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Comparing quality, prices, and competition strategies in Thailand

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Abstract

Supermarkets and hypermarkets are expanding rapidly in many developing countries. While consequences for farmers and consumers were analyzed recently, little is known about the implications for traditional retail formats such as wet markets. Using data from a market survey in Thailand and hedonic regression models, we analyze quality and prices for fresh vegetables from different retail outlets. Compared to wet markets, modern retailers sell higher quality at higher prices, indicating that they are primarily targeting better-off consumers. Hence, they are not directly competing for the same market segments. Yet there are signs that modern and traditional markets will gradually converge.

Keywords: supermarkets; modern retailers; traditional wet markets; product quality; vegetables; Thailand.

JEL Codes: C21, L15, Q13

Introduction

Modern retail structures are rapidly expanding in many developing countries. An emerging body of literature analyzes the effects of this ‘supermarketization’ (Reardon et al., 2005) on agro-food systems. While a first strand focuses on the impacts on smallholder farmers (e.g., Hernández et al., 2007; Bignebat et al., 2009; Timmer, 2009), a second strand investigates consumer-related aspects from various perspectives (Neven et al., 2006; Pingali, 2006; Mergenthaler et al., 2009a; Stringer et al., 2009). Another, much less researched topic of

interest relates to the implications for the traditional retail sector. While a few studies highlight the negative effects of increasing numbers of modern retail outlets on small-scale groceries shops (Faiguenbaum et al. 2002; Hawkes, 2008; Ho, 2005; Natawidjaja et al., 2007; Reardon et al., 2010), very little work focuses on wet markets, where traditionally the bulk of fresh fruits and vegetables (FFV) has been sold (Minten and Reardon, 2008). This is an important research gap for two reasons. First, while supermarkets in developing countries often start to sell processed foods, their share of fresh produce sales tends to increase when modern markets mature (D`Haese and van Huylenbroeck, 2005; Reardon et al., 2010). Hence, the competition between modern retailers and wet markets is likely to intensify over time, as was recently shown by Suryadarma et al. (2007) for the case of Indonesia. Second, with economic growth and rising consumer incomes, demand for high-value fruits and vegetables increases over-proportionally, so that this market segment is characterized by high dynamics (Mergenthaler et al., 2009b).

Of particular interest in this connection is to understand the strategy of modern retailers in terms of expanding their FFV sales. One option would be to exploit economies of scale and compete with wet markets on the basis of costs and prices, in order to gain shares of the existing market. Another option would be to build up new market segments for higher-quality products, especially catering for the growing share of better-off consumers. The latter strategy would likely have a lower impact on sales volumes in traditional wet markets, at least in the short run. The scant literature on price differences suggests that modern retailers gradually become price competitive in fresh foods in some situations (Minten and Reardon, 2008; Minten et al., 2010). Other authors observe that modern retailers introduce new quality standards to differentiate their FFV sales (Balsevich et al., 2003; Henson and Reardon, 2005). Yet, little is known about the details of such quality standards, and there are only few studies

that examine how quality is reflected in product prices (Minten and Reardon, 2008; Minten et al., 2010).

We aim to address this research gap by analyzing product quality and prices for fresh vegetables across different retail formats in Thailand, a country where modern retail structures are already at an advanced stage of development. The research focuses on the capital city, Bangkok, where modern retail outlets were first established and FFV sections are fairly developed. Bangkok hosts a wide array of different market outlets, ranging from traditional wet markets to modern supermarkets and hypermarkets¹, thus representing an ideal study setting. While results will be situation-specific, to some extent they may also portray future developments in other developing countries that are still at an earlier stage of ‘supermarketization’.

In a first step, drawing on secondary data, we provide an overview of the status and expansion of modern retail structures in Thailand. Then, we use data from a market survey, which was specifically carried out for this study, in order to analyze competition strategies of modern retailers. We do so by comparing product quality attributes and prices between modern retailers and traditional wet markets for two specific types of vegetables. Finally, we employ hedonic price models to identify the effect of product quality attributes on prices. We hypothesize that modern retailers target upscale markets rather than directly competing for traditional market segments. Furthermore, we hypothesize that supermarkets and hypermarkets differ in their competition strategy.

¹ Although supermarkets and hypermarkets differ in various ways, one major criterion for the differentiation is the size of the store. The size of a supermarket usually ranges from 400 to 1500 square meters, while hypermarkets often cover a retail area of more than 5,000 square meters.

Background on modern retailers in Thailand

In the 1980s and 1990s, increasing per capita incomes, urbanization trends and female labor force participation spurred the development of modern retail structures in Thailand. Several retail formats – supermarkets (first opened in 1972), convenience stores (first opened in 1989), hypermarkets (first opened in 1988), and department stores with integrated supermarkets (first opened in 1993) – were established, primarily in Bangkok and surrounding suburbs. Initially, the major share in these businesses was held by Thai investors. However, due to the economic crises in the late 1990s and liberalization with respect to foreign direct investment, parts of the equity were sold to multinational retail chains (TDRI, 2002; Tokrisna, 2005). In 2007, the two leading supermarket chains were Thai-owned, whereas the three leading hypermarket chains belonged to foreign investors.

