CHAPTER IV

RESULTS

This chapter was arranged into 2 main sections. The first section revealed methodological discovery from this study with the detail concept of the developed tool in examining the price variation. The other portrayed the situation of discriminating induced price dispersion of the chosen drug groups.

4.1 Methodological Discovery: Acquisition Capability

The study has applied the axiomatic approach of inequality measurements in quantifying price discrimination in the pharmaceutical market. The axiomatic approach of inequality measurement refers to all inequality indices that conform to a set of axioms: transfer principle, income scale independence, the principle of population, anonymity, and decomposability. The advantage of this approach is that an index number decisively reflects the magnitude of inequality. In the original or traditional context of income distribution, the index is intended to measure whether incomes per head are equitable among the population. The bigger index integer reflects the larger extent of inequality existing in that population. Using the proposed inequality measures, Gini and Thiel indices, purchased prices per unit or hospital acquisition costs were directly taken the place of incomes per head, while purchased quantities were used instead of the population. Unfortunately, data working has encountered some difficulties in interpretation and discovered that the selected measurements could not directly quantify price discrimination through this simple application with at least 2 incompatibilities found in the process. One was about the reference condition, and the other was on the social welfare implication.

Every inequality measurement has set the perfect equality as a reference condition. At a given situation the inequality extent reflects the degree the distribution in case deviating from this ideal reference condition. At the perfect equality condition for income distribution, every unit of population earns equal income per head. Analogously, if applied to pharmaceutical purchases, every unit of quantity bought at the same price should then be regarded as the reference condition for our analysis. However, this default reference condition does not reflect the efficient operation as it should be in drug purchasing. In general practice, the greater the quantity of drug is purchased the larger the volume discount would be expected. This preferred characteristic of transaction then leads to possible and justified unequal unit prices of the same product for different volumes purchased. The reference condition for trading or pharmaceutical purchasing should then take into account an acceptable inequality of purchased prices as a result of volume discounting.

Another disagreement is on social welfare implication. Inequality measurements are originated on the basis of social welfare concept which prefers more people in the society earning higher income. This preference has been built in the measurements. Thus, these tools give a higher weight of inequality for the poor majority distribution than for the rich majority, even though the majority is accounted for the same number of people.

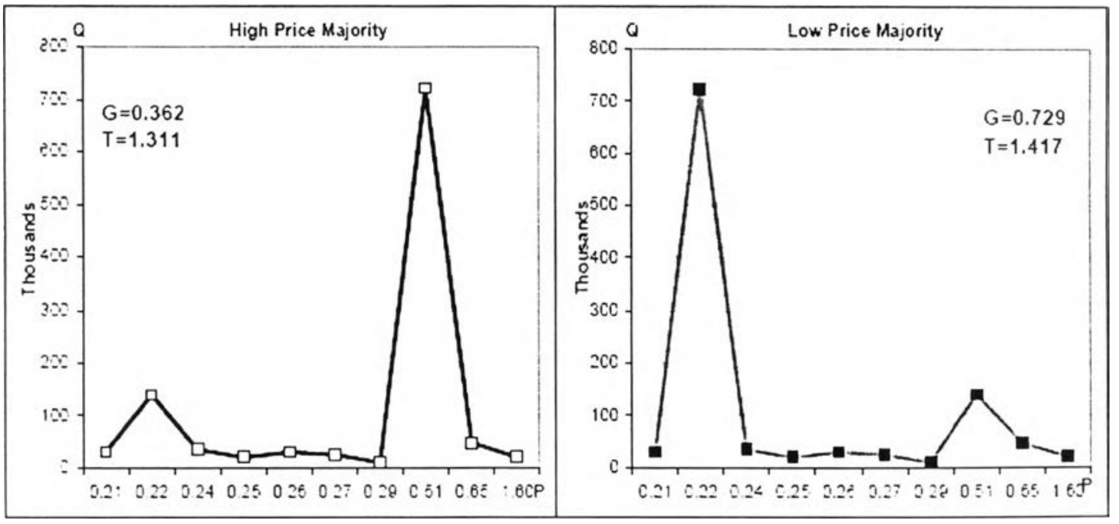


Figure 4.1 The Contrary of Social Welfare Preference

Two extreme distributions are illustrated in figure 4.1. The left picture is "High Price Majority", where most of purchased quantities are bought at high prices, which is comparable to the "Rich Majority Distribution" in income distribution context. This kind of distribution is resulted in the low G and T that harmonize with the context of income distribution. Since, the rich majority distribution, where most people in the society are rich, is the preferred social welfare sense, the inequality indices correspondingly indicate low inequality degree. This result is incompatible to trading context, since the inequality indices indicate the low level of inequality for high price majority distribution. The high price majority distribution is not preferred in trading context especially from public purchasing perspective, while the "Low Price Majority" in the right picture is preferred but results in higher inequality indices. In public purchasing context, a larger degree of inequality should be detected when majority of an identical products are bought at higher prices comparing with a smaller degree when the same majority are bought at lower prices.

These countered demands against the typical interpretation of inequality tools were the driving force to search for the new reckoning establishment before the inequality indices could be applied. The new tool was therefore constructed based on a number of concepts and speculations to facilitate inequality measurements of pharmaceutical pricing behaviors. The following section described how those concepts and speculations exerted in the development processes.

4.1.1 Incorporated Concepts & Speculations

- Originating Concept: Capability Approach

The developed calculation was stemmed from the concept of capability approach to economic inequality. The concept of "capabilities" has recently advocated by Martha Nussbaum and Amartya Sen (Sen, 1993). The originators described "capabilities" as abilities to achieve valuable functioning. "Capabilities" are independent from the preference of the individual. This approach makes the individual responsible for her own preferences. One may have the capability to nourish oneself, but has chosen not to achieve the functioning. The responsibility of the government and the aims of public policy are then to secure for each individual citizen the capability to achieve one's own goals, which may or may not be own business or welfare (Bojer, 2004; Sen, 1993).

This concept commenced the thought of its application in trading context. Building on the concept that each hospital had different abilities in achieving their purchasing responsibility, the application of the capability approach to the pharmaceutical purchase was thus introduced by measuring hospital capability to achieve the cheaper price as an alternative of measuring the price itself. The purchased quantity was primarily defined as a well-established source of purchasing capability. However, the acquisition price of a pharmaceutical product in reality was the function of various factors including identifiable and unidentifiable sources not limited to quantities or volumes of purchase.

