
619	Potato					
620	Carrots					
621	Other fresh and frozen vegetab es					
622	Canned or dr ed vegetab es (NOT fr ed or cr sps)					
711	Banana					
712	Mango					
713	Papaya					
714	Mangosteen					
715	App e					
716	Me on					
717	P neapp e					
718	Orange /mandar ns and other c trus					
719	Other fresh fru t					
720	Other fru t (canned, dr ed, processed, frozen, sweetened)					

E3. FOOD CONSUMPTION (processed food and beverages)

		Food Consumption	ASK ONLY IF E2 = 1			
			Change in Consumption	Purchased food		
		During the past 12 months, has your	Are members of your household consuming smaller or larger quantities of [...] on a per person basis than 5 years ago?	During the past month, how many times did your household purchase [...]?	For each purchase, what is the normal value of [...] bought for household consumption?	Where do you buy most of the 1. Hypermarkets 2. Supermarkets 3. Minimarkets 4. Semi-perm. stand 5. Small shop (warung) 6. Traditional wet market 7. Peddlers , 8. Other
		1. Yes 2. No	1. Smaller quantities 2. About the same 3. Larger quantities 4. Never consumed	Number of times	Value in Rupiah	
E1	**Food Product**	**E2**	**E3**	**E4**	**E5**	**E6**
811	Coconut and palm oil					
812	Other cooking oils (e.g. maize, soy, etc)					
813	Coconut milk					
814	Fats, butter, and margarine					
821	Spreads (e.g. peanut butter, jam, Nutella)					
822	Bisquits, crackers, cake, and pastries					
823	Chocolate, meisus, and sweets					
824	Sugar and sweeteners					
831	Salt, soya sauce, monosodium glutamate					
832	Chili sauce and other sauces					
833	Other spices and seasonings (e.g. pepper, coriander, etc)					
841	Bottled water (e.g. Aqua, refill water)					
842	Soda, fruit juice, & other non-alcoholic beverages					
843	Coffee (instant & powder) & tea (bags & leaves)					
844	Alcoholic beverages (beer, wine, spirits)					
851	Potato crisps and other snack food					
852	Infant & child formula, adult nutrition drink					
853	Vitamins, dietary supplements, & herbal drinks					
854	Quick prepare meals (soups, frozen meals)					
855	Ready-to-eat meals (take-away or supermarket or restaurant)					
856	Other processed food					
900	Meals & beverages eaten outside home (e.g. at restaurant)					

F. NON-FOOD EXPENDITURE

How much does your household spend on [item] in a typical week, month, or year? [do not include food, durable goods, taxes, or business expenses]		**Value** (Rp/IDR) Code as "0" if no expenditures.	**Time period** 1=weekly 2=monthly 3=yearly
F1	**Expenditure**	**F2**	**F3**
1	Household equipment (kitchen items, mats, blankets, etc)		
2	Housing maintenance and minor renovation		
3	Electricity, water, gas, and kerosene		
4	Telephone (fixed line, mobile recharge, and public phones)		
5	Body products, cleaning supplies, cosmetics, tissue, etc		
6	Health expenditures (hospital, clinic, doctor, medicine, etc)		
7	Health insurance		
8	Education expenditures (school fees, English classes, tutor, books, uniforms, etc)		
9	Transportation (bus fare, petrol, etc)		
10	Domestic employees (housekeeper, driver, etc)		
11	Clothing (including shoes and headcover)		
12	Tobacco (cigarettes, cigars, leaves, etc)		
13	Celebrations and ceremonies (excluding food)		
14	Other leisure spending (sports, movies, internet, magazines, etc)		
15	Other non-food consumption spending (e.g. gifts, life insurance)		

Note: Do not include food, durable goods, taxes, or business expenses.

F4 What is the ownership status of your house? _____ F4
1. Rented; 2. Owned; 3. Use without paying rent

F5 [If F4=1] How much rent does your household pay per year? _____ F5
(in Rupiah per year)

F6 [if F4=2 or 3] How much would it cost to rent housing like this in this neighborhood? (in Rupiah per year) _____ F6