All five modern retail chains steadily increased their number of branches over time, as is shown in figure 1. Comparing growth rates, hypermarkets (Big C, Tesco Lotus, Carrefour) expanded more than supermarkets (Foodland and Tops). In 2009, the number of hypermarket branches exceeded the number of supermarket branches by 32%. Another difference between the two retail formats is their regional focus, which is depicted in figure 2. Whereas the supermarket chains still have most of their branches in Bangkok, two of the hypermarket chains (namely Big C and Tesco Lotus) nowadays have fewer branches in Bangkok than in other parts of Thailand. This pattern suggests that hypermarkets start expanding earlier towards smaller cities and towns.

Insert figure 1 here

Insert figure 2 here

The overall growth of modern retailers is also reflected in their growing share in total retail trade. According to TDRI (2002), total retail sales in Thailand increased from 249 billion Baht in 1997 to 635 billion Baht in 2001, while the share of modern retailers increased from

26% to 53% during the same period. Focusing on food sales alone, studies indicated market shares of modern retailers between 25% and 35% for 2004 (Wiboonpongse and Sriboonchitta, 2004; Vandeplass et al., 2009). Keeping in mind that the number of supermarket and hypermarket branches has grown significantly since then (figure 1), it can be expected that their market shares have also further increased, implying a continued decline in the relative importance of traditional retailers.

For FFV, market shares of modern retailers in developing countries are usually lower than for food as a whole, but they are also increasing over time (Reardon et al., 2010). This trend can also be observed in Thailand (Wiboonpongse and Sriboonchitta, 2004). While precise numbers for the country as a whole are not available, Suddeephong (2010) recently reported that households in Bangkok spend about 25% of their total FFV expenditures for purchases in modern retail markets.

Market survey

To gain further insights into competition strategies, we conducted a sample survey of 43 market outlets in Bangkok in early 2009. In order to have sufficient observations for each retail format, a special sampling framework was designed. The two leading supermarket chains (Foodland and Tops) and three leading hypermarket chains (Big C, Tesco Lotus, Carrefour) were selected as modern retail outlets. As Tops has two different supermarket formats, Tops Supermarket and Tops Marketplace, we decided to treat them separately, so that in total six modern retail chains were differentiated. All these chains provide information about the number and addresses of all branches on their websites. In total, 122 branches of the six chains were identified in Bangkok in November 2008. From each chain, 20% of the branches were randomly sampled. Thus, the sample includes a total of 26 modern retail branches located in 17 districts of the city: 14 supermarket and 12 hypermarket branches. The

supermarket subsample includes two Foodland, eight Tops Supermarket, and four Tops Marketplace branches, whereas the hypermarket subsample includes three Big C, four Tesco Lotus, and five Carrefour branches. For better comparison, we sampled wet markets in the same 17 districts, based on district-level lists of all registered wet markets obtained from the Bangkok Metropolitan Administration. We randomly selected one wet market in each district, so that the traditional retailer subsample includes 17 wet markets. The total sample is representative of the surveyed retail formats in the city of Bangkok.

Data collection was based on a structured questionnaire especially designed for this purpose. In addition to some general information about the market outlets, the main focus was on product quality and prices of fresh vegetables. We decided to concentrate on two types of vegetables, namely morning glory and sweet pepper. Morning glory is a local leafy vegetable consumed in many different ways in various Thai dishes. Leafy vegetables account for 44% of consumer total vegetable expenditures in Bangkok (Suddeephong, 2010). In contrast, sweet pepper is a non-traditional vegetable in the Thai context; it was introduced in the country around ten years ago as a high-value product to be sold primarily in modern retail outlets. However, sweet pepper has recently gained wider popularity in certain consumer segments and is now also sold in traditional wet markets (Schipmann and Qaim, 2010). It will be interesting to analyze whether competition strategies of modern retailers differ between traditional and non-traditional types of vegetables.

Quality and price data were collected over a period of four months from January to April 2009. Each of the retail outlets sampled was visited once per month; in each month all visits to the different outlets took place within the same week. In the supermarkets and hypermarkets, data were collected for all morning glory and sweet pepper samples available. In the wet markets, we randomly sampled 20% of the food stalls (or a minimum of two stalls in very small wet markets) that offered sweet pepper or morning glory. In three wet markets,

only one food stall that sold sweet pepper was found. Each month, the same food stalls were visited. In total 39 market stalls were surveyed for morning glory and 28 for sweet pepper. Some stalls sold both types of vegetables, so that in total 52 stalls were surveyed. Morning glory was regularly sold at a single price at each stand, while sweet pepper was sometimes sold at different prices. In that case, data were collected for all different price categories.