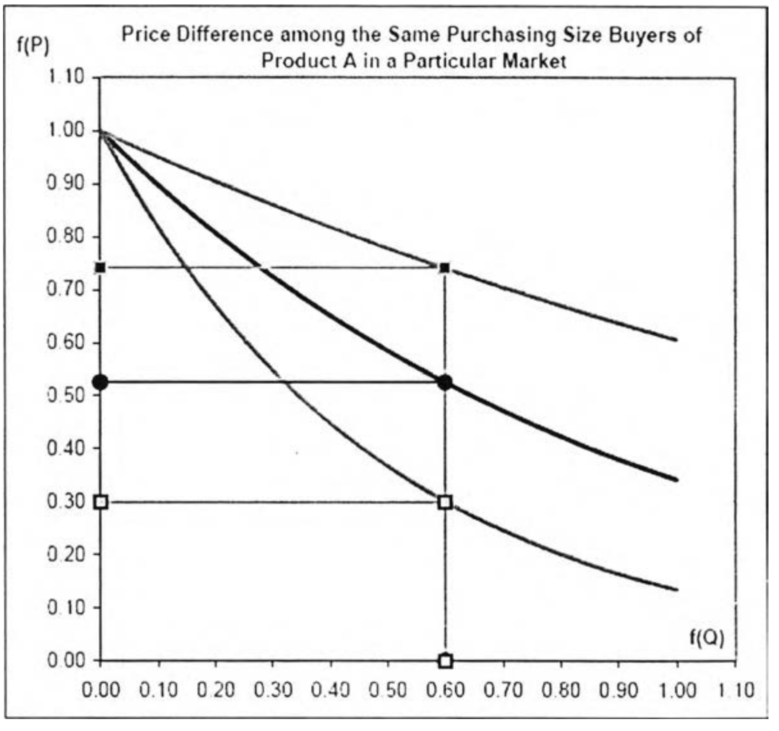


Figure 4.2 Price Difference among the Same Purchased Volume Buyers

If the price schedule of product A traded in a particular market has been drawn as the black line in figure 4.2, the same purchasing size buyers should purchase product A at the identical price. In actual contracts, the equal purchasing size buyers on the other hand dealt the product at different prices both cheaper and more expensive than what indicated by the black line. The occurrence suggested that the buyers could establish contracts for the product A based on different lines of price schedule. It must have some forces beyond purchased volume which bring about such price differences. In another word, the capability of a hospital to achieve the cheaper price is therefore grounded not only on the volume purchase but also on its negotiation power derived from some "miscellaneous factors" which are portrayed as any other elements forcing or enhancing a hospital to buy a pharmaceutical product at a particular price.

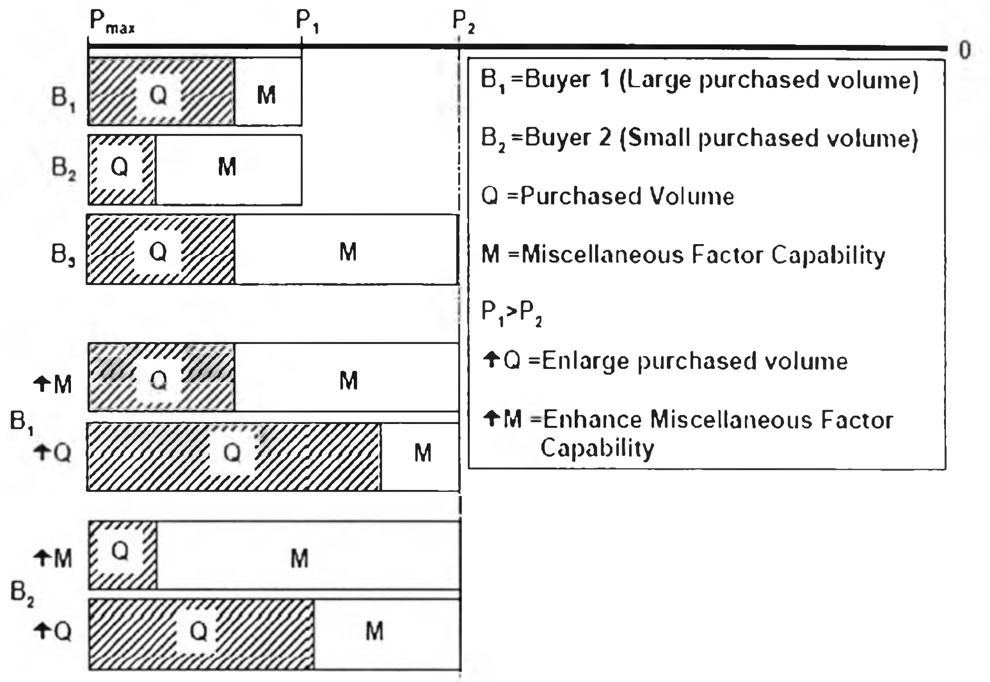


Figure 4.3 Harmonizing Work of Purchased Volume and Miscellaneous Factor Capabilities to Acquire a Particular Price

The capabilities from these factors complementarily work in harmony with purchasing volume to acquire a particular price. In figure 4.3, buyer 1 (B_1) owns the bigger purchased volume than buyer 2 (B_2), B_1 then needs less capabilities from miscellaneous factors (M) than B_2 to acquire the same price (P_1). B_3 with the same purchased volume as B_1 could obtain the cheaper price (P_2), because the bigger capabilities from miscellaneous factors (M) are exercised. To achieve the cheaper price (P_2), B_1 and B_2 could either enlarge their purchased volume (↑Q) or enhance their capabilities from miscellaneous factors (↑M). When B_1 and B_2 increase their volume of purchase, they require less M to achieve the same price or could exercise the same level of M to gain a cheaper price if possible.

Miscellaneous factors, in this study, could represent any factors beyond the volume of purchase that have either positive or negative influence on the acquisition price of pharmaceutical products, for example, negotiating effort, information, hospital fee, hospital image, personal relationship, etc. Measuring inequality of the purchased prices should then capture the aggregate capabilities caused by these miscellaneous factors. This study has coined this capability as "**Miscellaneous Acquisition Capability (MAC)**" to refer to all aggregate factors aside from purchased quantities that have influences on drug acquisition costs of hospitals.

- MAC attached properties:

  - *Volume Discounting Concept*

The difference of purchased prices that were based solely on their apparent capability in relation to volume discounting were labeled as accepted price differentiation, while the price differences acquired from the Miscellaneous Acquisition Capability (MAC) were considered as the differences occurred beyond volume discounting concept. The difference of purchasing capabilities was reflected by the difference of prices stemmed from the Miscellaneous Acquisition Capability (MAC), while equalizing the capability from volume discounting price structure. Another speculation consistent with the concept of volume discounting built in the formula as an essential ingredient was the sense that hospitals getting the same purchased price at a smaller volume should hold higher purchasing capability than those with a bigger volume. The sketchy formula, equation (1), would then put price function above quantity function.

$$\text{Capability} = \frac{\text{Function of Price}}{\text{Function of Quantity}} \quad \text{...}(1)$$

- *Scale insensitive*

Since prices of different products were varied on a very wide range of the scale, the formula then needed to scale-desensitize by using the proportion instead of the raw value. The scales of both prices and quantities were also standardized from 0 to 1 using the maximum price and the maximum quantity as the comparative values. The formula would then be written as equation (2).

$$\text{MAC} = \frac{\text{Proportion of Price}}{\text{Proportion of Quantity}} \quad \text{...(2)}$$

- *The Cheaper Price Preference Assigned*

The formula also assigned preference to the cheaper price by using natural logarithm function of the proportion of price. This caused the cheaper price in the system represented by the low value on the proportion of price in the capability formula getting a bigger absolute value on the logarithm function than the higher price. At a particular price, the smaller quantities they purchased the relatively higher capability they had.

Finally, for a particular product trading, if there was a set of buyers (hospitals in this case) H_i buying a set of quantities Q_i at a set of prices P_i when $i \in \{1,2,3,\ldots\ldots\ldots n\}$, the miscellaneous acquisition capability (MAC) of hospital i was then written as equation (3). For those who could purchase a product at the lowest possible price, their MAC was assigned at maximum regardless of their purchasing volume.

$$MAC_i = \frac{-\ln(P_i/P_{max})}{(Q_i/Q_{max})}, \begin{cases} \text{for every } P_i > P_{min} \\ \text{adjust } MAC_i = MAC_{max}, \text{ when } P_i = P_{min} \end{cases} \quad \text{.........(3)}$$

Where MAC_i = Miscellaneous Acquisition Capability of hospital i in buying a particular product

P_i = price that hospital i buys the product

P_{max} = $\max\{P_1,P_2,P_3,\ldots.P_n\}$

P_{min} = $\min\{P_1, P_2, P_3, \ldots. P_n\}$

Q_i = quantity that is bought by hospital i

Q_{max} = $\max\{Q_1, Q_2, Q_3, \ldots. Q_n\}$

MAC_{max} = $\max\{MAC_1, MAC_2, MAC3, \ldots. MAC_n\}$

4.1.2 Concept Interpretation

- General Concept and Meaning

Miscellaneous Acquisition Capability (MAC) is the extent of invisible or miscellaneous factors influencing price differences among those who have the same purchased quantity. The higher capability indicates the bigger effort of buyers spent over their purchased volume to achieve their prices. Buyers who can obtain a cheaper price at a smaller quantity have to exercise higher capability as depicted in figure 4.3. From another perspective, with equal purchased volume of a particular product, the higher capability buyers could buy the product at a cheaper price than the lower capability buyers could. Or among those acquiring the same price, the higher capability buyers require a smaller purchased volume than the lowers. By considering MAC, the interest has been turned to the more important and broader perspective, improvement of purchasing capability of hospitals, instead of emphasizing on finding one appropriate price solution. Even the ultimate outcome is not much different; the process under MAC approach provides more alternatives and encompasses a more profound concept. The applications out of this concept are thus extensive as discussed later in the chapter.