G. RETAIL OUTLET USE, PREFERENCES QUALITY, SAFETY AND CONVENIENCE

		If G1 = 1-8 then Ask				
	Where do you usually buy [food type]? 1. Hypermarkets 2. Supermarkets 3. Minimarkets 4. Semi-perm. stand 5. Small shop (warung) 6. Traditional wet market 7. Peddlers 8. From producer 9. Never buy	What is the primary reason that you buy [food type] at this Please use codes below.	Which is the best type of outlet to buy [food type] at a good price? 1. Hypermarkets 2. Supermarkets 3. Minimarkets 4. Semi-perm. stand 5. Small shop 6. Traditional wet 7. Peddlers 8. From producer	Which is the best type of outlet to buy [food type] that is 1. Hypermarkets 2. Supermarkets 3. Minimarkets 4. Semi-perm. stand 5. Small shop 6. Traditional wet 7. Peddlers 8. From producer	Which is the best type of outlet to buy [food type] 1. Hypermarkets 2. Supermarkets 3. Minimarkets 4. Semi-perm. 5. Small shop 6. Traditional wet 7. Peddlers 8. From producer	Which is the best type of outlet to buy 1. 2. 3. Minimarkets 4. Semi-perm 5. Small shop 6. Traditional 7. Peddlers 8. From
Food Product Categories	**G1**	**G2**	**G3**	**G4**	**G5**	**G6**
1 Fresh meat, poultry meat and offal						
2 Fresh fish and seafood, e.g. shrimp						
3 Fresh fruits						
4 Fresh vegetables						
5 Fresh milk and yogurt						
6 Processed food items (e.g. boxed goods)						
7 Rice						

Codes for G2

1 Low price (good value)	8 Food products are fresh	15 Store is close to other non-food
2 Fixed price (no negotiation)	9 Food product information (weight, labels, expiry,	16 Store is close to entertainment & social
3 Flexible prices (able to negotiate)	10 Product display is good (easy to find products)	17 Fast service (no waiting in lines)
4 Store provides discount (sales)	11 Wide variety of food products (good selection)	18 Cleanliness of store (including good shopping
5 Ability to purchase on credit	12 Can purchase small amounts	19 Better opening hours
6 High-quality food products	13 Product is unpackaged (can see and feel)	20 Air-conditioning
7 Food is safe to eat	14 Store is easy to get to	21 Friendly staff
		22 Delivery service

H. FACTORS IN FOOD CHOICE

In choosing the food products you purchase, what are the 3 most important factors influencing your decision (apart from halal)?

	Most H1	2nd H2	3rd most H3
1. Food in general			

In choosing each of the following types of products, what are the 3 most important factors influencing your decision (apart from halal)?

	Most H1	2nd H2	3rd Most H3
2. Mango			
3. Other Fresh Fruit			
4. Chilli			
5. Shallot			
6. Other Fresh			
7. Shrimp			
8. Poultry			
9. Meat (beef, lamb			

Codes for H1 - H3

1	Pr ce	12	D vers t
2	Nutr t ona content	13	Sme
3	Food safety	14	Co our
4	Qua ty	15	Appearance
5	Taste	16	F rmness/texture
6	Freshness	17	Var ety (e.g. gadung)
7	Easy to prepare	18	Package s ze
8	Product on method (e.g. organ c)	19	Exp ry date
9	Brand	20	Other abe ng nfo
10	Or g n (country or reg on)	21	Never purchase th s
11	Grade, C ass		

H4. How often do you use food ingredients and nutrition labels when shopping for food? ____ H4

Codes for H4

1	A ways
2	Often
3	Somet mes
4	Never

[If H4 is 1-3] What type of nutritional information do you use or look for?

Ingredients		H5
Calorie content		H6
Sugar		H7
Salt		H8
Fat		H9
Vitamins &		H10
Protein		H11
Fibre		H12
Other		H13

Codes for H5-H13

1. Yes, ooks for
2. No, does not ook for

What are the first and second most important sources of nutrition information for your household? ____ H14 ____ H15

Codes for H14-

1	Med ca profess ona (doctor, nurse, nutr t on st)
2	Government agenc es
3	Food compan es
4	Med a (TV, nternet, newspapers, rad o, magaz nes, books)
5	Fr ends and re at ves
6	Schoo
7	Other

I. NUTRITION ATTITUDES AND FOOD CONCERNS

SHOW RESPONDENT GREEN "AGREEMENT" SCALE PROVIDED ON CARD. RESPONDENT SHOULD POINT TO LEVEL OF AGREEMENT

For the next set of questions I1-I27, I am going to read you several statements. After I read you each statement then I would like you to point at the scale and tell me how strongly you agree or disagree with what I have said. 1 = STRONGLY DISAGREE and 5 = STRONGLY AGREE. There is no right or wrong response – I am really just interested in getting your OPINIONS and BELIEFS."