The total sample consists of 396 observations for morning glory, out of which 239 are from modern retailers and 157 from traditional wet markets. For sweet pepper, the total sample comprises 377 observations: 195 from modern retailers and 182 from wet markets.

Comparison of quality and prices across market outlets

Comparison of general market features

Table 1 compares general market features of the three retail formats. Wet markets are usually stand alone outlets, whereas supermarkets and hypermarkets are often integrated into bigger shopping malls. Being integrated into a mall offers additional convenience, because customers can buy a wider range of products in one location. Hypermarkets are shopping malls in themselves, selling a broad variety of products, from fresh and processed food to electronics and sometimes even furniture. Commonly, hypermarkets also incorporate various smaller food shops and playgrounds. These features promote shopping as a leisure activity for the whole family. Although wet markets are often surrounded by small garments or groceries shops, they can hardly compete with modern retailers from a convenience perspective.

Insert table 1 here

In terms of opening hours, all market formats are open around 14 hours a day, but supermarkets and hypermarkets open and close significantly later than wet markets. Thus, modern retail markets offer an advantage to consumers who have to go shopping after work. Likewise, parking lots are much more common in connection with modern retailers. As can

also be seen in table 1, location varies across retail formats. While wet markets and supermarkets are mostly located on main streets, hypermarkets are predominantly found near highways. This can partly be explained by market size, but also by zoning regulations of the Thai government. Clearly, a location near a highway offers better access by car, whereas markets located in residential areas are often within walking distance and thus easier to reach without a car.

As one would expect, there are also notable differences between retail formats in terms of cooling facilities in the FFV section, product labels, and the availability of organic produce. Product labels are a mechanism to signal quality and food safety to consumers. The most important label in Thailand is the Q-label. Products with the Q-label attest that the farmer who produced them has a GAP (Good Agricultural Practice) certificate issued by the Thai Ministry of Agriculture and Cooperatives. Recently, some modern retail chains also introduced their own private labels like the 'Carrefour Quality Line', which only comprises a limited number of products, however. In all modern retail branches, labeled products are found, but the share of labeled products is significantly higher in supermarkets than in hypermarkets. In wet markets, quality labels assigned to specific products are not found at all. However, 29% of the observed markets have the label 'Bangkok, city of clean food', which is a kind of quality label for wet markets as a whole. Interestingly, in terms of product variety no significant differences are found between modern and traditional retailers.

These comparisons show that modern retailers offer more convenience, especially for middle and upper income customers, who own a car and often have adopted western lifestyles, with relatively high levels of education, high awareness of food safety and quality, and women participating in the formal job market. In the following, we will analyze whether this pattern is also reflected in product quality differences between the retail formats.

Comparison of quality differences

We define product quality as a collection of observable search characteristics, because it is difficult to incorporate unobservable credence or experience attributes in such a study. As mentioned, we focus on two types of fresh vegetables, namely morning glory and sweet pepper. Since product quality valuation is often influenced by cultural backgrounds, prior to the actual market survey we carried out focus group discussions with a number of local students and market customers, in order to derive a list of relevant quality attributes and levels. Several samples of both types of vegetables were shown to participants, which they were asked to rank according to their own quality criteria. Afterwards, we discussed the participants' rankings. These discussions led to the quality attributes shown in tables 2 and 3.

Product quality criteria for morning glory and sweet pepper can be grouped into inherent product attributes, such as freshness and color, and sales attributes, such as packaging and labeling. For morning glory, freshness is characterized by leave and stem conditions, whereas other inherent attributes include the number of holes in the leaves, the color of the leaves, and whether or not the product is sold with roots. For sweet pepper, freshness is characterized by skin texture and spots, whereas variety, color, and shape are other inherent attributes of interest. For both vegetables, we consider whether they are packaged, labeled, and sold under a brand name as sales attributes.

Insert table 2 here

We first discuss the results for morning glory (table 2). While supermarkets offer a significantly higher share of morning glory with fresh stems and leaves, no significant difference is found between hypermarkets and wet markets. In regard to other inherent attributes, supermarkets offer significantly more morning glory without holes and roots, compared to both other retail formats. Compared to wet markets, hypermarkets also sell a significantly higher share without roots, but not with fewer holes in the leaves. No significant

differences in product color are found across market formats. Considering sales attributes, supermarkets rank best, that is, compared to both other formats they offer a significantly higher share of morning glory which is packaged and sold with a quality label or under a brand name. Hypermarkets rank second for these sales attributes.