- Application in the Inequality Indices

Using MAC instead of direct prices and quantities justified the proper use of inequality measurements, both the Gini-coefficient and Theil index, in pharmaceutical trading. Firstly, the Miscellaneous Acquisition Capability (MAC) characterizes the purchasing condition in a more conformity manner with social welfare preference than using the direct price. The objective of analyzing inequality of prices has thus shifted to estimating the inequality among hospital MACs which reflect the capability of hospitals in achieving a purchased price pattern not just one price. Finally, the reference equality condition has been modified so that prices and quantities related to each other as the equation (4).

$$P_i/P_{\max} = e^{(-\overline{MAC})(Q_i/Q_{\max})} \qquad \text{...(4)}$$

Where P_i = price that hospital i buys the product

P_{max} = $\max\{P_1,P_2,P_3,\ldots..P_n\}$

Q_i = quantity that is bought by hospital i

Q_{max} = $\max\{Q_1,Q_2,Q_3,\ldots.Q_n\}$

$\overline{MAC}$ = Miscellaneous Acquisition Capability of the market that hospital i belongs to

The inequality index is at this time calculated based on the capabilities and each individual purchasers or hospitals. Plugging MAC instead of unrefined prices and quantities into the inequality index thus allows price difference among different purchasing sizes based on the same MAC since at any given MAC, there is a set of relationship between prices and quantities purchased. Different MAC values thus reflect different purchasing capabilities of hospitals that could achieve different sets or discounting schedules of prices and quantities. The inequality estimated based on MACs should therefore portray the better picture of price discrimination than comparing raw prices and quantities as initially proposed. Since MAC integrates the volume discounting schedule and contains the whole set of prices and quantities, the differences of MACs then reveal the difference of the whole patterns of prices and quantities not only pure price discrepancy as in figure 4.4.

In figure 4.4, the difference of P1, P2, P3, and P4, which are on the same MAC line, stems solely from volume discounting. Since they have the same MAC, these price differences driven by volume discounting are not detected as price discrimination under the MAC approach. The extent of inequality index thus exclusively determines price difference grounded from the different MACs, which display as the gap between different MAC lines as illustrated in the figure 4.4.

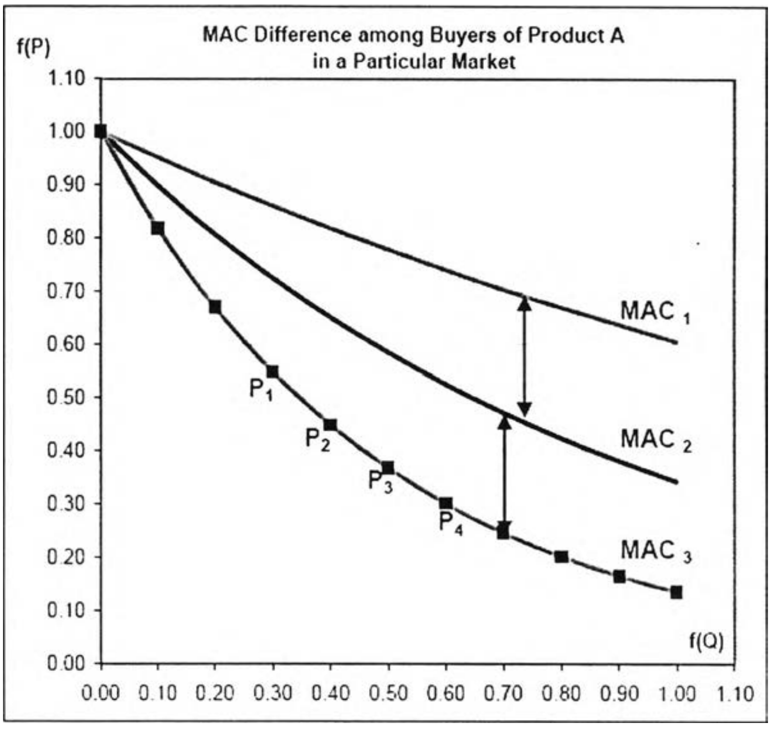


Figure 4.4 Comparing MAC instead of the Price and Quantities

This conveys that the perfect equality condition under MAC approach has adjusted for price differentiation occurred from volume discounting. The deviation from the equality condition means different purchasing capabilities detected. Each capacity or MAC, even calculated from one pair of price and quantity, represents a whole set of prices and quantities not only that particular point.

Within the same market, there could be as many reference lines as the number of purchasers or hospitals since they possess different MACs. The comparison of pharmaceutical prices among hospitals will be beneficial only when one reference line is selected as a preferred reference condition for a particular market. To evaluate the hospital purchasing performance, each hospital thus compares its own MAC with the reference MAC. The discrepancy reflects how much improvement each one needs to achieve where majority are concentrated. In achieving a cheaper price schedule, a hospital can either increase its volume of purchase or raise its capability as represented by MAC. If enlarging purchasing quantity is not an answer due to the limitation on utilization and hospital size, thorough investigation on other factors to increase its MAC could be recommended. The discounting schedule is graphically drawn for each MAC as shown in Figure 4.5.

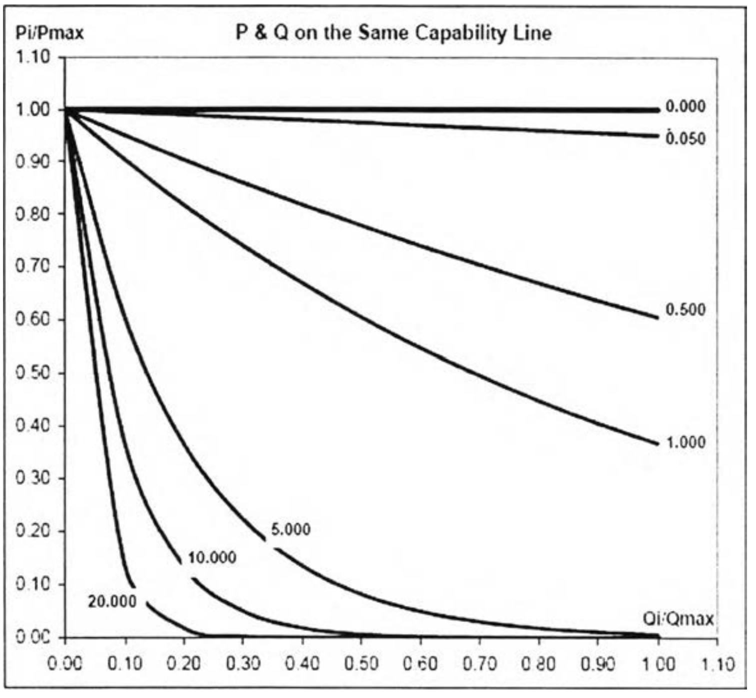


Figure 4.5 Price and Quantity Relationship on the Identical MAC

Figure 4.5 illustrates that prices in higher MAC markets are more sensitive to quantity changes than those in the lower. From another perspective, higher MAC markets are price insensitive compared to lower MAC markets. The price change in higher MAC markets could thus be possible without much impact on changes in volume of purchase. This evidence indicates that the power of negotiation factors is working in harmony between the volume of purchase and miscellaneous factors. While lower MAC markets could use quantity as a main power in negotiation, higher MAC markets could concentrate on their MACs in price negotiation.