		Agreement	
I 1	When purchasing food and drinks I am concerned about whether or not the product is healthy		I 1
I 2	Consuming some foods can INCREASE the risk of developing certain diseases		I 2
I 3	Consumption of certain foods can DECREASE the risk of certain diseases		I 3
I 4	Diet and nutrition play a major role in my health and the health of my family		I 4
I 5	I have very little control over my health		I 5
I 6	Regular exercise would improve my health or the health of family members		I 6
I 7	Avoiding smoking would improve my health or the health of family members		I 7
I 8	To maintain good health it is important to eat a wide variety of food products		I 8
I 9	I avoid purchasing food containing high amounts of fat or cholesterol		I 9
I 10	I avoid purchasing food containing high amounts of salt		I 10
I 11	I avoid purchasing food & drinks with high amounts of sugar		I 11
I 12	There are so many recommendations about healthy ways to eat that I do not know what to do.		I 12
I 13	The nutrition information on food labels is useful to me.		I 13
I 14	I feel confident that I know how to use food labels		I 14
I 15	Reading food labels makes it easier to choose foods		I 15
I 16	Sometimes I try new foods because of the information on food labels		I 16
I 17	I am concerned about having enough food available (adequate access to food and /or affording food)		I 17
I 18	I am concerned about the safety of my food		I 18
I 19	I am concerned about the nutritional content of my food		I 19
I 20	I am concerned about the use of pesticides to produce my food		I 20
I 21	I am concerned about the use of additives, preservatives and artificial colours in my food		I 21
I 22	I am concerned about bacterial contamination of my food		I 22
I 23	I am concerned about heavy metals or toxic chemicals might be in my food		I 23
I 24	I am concerned about the accurracy of information on food labels and food displays		I 24
I 25	I am concerned about the accuracy of information regarding halal certification		I 25
I 26	I am concerned about food imported from outside Indonesia		I 26
I 27	I am concerned that the food was not stored properly (not kept refrigerated)		I 27

J1. CERTIFICATION AWARENESS, PURCHASES, PERCEPTIONS

	NOTE: ALL CELLS IN THIS TABLE SHOULD BE FILLED OUT!	Have you ever seen or heard of food products that are so d …. 1 = Yes ; 2 = No	Have you ever PURCHASED food and beverages that are so d as … 1 = Yes ; 2 = No; 3 = Do not know, unsure	Wou d you PREFER to purchase food and beverages that are so d as … 1 = Yes ; 2 = No 3 = Unsure, do not understand
		J1	J2	J3
1	…organic or certified organic			
2	…pesticide Free			
3	…chemical Free			
4	…natural			
5	…preservative or additive free			
6	…natural ripening			
7	…safe or safety guaranteed			
8	…healthy			
9	…environmentally friendly or Eco-Friendly			
10	…hydroponic			
11	…hygienic			
12	…from a particular country			
13	…from a particular region of Indonesia			
14	…free of genetically modified organisms (GMO Free)			

		J4	J5
		…organic? 1. Yes; 2. No	pesticide free? 1. Yes; 2. No
1	Do you know what it means when a product is labelled or certified as ….		
	Do you agree with the following statements. [Complete each column in this section ONLY if the answer in row 1 above = yes. Otherwise leave column blank]	Certified "organic" products … 1 = Yes or 2 = No	Certified "pesticide Free" products … 1 = Yes or 2 = No
2	…are healthier.		
3	…contain no pesticides or residues.		
4	…were produced without pesticides.		
5	…were produced without GMOs.		
6	…are more eco-friendly or environmentally friendly.		
7	…production is overseen by government		
8	…are safer to eat.		
9	…are better tasting.		
10	…are no different (certification is meaningless).		

J2. CERTIFICATIONS

		Who would you most trust to certify [attribute] in [product]? [Use codes at right]		
		Fruits & Vegetables	Shrimp	Chicken
J7	Attribute	J8	J9	J10
1	**Safety** ("Clean", "Biosecurity", Expiry Date, No Additives) Agency is inspecting the production processes to ensure that producers and processors are following "best practices" to prevent food-related illnesses. Halal is NOT considered a safety certification.			
2	**Quality** (freshness, weight, grade) Agency inspects the product to guarantee that the product meets specific grades or standards or levels of quality met.			
3	**Production information** (e.g. organic, pesticide free, etc.) Agency inspects and verifies that claims such as organic, pesticide free, natural etc. are truly used.			
4	**Nutrition information** (e.g. fat free, low fat, low calorie, low sugar, high energy) Agency is inspects food manufacturer to make sure any nutritional claims such as fat free, low fat, low calorie, low sugar, high energy etc. are true.			

Codes for J8-J10	
1	The Indonesian Government (e.g. Federal, Ministry of Health)
2	State or local government (Provincial or District)
3	Foreign government organization
4	Farmers & farmer organizations (e.g. HKTI)
5	Food company (brand, e.g. Danone, Indofood, Garuda Food)
6	Retailer/Supermarket (e.g. Matahari, Giant, Carrefour)
7	Independent 3rd party (not for profit)
8	Religious organization
9	Other SPECIFY_____
10	No opinion, Do not Know

			If J12 = yes		If J12 =yes and J14=2
		Does your household ever purchase [product]? 1. Yes 2. No	What is the normal price you pay for this product? Rupiah/kg	If you have a choice between buying conventional [product] and [product] that is labelled "Certified Organic", which one would you buy? 1 = I would NEVER buy the "Certified Organic" product 2 = I would buy the "Certified Organic" product if the price was right.	What is the maximum amount extra that you would be willing to pay for [product] that is labelled as "Certified organic"? (percent)
J11	Product	J12	J13	J14	J15
1	Chillies				%
2	Mangos				%
3	Shrimp				%
4	Chicken				%