Findings for sweet pepper are similar, but the differences are not as clear cut (table 3). Supermarkets and hypermarkets offer significantly higher shares of sweet pepper without wrinkles, and lower shares with over 25% skin spots. This indicates that sweet pepper is fresher in modern retail markets. For variety, color, and shape no significant differences are observed. For sales attributes, modern retailers rank better than traditional wet markets. However, unlike for morning glory, hypermarkets rank better than supermarkets, offering more sweet pepper which is packaged and sold with a label or under a brand name.

Insert table 3 here

Strikingly, in both modern retail formats, the share of packaged, labeled, and branded products is lower for sweet pepper than for morning glory. One explanation is that packaging and labeling are primarily used to signal food safety and generate consumer trust, which may be more important for a traditional vegetable like morning glory than for a modern product like sweet pepper. Overall, the results show that modern retailers offer higher quality products than traditional wet markets. This was also shown by Minten and Reardon (2008) for rice and tomatoes in Madagascar.

Comparison of price differences

Table 4 shows average product prices over the four-month survey period for the three retail formats. For sweet pepper, we distinguish between green and red varieties, because red sweet pepper is usually sold at higher prices. In both modern retail formats morning glory and sweet pepper are significantly more expensive than in traditional wet markets. Among the modern

retailers, products in supermarkets are more expensive than in hypermarkets, though the difference is not always significant.

Insert table 4 here

These results suggest that neither supermarkets nor hypermarkets are price competitive with wet markets. Hence, the rapid expansion of modern retailers in Thailand seems to be more associated with the growth of high-quality, differentiated market segments rather than a direct competition for traditional market shares. This is in line with the quality differences observed. Supermarkets offer the highest quality and sell at the highest prices, followed by hypermarkets and then wet markets. However, the descriptive statistics discussed so far do not tell us to what extent price differences are actually determined by observable quality attributes. This will be explored in the next section.

Hedonic price models

Model specification

Hedonic models are based on the theory of consumer choice and follow the idea that product prices can be decomposed into values for individual product attributes (Lancaster, 1966). Here, we employ hedonic modeling to measure the effect of quality attributes on the price of vegetables. As the two types of vegetables are characterized by different quality attributes, we run separate models for morning glory and sweet pepper.

Another important question is whether the observations from different retail outlets can be pooled, that is, whether the price effects of quality attributes are sufficiently similar across retail formats. We conducted a Chow-test, the results of which showed that data from traditional wet markets and modern retailers cannot be pooled, but that data can be pooled for supermarkets and hypermarkets. This is an indication that traditional and modern retailers indeed cater for consumers with different quality preferences. Hence, we estimate two

different models for each vegetable type, one for traditional wet markets and the other for modern retailers.

The dependent variable in all models is the price per kg of vegetable, while the independent variables are the product quality attributes described above. Dummy variables for brand and hypermarkets are only included in the modern retail models, because these variables are not relevant in traditional wet markets. Moreover, due to a limited number of observations, packaging is not included in the wet market sweet pepper model. For some attributes, we summarized observations in two instead of three dummy variables when the number of observations was very low for a specific attribute level. We include dummies for the month of observation in all models to capture seasonal price variation. Furthermore, we include a variable capturing the monthly average per capita income at the district level, because sales prices may potentially be correlated with average living standards in the neighborhood. The district-level income data refer to 2008 and were obtained from the Thai National Statistics Office. In terms of functional form, we decided to use linear specifications for all models. Following Edmeades (2007) and Ward et al. (2008), we also employed Box-Cox transformations, but differences with the linear specifications were very small.

Regression results

Tables 5 and 6 show the results for the morning glory and sweet pepper models, respectively. In wet markets, only one of the inherent product attributes of morning glory has a significant effect on price, namely freshness of the leaves. *Ceteris paribus*, one kg of morning glory with very fresh leaves fetches a price that is 3.9 Baht higher than one kg of product with leaves which are not fresh; this corresponds to a price premium of 17% with respect to the mean price of morning glory in traditional wet markets. In modern retail markets, significant price effects are found for three inherent product attributes. Beyond leave freshness, holes in the

leaves tend to increase the price. This may surprise on first sight, but it can be explained by the fact that some consumers consider holes in the leaves as an indicator for less pesticide usage. This effect cannot be observed in wet markets, suggesting that consumers in those markets are less aware of food safety issues on average. In modern retail markets, roots also significantly affect prices: when roots are cut, morning glory is sold for 11.8 Baht per kg more, implying a premium of 12%.