Using the selected discounting schedule as a reference condition, the extent of inequality index therefore indicates the deviation of prices, now characterized by MACs, from that reference schedule. The reference condition could be set at any reasonable MAC depending upon the rationale and use for a certain situation, but has to be consistent with the reference condition in the context of the indices of inequality. This consistency is fundamental for the legitimate identification of "could be better" or unfair contracts. This study took the middle road policy and decided on the market average MAC to develop price discount schedule accordingly. The chosen average MAC connected the estimated market price schedule with the inequality indices, which was also set the default reference condition at the arithmetic mean of MAC. This reference condition, however, could be changed when the pharmaceutical market environment rises or falls or it deems appropriate otherwise. Even the variation of prices are initially explored, the essence of the measurement focus has now been shifted to differences of capabilities (MAC) among hospitals as a representative and an underlying cause of price differentiation. Under the MAC approach, the procedure of data analysis was summarized as following figure.

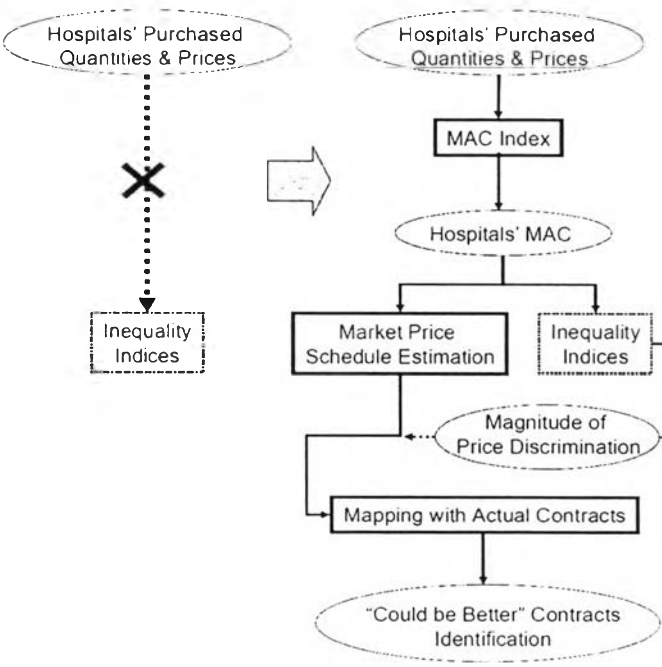


Figure 4.6 MAC Approach in Price Discrimination Assessment Processes

This tailor-made methodology has been applied for achieving the study objectives. The following section aimed not only to depict the current situation of price discrimination but also demonstrated how this methodological tool of MAC performed as a crucial indicator for monitoring price behavior in the pharmaceutical market.

4.2 The Situation of Discriminating Induced Price Dispersion

This section was divided into 3 major parts. The first part was elementary analysis which descriptively presented data across the selected pharmacological groups. Each pharmacological group was displayed by 2 subsections. To begin, the section explained the information on group overview to propose initial items for analysis based on generic names, strengths, as well as dosage forms. The numbers of available brands and applicable brands of each item were also identified in this subsection. To end this section, analyzable brands were all characterized by their types and the extent of discriminating-induced price dispersion behaviors was then quantified. The second part was the analysis for detailed investigation which the identical course of action was repeatedly done and resulted in overwhelming parallel formats of the result report. This main part was then demonstrated using the result of the brand with highest purchasing frequency (the popular brand of enalapril 5 mg) as an example of each generic item, while the remains were summarized in the appendices. The last vital part was the analysis of a set of market structure variables explaining the variation of price discrimination magnitude in different markets.

4.2.1 The elementary analysis

The situation of price discrimination on 5 pharmacological groups was explored. The profile of studied drug groups was presented in the table 4.1.

Table 4.1 Descriptive data of studied drug groups in the database

Pharmacological Group	Available				Applicable			
	Generic	Brand	Items	Entities	Generic	Brand	Items	Entities
ACE Inhibitor	8	25	14	39	6	10	9	15
Angiotensin II Antagonist	7	7	11	11	4	4	5	5
Beta blocking agents	5	47	11	71	5	9	8	16
Calcium channel blockers	7	39	25	67	7	21	15	28
Serum lipid reducing agent	5	34	12	50	4	11	9	16
Total	**32**	**152**	**73**	**238**	**26**	**55**	**46**	**80**
Percentage	**100**	**100**	**100**	**100**	**81.25**	**36.14**	**63.01**	**33.61**

Of 32 generic drugs, there were 152 different product brands or the average of 5 different manufacturers per generic drug. These generic drugs had 73 different strengths and dosage forms or less than 3 items per generic drugs in general. After taking into account different brands, strengths, dosage forms, as well as package sizes, total of 238 different entities were extracted from the database. However, only those with at least four buyers in the same market or the same level of care, classified by primary, secondary, and tertiary hospitals, were considered applicable for the analysis. Total of 80 applicable entities from 238 availability accounted for 33.61% were included in the analysis.

From table 4.2, the result evidently showed the existence of price discrimination. On the average half of applicable entities in every market were indicated as watchful first degree price discrimination behavior. The third degree price discrimination was also detected approximately 30% of applicable entities. There was no entity of Angiotensin II Antagonist group applicable for analysis in primary hospital market, since the drugs were not generally used by primary hospitals. The third degree price discrimination of this drug group was consequently unable to quantify, since there were applicable entities only in 2 from 3 comparative markets.

Table 4.2 Overall Situation of Price Discrimination

Pharmacological Group	First Degree Price Discrimination			Third Degree Price Discrimination
	Primary Hospital	**Secondary Hospital**	**Tertiary Hospital**	
ACE Inhibitor	4/7*	4/7	3/8	0/2
Angiotensin II Antagonist	n/a	0/3	1/3	n/a
Beta blocking agents	6/12	2/9	1/9	1/6
Calcium channel blockers	10/18	7/15	8/13	3/5
Serum lipid reducing agent	7/13	3/5	3/6	1/2
Total	**27/50**	**16/39**	**16/39**	**5/15**
Percentage	**54.00**	**41.03**	**41.03**	**33.33**

Note: n/a = the data was not enough for calculation,

*4/7 =There were 4 entities from 7 applicable entities detected the crucial magnitude of first degree price discrimination among primary hospitals.

It was not feasible for every drug to have applicable entities consistent with the inclusion criteria in every market, since some entities might not available in some markets or mainly marketed only in their profitable markets. Some items of drug were restricted for the higher level of care such as some new advance drugs which were not available for primary hospitals. Not applicable in only one market out of three, the third degree price discrimination was consequently undetermined. There were thus a number of sign “n/a” in every table which reflected the nature of pharmaceutical market behavior according to the regulations and/or business reasons. The entities of drug were not usually applicable for analysis in every level of care.

4.2.1.1 Agent acting on the Renin-Angiotensin system (ACE Inhibitor)

a. Group overview

The ACE Inhibitor group included 8 generic drugs in the purchasing database with 2 different strengths for each of 6 generic drugs and one dosage strength for the remaining 2 drugs. Hence, 14 items were counted as initial items for analysis. In each item, there were a number of brands that were purchased by hospitals under this study. When taking into account different brands, and strengths, there were 39 available entities. Of these, enalapril 5 mg were the generic drug with the most available entities of 10 brands. About half of these generic entities with no competitors included cilazapril, quinapril, fosinopril, perindopril, and ramipril 2.5 mg.