K. DIET RELATED HEALTH AND MANAGEMENT

		On a scale of 1 to 5, how concerned are you that each of the following may affect you or your family?	Have any members of the household been diagnosed by a medical professional as having…	[If K3 = yes]			[If K6=yes]		
		1. Not at all 2. A little 3. Moderately 4. Concerned 5. Extremely 6. Don't know	1.Yes 2. No	Which household member was it? 1. Adult(s) 2. Child(ren) 3. Both	What year was a household member first diagnosed? Year	Have any members of your household made any changes in order to manage or prevent these problems? 1.Yes 2. No	What have you done to control [problem]? [No prompting, classify up to 3 responses with codes below]		
K1		**K2**	**K3**	**K4**	**K5**	**K6**	**K7**	**K8**	**K9**
1	Obesity or overweight?								
2	Underweight or malnourished?								
3	Diabetes?								
4	High blood pressure?								
5	Heart disease?								
6	Cancer?								
7	Food allergies or intolerance?								

Codes for K10-K13
1. All of us
2. Some of us
3. None of us
4. No children

In the last 12 months have you or anyone in your household experienced…
...severe diarrhoea? _____ K10
...illness' related to food poisoning (unsafe food)? _____ K11

In the last 12 months, how many of the adults in the household have seen a medical professional?
(For any reason including check-ups) _____ K12

In the last 12 months, how many of the children in the household have seen a medical professional?
(For any reason including check-ups) _____ K13

Codes for K7 - K9
1. Decrease fat consumption
2. Decrease sugar consumption
3. Decrease salt consumption
4. Decrease cholesterol consumption
5. Increase fibre consumption
6. Decrease total calories
7. Increase fruit consumption
8. Increase vegetable consumption
9. Eat less processed food
10. Exercise more
11. Decrease alcohol consumption
12. Take medication
13. Take vitamins or alternative med
14. Reduce or stop consuming food related to allergy
15. Other, specify _____

L. OTHER

On average, how many **hours per day** do the **ADULTS** (18 and over) in your household spend watching TV, videos, or on the internet for entertainment? ☐ L1 hours/day

On average, how many **hours per day** do the **CHILDREN** (5-17 years) in your household spend watching TV, videos, or on the internet? Note: If no children code as 999. ☐ L2 hours/day

On average, how many **hours per week** does each **ADULT** in the household do exercise (e.g. sports, bike riding)? ☐ L3 hours/week

On average, how many **hours per week** does each **CHILD** in the household do exercise (e.g. sports, physical education at school, bike riding, playing outside)? Note: If no children code as 999. ☐ L4 hours/week

Does anyone in your household smoke cigarettes daily? ☐ L5

1. Yes 2. No

How has the **size** your household changed in the last 5 years? ☐ L6

1. Increased (more members)
2. No change
3. Decreased (fewer members)

How has the **health status** of household members changed in the last 5 years? ☐ L7

1. Improved
2. No change
3. Deterioration
4. Don't know/not applicable

[If L7=1 or 3] What is the primary reason for the change in the health status of household members? ☐ L8

1. Household member had an accident
2. Household member fell ill due to disease
3. Medical intervention improved status
4. Change in diet
5. Change in lifestyle (e.g. exercise more, stopped smoking)

What is the approximate **income** of the household? ☐
[This includes the income of all household members including children, but NOT domestic employees. For self-employed members, we want the net income, i.e. business revenue minus business expenses.]

1 Less than 50,000 IDR/month
2 50,000 to 100,000 IDR/month
3 100,000 to 200,000 IDR/month
4 200,000 to 500,000 IDR/month
5 500,000 to 1,000,000 IDR/month
6 1,000,000 to 2,000,000 IDR/month
7 2,000,000 to 5,000,000 IDR/month
8 5,000,000 to 10,000,000 IDR/month
9 More than 10,000,000 Rp/month

How has the **standard of living** of your household changed in the last 5 years? ☐

1 Improved significantly (>30%)
2 Improved somewhat (10-20%)
3 No change (-10% to 10%)
4 Deteriorated somewhat (-10-30%)
5 Deteriorated significantly (>-30%)

[If L10=1,2,4,5] What is the primary **reason** for the change in the standard of living? ☐

1 Household member(s) found/lost job(s)
2 Household member(s) earning more/less from same job(s)
3 Change in health of household members
4 Losses associated with crime (e.g. theft)
5 Losses associated with natural disaster
6 New expenses associated with illness
7 New expenses associated with newborn
8 New expenses associated with education
9 Inheritance

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