Insert table 5 here

Packaging and labeling have a significantly positive effect on price in both morning glory models. While label refers to product labels in the modern retailer model, it refers to the ‘Bangkok, city of clean food’ label for markets as a whole in the wet market model. Among the modern retailers, we observe that morning glory is sold significantly cheaper in hypermarkets than in supermarkets, which is in line with the descriptive statistics. Interestingly, all month dummies are significant in the wet market model, whereas they are not significant in the modern retailer model. No significant price fluctuations in supermarkets and hypermarkets show that modern retailers can better control seasonality. Often, modern retailers in Thailand have longer-term agreements with vegetable producers and strict requirements in terms of regularity of supply (Schipmann and Qaim, 2010). Similarly, the district-level income variable is only significant in the wet market model. Keeping all other factors constant, morning glory is sold at higher prices in wet markets that are located in districts with higher per capita incomes. As wet markets are not organized in chains, they can adapt prices to the area in which they are located. For modern retail chains, this option exists only to a lesser extent.

The estimation results for sweet pepper differ less between wet markets and modern retailers (table 6). This should not surprise. As explained, sweet pepper is a non-traditional product, which was first introduced by modern retailers. Even though sweet pepper is now

also sold in traditional wet markets, it is mostly consumed by better-off households (Suddeephong, 2010), so that markets are somewhat less segmented than for morning glory. In both models, red sweet pepper is found to be significantly more expensive than the green variety. Likewise, sweet pepper without wrinkles is sold at a higher price. Compared to many wrinkles, smooth skin fetches a premium of 15% in wet markets and of 6% in modern retail markets. Labeling has a significant effect on sweet pepper prices only in wet markets, while packaging affects prices positively in modern retail markets. Prices in hypermarkets are once again significantly lower than in supermarkets.

Insert table 6 here

Monthly price fluctuations are small in both models. The reason is that sweet pepper in Thailand is almost exclusively grown in greenhouses, where production takes place all the year around. Exceptions are significant price effects for wet markets in February and for modern retailers in April, for which we do not have a clear explanation. Like for morning glory, district-level income matters only for prices in wet market, which are not organized in chains.

In summary, the results for both types of vegetables underline that quality differences are reflected in product prices. This was also found by Vandelpas et al. (2009) for rice and tomato in Madagascar and India and by Minten et al. (2010) for various fruits and vegetables in India. Furthermore, beyond inherent attributes such as freshness and appearance, product quality also comprises sales attributes, such as food safety labels and packaging, for which consumers also have a positive willingness to pay.

Since modern retailers offer higher vegetable quality than traditional wet markets, they also sell at higher prices. But can differences in product quality alone explain the observed price differences? To address this question, we estimate additional models for which we pool the data from all three retail formats and introduce dummies for supermarkets

and hypermarkets, so that wet markets constitute the reference. Results are shown in table 7. As mentioned, the Chow-test suggested that quality effects are not uniform across retail formats, so that the marginal effects of quality attributes are difficult to interpret. This is why we do not show them in the table. Nonetheless, their inclusion in model estimation controls for quality variation. Hence, the positive and significant effects of the supermarket and hypermarket dummies emphasize that price differences remain, even after controlling for product quality. *Ceteris paribus*, compared to mean wet market prices, morning glory is 122% more expensive in supermarkets and 65% more expensive in hypermarkets. For sweet pepper, quality-adjusted price differences are 60% and 47%, respectively. Obviously, a modern shopping atmosphere and convenience in terms of opening hours, one-stop shopping, and accessibility by car are features that are valued by customers beyond actual product quality.²

Insert table 7 here

This confirms our first hypothesis that modern retailers do not directly compete with traditional wet markets for the same market segment. Rather, they respond to changing consumer preferences and cater primarily for middle and upper income segments. However, the fact that hypermarkets offer somewhat lower product quality at lower average prices than supermarkets is an interesting observation, which suggests that traditional and modern market segments are gradually starting to converge. As described above, hypermarkets in Thailand also started earlier than supermarkets to expand to smaller cities and towns, where average incomes of customers are lower than in Bangkok. Due to their big size, hypermarkets can also better exploit economies of scale, so that prices for fresh vegetables in these outlets may further drop. This confirms our second hypothesis that supermarkets and hypermarkets have different competition strategies.

² This is certainly not only true in Thailand or other developing countries, but also in developed countries. In a recent study carried out in the USA, Amanor-Boadu (2009) showed that the overall attractiveness of a market outlet importantly influences consumer choices.

Conclusion

We have analyzed and compared quality, prices, and competition strategies between traditional wet markets and modern retailers, using two types of fresh vegetables in Thailand as examples. Recently, modern retail chains have expanded significantly in Thailand and many other developing countries. Accordingly, it is important to understand the implications for the traditional retail sector.

Our analysis shows that supermarkets and hypermarkets sell vegetables at significantly higher prices than wet markets, so they are not competitive on the basis of price. However, these modern retailers offer higher quality, so that they seem to target a different consumer segment. By offering fresh products of high quality and often with food safety assurance, modern retailers cater primarily for middle and upper income consumers. This is also reflected in opening hours and other features of modern retail shops that are more tailored to westernized lifestyles. Even after controlling for product quality differences, vegetable prices remain significantly higher in modern retail outlets than in traditional wet markets, indicating that customers value the modern shopping atmosphere and convenience offered by supermarkets and hypermarkets.