However, only some brands of each item were included for analysis. These analyzable entities had to have at least 4 entries of buyers which belonged to the same level of hospitals. From the table 4.3, there is only 1 applicable entities from 5 availables of captopril 25 mg, while no applicable of lisinopril 5, 10 mg. Overall, there were only 15 or less than 50% analyzable with 4 entities each of enalapril 5 mg and 20 mg and the rests were evenly distributed of 1 entity each for captopril 25 mg, ramipril 5 mg and 2.5 mg, fosinopril, quinapril 5 mg and 20 mg, and perindopril 4 mg as detailed in table 4.3.

Table 4.3 Analysis Size of ACE Inhibitor

Items	Generic Name	Available Entities	Applicable Entities
1	Enalapril 5mg	10	4
2	Enalapril 20mg	8	4
3	Captopril 25mg	5	1
4	Ramipril 5mg	2	1
5	Ramipril 2.5mg	1	1
6	Fosinopril	1	1
7	Quinapril 5mg	1	1
8	Quinapril 20mg	1	1
9	Perindopril 4mg	1	1
10	Perindopril 2mg	1	0
11	Lisinopril 5mg	3	0
12	Lisinopril 10mg	2	0
13	Captopril 12.5mg	2	0
14	Cilazapril	1	0
	Total	**39**	**15**

b. Types and the extent of price discrimination

Price discrimination situation of each applicable entity was structured into two types: first and third degree price discrimination. The price discrimination behavior was considered significance for the purpose of this study when Gini (G) or Theil (T) index was higher than 0.500(Haidich & Ioannidis, 2004). The extents of first and third degree price discrimination were both determined by the magnitude of Gini (G) and Theil (T) indices. For the entities that presented both the first and the third degree price discrimination, the contributions to the overall inequality from each type of discrimination, across markets and within the same markets, would also be included.

The whole picture of price discrimination in this pharmacological group was summarized in table 4.4. Majority of the ACEI group were detected first degree price discrimination in at least one of their analyzable markets. More than half of analyzable brands behaved first degree price discrimination among primary hospitals and secondary hospitals, while there were about 40% of brands detected in the tertiary hospital market. There was no serious extent of third degree price discrimination detected from 2 applicable entities.

Table 4.4 Summary of ACE inhibitor's price discrimination

Items	First Degree PD			Third Degree
	Primary	Secondary	Tertiary	
Enalapril 5 mg	2/4*	0/1	0/1	0(1)
Enalapril 20 mg	2/3	1/2	1/1	0(1)
Perindopril 4 mg	n/a	0/1	0/1	n/a
Quinapril 20 mg	n/a	1/1	0/1	n/a
Ramipril 2.5 mg	n/a	1/1	0/1	n/a
Ramipril 5 mg	n/a	n/a	1/1	n/a
Captopril 25 mg	n/a	n/a	1/1	n/a
Fosinopril 10 mg	n/a	n/a	0/1	n/a
Total (detected/applicable)	**4/7**	**4/7**	**3/8**	**0/2**
Percentage	**57.14**	**57.14**	**37.50**	**0.00**

<u>*Note*</u> *n/a= the data was not enough for calculation based on inclusion criteria*
**2/4=There were 2 entities from 4 applicable entities detected the crucial magnitude of first degree price discrimination among primary hospitals.*

Most of analyzable entities other than enalapril 5 mg and 20 mg were unable to analyze in the primary hospital market. The third degree price discrimination was consequently undetermined since it measured the price differentiation among markets thus required data entries from all levels of hospitals. Fosinopril 10 mg and perindopril 4 mg, marketed by only one vendor (single source drug), of which first degree price discrimination were not detected in their analyzable markets were illustrated in table 4.5.

Table 4.5 Insignificant-Extent of Price Discrimination Items under ACEI

Trade Name	Data	First Degree PD Primary	First Degree PD Secondary	First Degree PD Tertiary	Third Degree PD	%contribution
ACEI-FOSINOPRIL 10 MG						
Single Brand	G	n/a	n/a	0.376	n/a	n/a
	T	n/a	n/a	0.310	n/a	n/a
ACEI-PERINDOPRIL 4 MG						
Single Brand	G	n/a	0.471	0.425	n/a	n/a
	T	n/a	0.402	0.333	n/a	n/a

Note G = Gini index T = Theil index
PD = Price discrimination n/a = not applicable
%contribution = percentage of third degree price discrimination contributed to overall inequality

Among those presented the first degree price discrimination only in the tertiary market, the most popular brand of captopril 5 mg was seemed to engage in a larger degree of price discrimination than that of ramipril 5 mg as reported in table 4.6.

Table 4.6 Moderate-Extent of Price Discrimination Items under ACEI

TradeName	Data	First Degree PD Primary	First Degree PD Secondary	First Degree PD Tertiary	Third Degree PD	%contribution
ACEI-RAMIPRIL 5 MG						
Popular Brand*	G	n/a	n/a	0.468	n/a	n/a
	T	n/a	n/a	* **0.546**	n/a	n/a
ACEI-CAPTOPRIL 25 MG						
Popular Brand*	G	n/a	n/a	* **0.600**	n/a	n/a
	T	n/a	n/a	* **0.698**	n/a	n/a

Note * There was only one brand applicable. It was therefore the most popular.
Popular Brand = Brand which was purchased by the most purchasers
%contribution = percentage of third degree price discrimination contributed to overall inequality
G = Gini index T = Theil index
PD = Price discrimination n/a = not applicable

The following entities behaved intensive first degree price discrimination especially in the secondary hospital market as illustrated in table 4.7. The data entries of quinapril 20 mg and ramipril 2.5 mg were also adequate for analysis in the tertiary hospital market, but the magnitude of G and T were too small to conclude the existence of first degree price discrimination.

Table 4.7 High-Extent of Price Discrimination Items under ACEI

TradeName	Data	First Degree PD Primary	Secondary	Tertiary	Third Degree	%con--tribution
ACEI-QUINAPRIL HCL 20 MG						
Single Brand	G	n/a	*** 0.620**	0.167	n/a	n/a
	T	n/a	*** 0.792**	0.182	n/a	n/a
ACEI-QUINAPRIL HCL 5 MG						
Single Brand	G	n/a	*** 0.748**	n/a	n/a	n/a
	T	n/a	*** 1.364**	n/a	n/a	n/a
ACEI-RAMIPRIL 2.5 MG						
Single Brand	G	n/a	*** 0.750**	0.464	n/a	n/a
	T	n/a	***1.386**	0.446	n/a	n/a

Note G = Gini index T = Theil index
PD = Price discrimination n/a = not applicable
%contribution = percentage of third degree price discrimination contributed to overall inequality

The last two items, enalapril 20 mg (table 4.8) and 5 mg (table 4.9) were cases that were rich of data entries. At least one entity of of both items contained enough entries for data analysis in all market levels. The third degree price discrimination was then quantified for the entities containing data of every market as illustrated in table 4.8.