Given these findings, the rapid expansion of modern retailers seems to be more associated with the growth of high-quality, differentiated market segments rather than a direct competition for traditional market shares. This sounds like good news for wet markets, because low-income consumers may still constitute a sufficiently large group of customers in Thailand and most other developing countries. Yet this is a short-sighted perspective for at least two reasons. First, over time the modern retail sector will likely adapt to various consumer needs and, through exploiting economies of scale, it will also be able to reduce prices and increasingly attract lower-income customers. Thus, traditional and modern market

segments will gradually converge. This is already observable to some extent through supermarkets offering vegetables of somewhat lower quality and at lower prices than hypermarkets. Second, economic growth and globalization lead to rising household incomes, better access to education and information, and rapidly changing consumer preferences towards higher-value products. Mergenthaler et al. (2009b) showed for the case of Vietnam that income elasticities of demand are much higher for fresh vegetables from modern retail outlets than for vegetables from traditional markets. The same was recently confirmed by Lippe et al. (2010) for Thailand. Hence, modern retailers grow over-proportionally with economic development, partly at the expense of the traditional retail sector. This may have far-reaching social consequences along traditional supply chains, because wet markets are still the major outlet for fresh produce from smallholder farmers.

A twofold strategy is proposed to reduce undesirable social consequences. First, wet markets also need to better adapt to changing consumer preferences. Important steps in this direction include increasing the overall attractiveness of wet markets and offering higher-quality products. Certain aspects, such as adjusting market opening hours or packaging vegetables, can be implemented in the short run, whereas others may need more profound adjustments in supply chain structures and physical infrastructure. This may also require some government support. Second, the opportunities offered by the expansion of modern retail markets have to be seized. Growth trends observed in Thailand and other developing countries suggest that supermarkets and hypermarkets are not only temporary phenomena. Hence, policies need to be developed and implemented to better link smallholder farmers, traders, and other actors in traditional markets to these emerging high-value chains.

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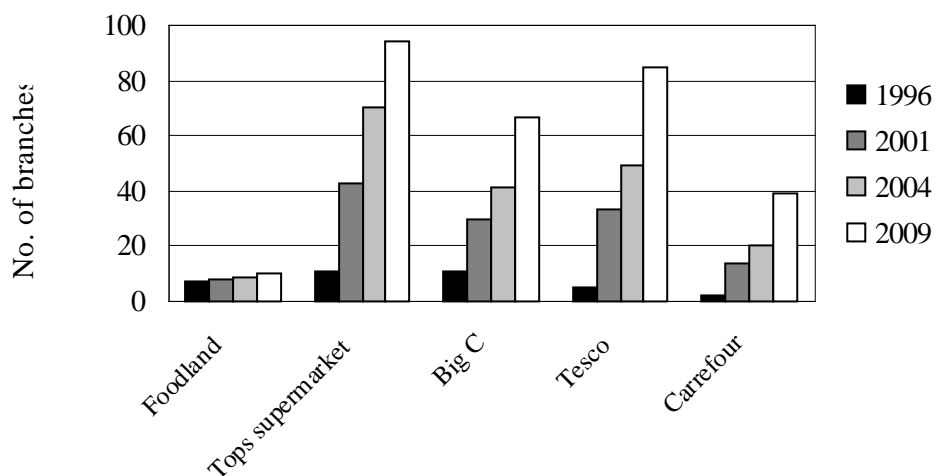
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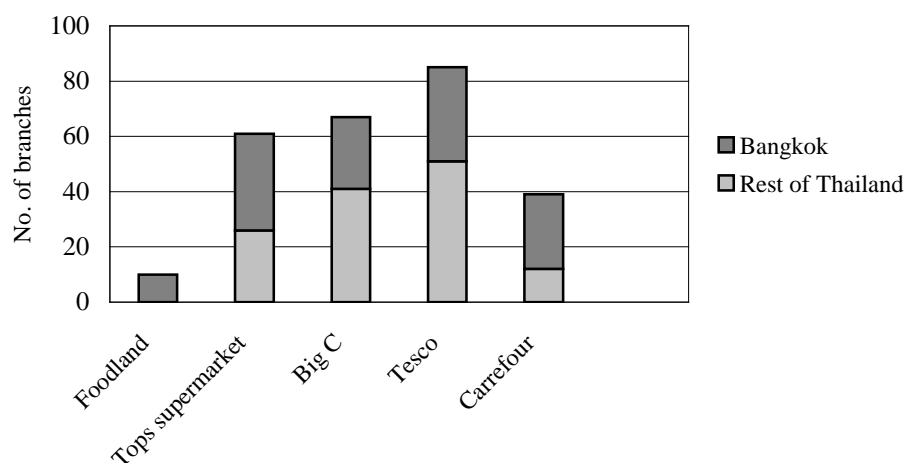
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Figure 1: Leading super- and hypermarket chains in Thailand, 1996-2009



Source: TDRI, 2002; Tokrisna, 2006; websites: <http://www.carrefour.co.th/eng/Map.aspx>; <http://www.biggc.co.th/en/stores/>; www.foodland.co.th/home.htm; <http://www.tops.co.th/main.html>; http://www.tescolotus.com/left.php?lang=en&menu=location_th&data=searchlocation

Figure 2: Spatial distribution of retail chain branches in Thailand in 2009



Source: <http://www.carrefour.co.th/eng/Map.aspx>; <http://www.biggc.co.th/en/stores/>; http://www.tescolotus.com/left.php?lang=en&menu=location_th&data=searchlocation; www.foodland.co.th/home.htm; <http://www.tops.co.th/main.html>

Table 1: Comparison of market features in 2009 (%)

	Wet markets	Super-markets ^a	Hyper-markets ^b	Diff. super- and hypermarkets
<i>General features</i>				
Integrated in shopping mall	5.88	28.75*	100.00**	**
Opening time am ^c	4.30	7.30**	9.00***	
Closing time pm ^c	6.30	10.00**	11.00***	*
Parking lot	52.94	92.86**	100.00***	
<i>Branch location</i>				
Highway	11.76	35.71	91.67***	***
Main street	64.71	50.00	8.33***	**
Side street	23.53	14.29	0.00*	
<i>Fresh fruit and vegetable section</i>				
Cooling facilities	5.88	100.00***	100.00***	
Share of vegetables with a label	0.00	57.14***	80.00***	***
Organic FFV available	0.00	64.29***	33.33***	
Low product variety	17.65	21.43	8.33	
Normal product variety	70.59	42.86	75.00	*
High product variety	11.76	35.71	16.67	

Notes: *, **, *** displays a 10%, 5%, and 1% significance level, respectively.

^a Significance levels in this column refer to the difference between supermarkets and wet markets.

^b Significance levels in this column refer to the difference between hypermarkets and wet markets.

^c Information here is not given in %, but shows the average opening/closing time.

Table 2: Quality differences for morning glory by retail outlet

Morning Glory	Wet markets (n=155)	Super- markets^a (n=133)	Hyper- markets^b (n=106)	Diff. super- and hypermarkets
<i>Freshness of leaves</i>				
Not good	22.93	3.76***	25.47	***
Good	61.51	74.44**	63.21	*
Very good	15.92	21.80	11.32	**
<i>Freshness of stem</i>				
Not good	15.29	4.51***	17.92	***
Good	84.71	95.49***	82.08	***
<i>Holes in leaves</i>				
None	54.78	69.92***	55.66	**
Few	43.31	28.57***	39.62	*
>25%	1.91	1.50	4.72	
<i>Color</i>				
Dark/light green	31.21	23.31	35.85	**
Normal green	68.79	76.69	64.15	**
<i>Roots</i>				
No	3.72	64.66***	10.38**	***
Yes	96.82	35.34***	89.62**	***
<i>Package</i>				
No	85.99	0.00***	19.81***	***
Yes	14.01	100.00***	80.19***	***
<i>Label</i>				
No	100.00	6.02***	44.44***	***
Yes	0.00	93.98***	55.56***	***
<i>Brand</i>				
No	100.00	0.75***	11.32***	***
Yes	0.00	99.25***	88.68***	***

Notes: *, **, *** displays a 10%, 5%, and 1% significance level, respectively.

^a Significance levels in this column refer to the difference between supermarkets and wet markets.

^b Significance levels in this column refer to the difference between hypermarkets and wet markets.

Table 3: Quality differences for sweet pepper by retail outlet

Sweet pepper	Wet markets (n=182)	Super- markets ^a (n=102)	Hyper- markets ^b (n=93)	Diff. super- and hypermarkets
<i>Skin texture</i>				
>25% wrinkled	27.07	3.92***	6.45***	
Few parts wrinkled	36.46	42.16	26.88	**
Smooth	36.46	53.92***	66.67***	*
<i>Skin spots</i>				
>25%	6.63	0.00***	0.00**	
Few	49.17	49.02	48.39	
None	44.2	50.98	51.61	
<i>Variety</i>				
Green	51.93	47.06	46.24	
Red	48.07	52.94	53.76	
<i>Color</i>				
>25% colored differently	6.08	3.92	4.3	
Few color differences	23.76	20.59	17.2	
Pure color	70.17	75.49	78.49	
<i>Shape</i>				
Not good	6.63	6.86	6.45	
Good	17.13	21.57	16.13	
Very good	76.24	71.57	77.42	
<i>Package</i>				
No	96.69	51.96***	39.78***	*
Yes	3.31	48.04***	60.22***	*
<i>Label</i>				
No	100.00	85.29***	82.80***	
Yes	0.00	14.71***	17.20***	
<i>Brand</i>				
No	100.00	48.04***	34.41***	*
Yes	0.00	51.96***	65.59***	*

Notes: *, **, *** displays a 10%, 5%, and 1% significance level, respectively.