Table 4.8 Extent of Price Discrimination (Enalapril 20 mg)

Trade Name	Data	First Degree PD Primary	Secondary	Tertiary	Third Degree	%con--tribution
ACEI-ENALAPRIL maleate 20 MG						
Popular Brand	G	*** 0.753**	0.478	*** 0.523**	0.333	37.69
	T	*** 1.344**	0.433	*** 0.548**	0.405	41.57
Brand A	G	0.426	n/a	n/a	n/a	n/a
	T	0.394	n/a	n/a	n/a	n/a
Brand B	G	n/a	0.459	n/a	n/a	n/a
	T	n/a	*** 0.518**	n/a	n/a	n/a
Brand C	G	*** 0.598**	n/a	n/a	n/a	n/a
	T	*** 0.895**	n/a	n/a	n/a	n/a

Note Popular Brand = Brand which was purchased by the most purchasers
%contribution = percentage of third degree price discrimination contributed to overall inequality
G = Gini index T = Theil index
PD = Price discrimination n/a = not applicable

There were 4 analyzable brands of enalapril 20 mg (table 4.8). Among primary hospitals, the market leader or the popular brand behaved first degree price discrimination with Gini index of 0.753 and Theil index of 1.344 which were as high as brand C (0.598, 0.895 respectively), while brand A's inequality magnitude (0.426, 0.394) was not strong enough to consider to be attentive. In the secondary hospital market, G and T of two analyzable brands, the popular brand (0.478, 0.433) and brand B (0.459, 0.518), were fairly unattractive to be concerned. In the tertiary market, the popular brand was the only one entity that could be analyzed. The magnitude of G and T (0.523, 0.548) also signaled the existence of first degree price discrimination.

The popular brand of enalapril 20 mg had enough entries for analysis within every market and across markets (table 4.8). The third degree price discrimination was thus determined. The magnitude of G (0.333) and T (0.405) between markets indicated that the third degree price discrimination was not pretty much a concern. Its contribution to overall price discrimination was approximately 40%, while the remaining 60% was contributed by its first degree price discrimination. The result of the percent contribution reflected that the popular brand did not price much different among markets, it instead priced differently among buyers in the same market.

Table 4.9 Extent of Price Discrimination (Enalapril 5 mg)

ACEI-ENALAPRIL maleate 5 MG

		First Degree PD			Third	%con-
TradeName	**Data**	**Primary**	**Secondary**	**Tertiary**	**Degree**	**-tribution**
Popular Brand	G	*** 0.620**	0.355	0.402	0.353	38.62
	T	*** 0.771**	0.260	0.367	0.407	38.18
Brand A	G	0.375	n/a	n/a	n/a	n/a
	T	0.470	n/a	n/a	n/a	n/a
Brand B	G	0.280	n/a	n/a	n/a	n/a
	T	0.263	n/a	n/a	n/a	n/a
Brand C	G	*** 0.570**	n/a	n/a	n/a	n/a
	T	*** 0.754**	n/a	n/a	n/a	n/a

__*Note*__ *Popular Brand = Brand which was purchased by the most purchasers*
%contribution = percentage of third degree price discrimination contributed to overall inequality
G = Gini index *T = Theil index*
PD = Price discrimination *n/a = not applicable*

From tables 4.8 and 4.9, the situation of enalapril 5 mg and 20 mg looked similarly as displayed above. All brands were analyzable in the primary hospital market. The first degree price discrimination was significantly detected for two entities, the popular brand (0.620, 0.771) and brand C (0.570, 0.754). The popular brand was the only entities of which the third degree price discrimination could be determined and small magnitude of G (0.353) and T (0.407) were found. The results implied marginal extents of the third degree price differentiation which was thus not prioritized to be concerned, as its contribution was only 40% comparing to 60% of the first degree contribution.

4.2.1.2 Agent acting on the Renin-Angiotensin system (AngiotensinII Antagonist)

a. Group overview

All of drugs under this group were available from single source, as there was only one brand in the market for each item. Although five entities from eleven were feasible for data analysis as demonstrated in table 4.10, they contained enough entries for data analysis in only the secondary and the tertiary markets but not the primary hospitals. Third degree price discrimination was consequently unable to be quantified for all drugs under this pharmacological group.

Table 4.10 Overview Situation (Angiotensin II Anatgonist)

Items	Available Entities	Analyzable Entities	First Degree PD			Third Degree
			Primary	Secondary	Tertiary	
Losartan 50 mg Tab.	1	1	n/a	0/1*	n/a	n/a
Losartan+HCTZ 100+25mg	1	1	n/a	0/1	n/a	n/a
Valsartan 80 mg	1	1	n/a	n/a	1/1	n/a
Valsartan 160 mg	1	1	n/a	0/1	1/1	n/a
Valsartan+HCTZ80+12.5 mg	1	1	n/a	n/a	0/1	n/a
Irbesartan 150 mg	1	0	-	-	-	-
Irbesartan 300 mg	1	0	-	-	-	-
Candesartan 8 mg	1	0	-	-	-	-
Telmisartan 40 mg	1	0	-	-	-	-
Losartan+HCTZ 50+12.5mg	1	0	-	-	-	-
Valsartan+HCTZ160+25 mg	1	0	-	-	-	-
Total	**11**	**5**	**n/a**	**0/3**	**2/3**	**n/a**
Percentage	**100**	**45.45**	**n/a**	**0.00**	**66.67**	**n/a**

<u>*Note*</u> *n/a= the data was not enough for calculation*
**0/1=There was no entity from 1 applicable entity detected the crucial magnitude of first degree price discrimination among secondary hospitals.*

This group, as a whole, generally presented minimal first degree price discrimination. Only one generic drug, valsartan, with 2 different strengths, 80 and 160 mg from three analyzable entities was detected first degree price discrimination in the tertiary hospital market. All of analyzable entities in the secondary hospital market were not detected price discrimination. As this group of medicine was considered new drugs in the market, there would be very few, if any, primary hospitals carrying this group of medication. It was thus no entity feasible for analysis in the primary market.

b. Types and the extent of price discrimination

Five analyzable items were around two main generic drugs, either losartan or valsartan as shown in table 4.11. Whereas the pricing behavior of valsartan could be examined in 2 markets, secondary and tertiary, losartan had enough number of hospitals to allow price observation in only the secondary market. Losartan, in the secondary hospital market, presented less extent of first degree price discrimination than valsartan, however both did not signal discrimination caution. The tertiary market, on the other hand, detected decisive extent of first degree price discrimination in 2 out of 3 items of valsartan, 80 and 160 mg.

Table 4.11 Extent of Price Discrimination (Angiotensin II Antagonist)

Analyzable Items	TradeName	Data	First Degree PD Primary	First Degree PD Secondary	First Degree PD Tertiary	Third Degree	%con- -tribution
Losartan 50 mg	Single Brand	G	n/a	0.250	n/a	n/a	n/a
		T	n/a	0.288	n/a	n/a	n/a
Losartan+HCTZ 100+25mg	Single Brand	G	n/a	0.250	n/a	n/a	n/a
		T	n/a	0.288	n/a	n/a	n/a
Valsartan 80 mg	Single Brand	G	n/a	n/a	* 0.711	n/a	n/a
		T	n/a	n/a	* 1.143	n/a	n/a
Valsartan 160 mg	Single Brand	G	n/a	0.490	* 0.650	n/a	n/a
		T	n/a	0.462	* 0.820	n/a	n/a
Valsartan+HCTZ80+12.5 mg	Single Brand	G	n/a	n/a	0.327	n/a	n/a
		T	n/a	n/a	0.313	n/a	n/a

Note *G = Gini index* *T = Theil index*
PD = Price discrimination *n/a = not applicable*
%contribution = percentage of third degree price discrimination contributed to overall inequality

In a nutshell, valsartan 80 and 160 mg were two items from this pharmacological group that needed detailed analysis as demonstrated later in this chapter.

4.2.1.3 Beta blocking agents

a. Group overview

Five generic drugs under the beta blocking agent comprised 11 items including different strengths. When taking into account different trade names, only 16 from 71 available entities were included into the analysis. Overall situation of price discrimination was summarized in table 4.12.

Table 4.12 Overview Situation (Beta Blocking Agent)

Items	Available Entities	Applicable Entities	First Degree PD			Third Degree
			Primary	Secondary	Tertiary	
Atenolol 50 mg	9	3	2/3*	1/1	0/1	1/1
Atenolol 100 mg	12	2	2/2	1/2	0/1	0/1
Propanolol 10 mg	21	4	2/4	0/2	0/2	n/a
Propanolol 40 mg	12	3	0/3	0/2	0/2	n/a
Bisoprolol 5 mg	1	1	n/a	n/a	0/1	n/a
Carvidilol 12.5 mg	1	1	n/a	n/a	1/1	n/a
Carvidilol 25 mg	1	1	n/a	0/1	0/1	n/a
Metoprolol 100 mg	10	1	n/a	0/1	n/a	n/a
Atenolol 25 mg	2	0	-	-	-	-
Bisoprolol 2.5 mg	1	0	-	-	-	-
Carvidilol 6.25 mg	1	0	-	-	-	-
Total	**71**	**16**	**6/12**	**2/9**	**1/9**	**1/2**
Percentage	**100**	**20.90**	**50.00**	**22.22**	**11.11**	**50.00**

Note *n/a = the data was not enough for calculation*
**2/3=There were two entities from 3 applicable entities detected the crucial magnitude of first degree price discrimination among primary hospitals.*

First degree price discrimination was momentously detected in the primary hospital market. Six from twelve analyzable brands behaved price discrimination among primary hospitals. There were fewer brands in secondary and tertiary hospital markets detected for significant first degree price discrimination. Two items of atenolol 50 mg and 100 mg could provide enough entries for examination of third degree price discrimination and atenolol 50 mg but not 100 mg was detected price discrimination among markets.

b. Types and the extent of price discrimination

Pricing behaviors of multiple-source items was noticeably separated into two patterns. The first was simply found in many multiple-source items. Intensive magnitude of first degree price discrimination was detected in both primary and secondary hospital markets by the popular brand as found in atenolol 50 and 100 mg. At the same time brand A of each item behaved similar to the market leader. The other pattern was rarely found. It was in propanolol 10, 40 mg of which the market leader was the GPO brand. Since it was owned by the government, pricing strategy was strictly single price policy. It was thus no price discrimination within or between the markets as G and T indices showed inequality of 0.000. At the other extreme, the competitor products, brand A and B of propanolol 10 mg were detected significant performance on first degree price discrimination in the primary market. The first degree price discrimination by brand A of propanolol 40 mg, however, did not present as meaningfully as found for propanolol 10 mg under the same market. One of single source items, carvidilol 12.5 mg with the large degree of G and T indices in the tertiary hospital market, was also needed closer exploration.

The popular brand of atenolol 50 mg indicated the existence of third degree price discrimination. The magnitude and percent contribution of third degree price discrimination were vital enough to be concerned as much as the first degree.

Table 4.13 Extent of Price Discrimination (Beta Blocking Agent)

Items	TradeName	Data	First Degree PD Primary	First Degree PD Secondary	First Degree PD Tertiary	Third Degree	%con-tribution
Atenolol 50 mg	Popular Brand	G	*** 0.606**	*** 0.512**	0.374	0.485	47.21
		T	*** 0.732**	*** 0.508**	0.265	*** 0.513**	46.22
	Brand A	G	*** 0.553**	n/a	n/a	n/a	n/a
		T	*** 0.584**	n/a	n/a	n/a	n/a
	Brand B	G	0.308	n/a	n/a	n/a	n/a
		T	0.255	n/a	n/a	n/a	n/a
Atenolol 100 mg	Popular Brand	G	*** 0.612**	*** 0.548**	0.430	0.418	43.26
		T	*** 0.689**	*** 0.573**	0.365	0.438	43.26
	Brand A	G	*** 0.518**	n/a	n/a	n/a	n/a
		T	*** 0.602**	n/a	n/a	n/a	n/a
Bisoprolol 5 mg	Single Brand	G	n/a	n/a	0.419	n/a	n/a
		T	n/a	n/a	0.391	n/a	n/a
Carvidilol 12.5 mg	Single Brand	G	n/a	n/a	*** 0.750**	n/a	n/a
		T	n/a	n/a	*** 1.386**	n/a	n/a
Carvidilol 25 mg	Single Brand	G	n/a	0.000	0.143	n/a	n/a
		T	n/a	0.000	0.154	n/a	n/a
Propanolol 10 mg	Popular Brand-1	G	0.009	0.000	0.000	0.000	-
		T	0.009	0.000	0.000	0.000	-
	Popular Brand-2	G	0.000	0.000	0.000	0.000	-
		T	0.000	0.000	0.000	0.000	-
	Brand A	G	*** 0.776**	n/a	n/a	n/a	n/a
		T	*** 1.411**	n/a	n/a	n/a	n/a
	Brand B	G	*** 0.520**	n/a	n/a	n/a	n/a
		T	*** 0.562**	n/a	n/a	n/a	n/a

Table 4.13 Extent of Price Discrimination (Beta Blocking Agent)

Items	TradeName	Data	First Degree PD Primary	First Degree PD Secondary	First Degree PD Tertiary	Third Degree	%con-tribution
Propanolol 40 mg	Popular Brand-2	G	0.000	0.000	0.000	0.000	-
		T	0.000	0.000	0.000	0.000	-
	Popular Brand-1	G	0.000	0.000	0.000	0.000	-
		T	0.000	0.000	0.000	0.000	-
	Brand A	G	0.317	n/a	n/a	n/a	n/a
		T	0.305	n/a	n/a	n/a	n/a
Metoprolol 100mg	Popular Brand	G	n/a	0.431	n/a	n/a	n/a
		T	n/a	0.450	n/a	n/a	n/a

Note Popular Brand = Brand which was purchased by the most purchasers
Single Brand = The only one available brand in the database of that particular item
G = Gini index T = Theil index
PD = Price discrimination n/a = not applicable
%contribution = percentage of third degree price discrimination contributed to overall inequality

4.2.1.4 Calcium channel blockers

a. Group overview

The purchasing database contained 7 generics of calcium channel blockers, i.e. amlodipine, diltiazem, felodipine, manidipine, nicardipine, and verapamil. Different strengths and dosage forms of these generic drugs made up of 25 items with 67 brand entities available. Only 15 items including 28 brand entities were analyzable.

Table 4.14 Overview Situation (Calcium Channel Blocker)

Items	Available Entities	Applicable Entities	First Degree PD Primary	First Degree PD Secondary	First Degree PD Tertiary	Third Degree
Felodipine 5 mg	2	1	1/1*	1/1	1/1	0/1
Diltiazem 30 mg tab.	8	2	1/1	0/2	0/2	0/1
Diltiazem 90 mg tab.	1	1	n/a	0/1	n/a	
Diltiazem 120 mg tab.	2	1	n/a	1/1	0/1	
Nifedipine 5 mg	6	3	2/3	0/1	0/1	1/1
Nifedipine 10 mg	9	4	2/4	2/2	1/1	1/1
Nifedipine 20 mg	6	5	3/5	0/2	1/1	
Nifedipine 30 mg	1	1	n/a	n/a	1/1	
Verapamil 40mg Tab	8	3	0/3	0/1	1/1	1/1
Verapamil 240 mg Dragee SR	1	1	n/a	1/1	n/a	
Amlodipine 5 mg	3	1	1/1	1/1	n/a	
Amlodipine 10 mg	3	2	n/a	n/a	1/2	
Manidipine 20 mg	1	1	n/a	n/a	1/1	
Nicardipine 2mg/2mlAmp.	1	1	n/a	1/1	n/a	
Nicardipine 10mg/10mlAmp.	1	1	n/a	n/a	1/1	
Diltiazem 10 mg Amp.	1	0	-	-	-	-
Diltiazem 60 mg tab.	4	0	-	-	-	-
Diltiazem 100 mg tab.	1	0	-	-	-	-
Felodipine 2.5 mg	1	0	-	-	-	-
Felodipine 10 mg	1	0	-	-	-	-