^a Significance levels in this column refer to the difference between supermarkets and wet markets.

^b Significance levels in this column refer to the difference between hypermarkets and wet markets.

Table 4: Product prices by retail outlet (in Baht/kg)

	Wet markets		Supermarkets ^a		Hypermarkets ^b		Diff. super- and hypermarkets
	Price/kg	Obs.	Price/kg	Obs.	Price/kg	Obs.	
<i>Morning Glory</i>							
Average	22.77	157	100.19	133	67.96	106	
Price difference (%)			340.01***		198.46***		32.17***
<i>Sweet pepper, red</i>							
Average	129.69	87	194.45	54	182.05	50	
Price difference (%)			49.93***		40.37***		6.38*
<i>Sweet pepper, green</i>							
Average	105.12	94	166.12	48	156.54	43	
Price difference (%)			58.03***		48.92***		5.77

Notes: *, **, *** displays a 10%, 5%, and 1% significance level, respectively.

^a Price differences in this column refer to the comparison between supermarkets and wet markets.

^b Price differences in this column refer to the comparison between hypermarkets and wet markets.

Table 5: Hedonic price regressions for morning glory

Variable ^a	Wet markets (n=157)		Modern retailers (n=239)	
	Coefficient	Std. error	Coefficient	Std. error
Hypermarket			-8.58*	5.03
Brand			16.25	9.88
Package	2.98**	1.42	15.89*	8.43
Label	2.26**	1.13	29.91***	5.75
Freshness of leaves: good	2.33	1.49	3.39	7.04
Freshness of leaves: very good	3.86**	1.87	20.95**	9.11
Freshness of stem: good	2.10	1.77	0.47	7.22
Holes in leaves ^b	-1.23	0.99	12.63***	4.44
Color: normal green	0.33	1.06	-0.99	4.56
Roots: no	0.97	3.10	11.80**	4.77
Average income (in 1000 Baht)	1.12***	0.22	0.47	0.71
February	-8.29***	1.35	-2.23	5.73
March	-6.80***	1.40	0.34	5.57
April	-2.93**	1.38	-2.19	5.66
Constant	10.93***	2.61	17.92	13.48
F-statistics	8.60***		11.62***	

Notes: *, **, *** displays a 10%, 5%, and 1% significance level, respectively. The dependent variable is product price in Baht/kg.

^a All variables, except for average income, are dummy variables.

^b Because of only very few observations for >25% holes in leaves, this quality attribute is summarized in two categories here.

Table 6: Hedonic price regressions for sweet pepper

Variable ^a	Wet markets (<i>n</i> =181)		Modern retailers(=195)	
	Coefficient	Std. error	Coefficient	Std. error
Hypermarket			-13.67***	4.43
Brand			-3.13	5.48
Package			18.58***	5.45
Label	14.48***	4.67	-10.19	6.84
Skin texture: few wrinkles	15.07**	5.98		
Skin texture: no wrinkles ^b	15.51**	6.41	10.41**	5.19
Skin spots: no ^b	-4.47	5.03	2.70	5.27
Variety: red	23.61***	4.52	28.29***	4.37
Color: pure ^b	-5.11	5.09	0.65	5.63
Shape: sweet pepper ^b	4.94	5.62	3.85	5.23
Average income (in 1000 Baht)	2.87**	1.12	-0.79	0.77
February	-26.81***	6.51	0.87	6.42
March	0.80	6.79	-2.51	6.52
April	-2.63	6.89	27.76***	6.32
Constant	66.12***	15.09	147.40***	14.25
F-statistics	6.97***		8.59***	

Notes: *, **, *** displays a 10%, 5%, and 1% significance level, respectively. The dependent variable is product price in Baht/kg.

^a All variables, except for average income, are dummy variables.

^b Because of only very few observations for the lowest quality level, the respective attributes were summarized in two categories. For skin texture, this only applies for the modern retailer model.

Table 7: Hedonic price regressions with pooled data for wet markets and modern retailers

Variable	Morning Glory (n=396)		Sweet pepper (n=376)	
	Coefficient	Standard Error	Coefficient	Standard Error
Supermarket (dummy) ^a	27.87***	8.01	62.89***	5.19
Hypermarkets (dummy) ^a	14.74**	7.21	49.08***	5.63

Notes: *,**,*** displays a 10%, 5% and 1% significance level, respectively. The dependent variable is product price in Baht/kg. Quality attributes were included in the regressions but are not shown here.

^aThe reference category is wet markets.