Table 4.14 Overview Situation (Calcium Channel Blocker)

Items	Available Entities	Applicable Entities	First Degree PD Primary	First Degree PD Secondary	First Degree PD Tertiary	Third Degree
Manidipine 10 mg	1	0	-	-	-	-
Nicardipine 20 mg Tab.	2	0	-	-	-	-
Nicardipine 40 mg Tab.	1	0	-	-	-	-
Verapamil 5mg/2ml Amp.	1	0	-	-	-	-
Verapamil 40mg Dragee	1	0	-	-	-	-
Total	**67**	**28**	**10/18**	**7/14**	**8/13**	**3/5**
Percentage	**100**	**41.79**	**55.56**	**50.00**	**61.54**	**60.00**

Note *n/a= the data was not enough for calculation*
**1/1=There were one entity from an applicable entity detected the crucial magnitude of first degree price discrimination among primary hospitals.*

The first degree price discrimination was generally practiced by pharmaceutical manufacturers in every market. Price discrimination in the secondary hospital market was detected with a half of analyzed entities while the primary and the tertiary hospital markets presented higher proportion of products. The price difference for this particular product group could be observed not only within the same market but among different markets. Table 4.14 illustrated that 3 out of 5 analyzed entities signaled a decisive extent of price discrimination among comparative markets.

b. Types and the extent of price discrimination

Among 5 entities explored for both the first and the third degree of price discrimination, popular brands of diltiazem 30 mg tablet, felodipine 5 mg, nifedipine 5 mg and 10 mg, and verapamil 40 mg tablet, price behaviors could be categorized into 3 types: first degree dominated, third degree dominated and equally mixed-up.

Table 4.15 Extent of Price Discrimination (Calcium Channel Blocker)

Items	TradeName	Data	First Degree PD Primary	First Degree PD Secondary	First Degree PD Tertiary	Third Degree	%con-tribution
Amlodipine 5 mg	Popular Brand	G	* 0.573	* 0.667	n/a	n/a	n/a
		T	* 0.631	* 1.099	n/a	n/a	n/a
Amlodipine 10 mg	Popular Brand	G	n/a	n/a	* 0.800	n/a	n/a
		T	n/a	n/a	* 1.609	n/a	n/a
	Brand A	G	n/a	n/a	0.283	n/a	n/a
		T	n/a	n/a	0.292	n/a	n/a
Diltiazem 30 mg tab.	Popular Brand	G	0.489	0.455	0.444	0.470	50.39
		T	* 0.627	0.400	0.480	0.492	49.85
	Brand A	G	n/a	0.476	0.348	n/a	n/a
		T	n/a	0.419	0.342	n/a	n/a
Diltiazem 90 mg tab.	Single Brand	G	n/a	0.250	n/a	n/a	n/a

Table 4.15 Extent of Price Discrimination (Calcium Channel Blocker)

Items	TradeName	Data	First Degree PD			Third Degree	%con-tribution
			Primary	Secondary	Tertiary		
		T	n/a	0.288	n/a	n/a	n/a
Diltiazem 120 mg tab.	Popular Brand	G	n/a	*** 0.525**	0.000	n/a	n/a
		T	n/a	*** 0.539**	0.000	n/a	n/a
Felodipine 5 mg	Popular Brand	G	*** 0.572**	*** 0.630**	*** 0.744**	0.424	38.97
		T	*** 0.645**	*** 0.758**	*** 1.142**	0.443	33.41
Manidipine 20 mg	Single Brand	G	n/a	n/a	*** 0.858**	n/a	n/a
		T	n/a	n/a	*** 1.794**	n/a	n/a
Nicardipine 2mg/2mlAmp.	Single Brand	G	n/a	*** 0.572**	n/a	n/a	n/a
		T	n/a	*** 0.620**	n/a	n/a	n/a
Nicardipine10mg/10mlAmp.	Single Brand	G	n/a	n/a	0.486	n/a	n/a
		T	n/a	n/a	*** 0.614**	n/a	n/a
Nifedipine 5 mg	Popular Brand	G	*** 0.765**	0.492	0.408	*** 0.606**	47.40
		T	*** 1.204**	0.482	0.364	*** 0.793**	44.93
	Brand A	G	*** 0.539**	n/a	n/a	n/a	n/a
		T	*** 0.526**	n/a	n/a	n/a	n/a
	Brand B	G	0.365	n/a	n/a	n/a	n/a
		T	0.378	n/a	n/a	n/a	n/a
Nifedipine 10 mg	Popular Brand	G	0.469	*** 0.568**	0.400	*** 0.610**	56.49
		T	0.397	*** 0.655**	0.356	*** 0.808**	66.21
	Brand A	G	*** 0.533**	*** 0.700**	n/a	n/a	n/a
		T	0.490	*** 1.058**	n/a	n/a	n/a
	Brand B	G	*** 0.512**	n/a	n/a	n/a	n/a
		T	0.484	n/a	n/a	n/a	n/a
	Brand C	G	0.459	n/a	n/a	n/a	n/a
		T	0.388	n/a	n/a	n/a	n/a
Nifedipine 20 mg	Popular Brand	G	0.459	0.448	n/a	n/a	n/a
		T	0.386	0.377	n/a	n/a	n/a
	Brand A	G	*** 0.656**	0.261	n/a	n/a	n/a
		T	*** 0.806**	0.206	n/a	n/a	n/a
	Brand B	G	0.494	n/a	*** 0.539**	n/a	n/a
		T	0.465	n/a	*** 0.571**	n/a	n/a
	Brand C	G	*** 0.737**	n/a	n/a	n/a	n/a
		T	*** 1.154**	n/a	n/a	n/a	n/a
	Brand D	G	*** 0.713**	n/a	n/a	n/a	n/a
		T	*** 1.087**	n/a	n/a	n/a	n/a
Nifedipine 30 mg	Single Brand	G	*** 0.627**	n/a	n/a	n/a	n/a
		T	*** 0.806**	n/a	n/a	n/a	n/a

Table 4.15 Extent of Price Discrimination (Calcium Channel Blocker)

Items	TradeName	Data	First Degree PD Primary	Secondary	Tertiary	Third Degree	%con-tribution
Verapamil 40mg Tab	Popular Brand	G	0.421	0.413	* 0.521	0.333	42.86
		T	0.340	0.298	0.490	0.405	52.75
	Brand A	G	0.427	n/a	n/a	n/a	n/a
		T	0.373	n/a	n/a	n/a	n/a
	Brand B	G	0.443	n/a	n/a	n/a	n/a
		T	0.423	n/a	n/a	n/a	n/a
Verapamil240mgDragee SR	Single Brand	G	n/a	* 0.644	n/a	n/a	n/a
		T	n/a	* 0.809	n/a	n/a	n/a

Note *Popular Brand = Brand which was purchased by the most purchasers*
Single Brand = The only one available brand in the database of that particular item
G = Gini index *T = Theil index*
PD = Price discrimination *n/a = not applicable*
%contribution = percentage of third degree price discrimination contributed to overall inequality

The popular brand of felodipine 5 mg were first degree dominated type, since their G and T indices signified more rigorous extent of first degree than the third degree. As presented in table 4.15, the price discrimination was contributed to the variation of prices among different markets with a smaller contribution (38.97% under G index or 33.41% under T index). In other words, this brand varied its price more extensively within the same market than it did among different markets. The third degree dominated type was found in price behavior of the popular brand of nifedipine 10 mg which tended to discriminate its prices among different markets with a larger contribution than within the same market. Popular brands of diltiazem 30 mg and nifedipine 5 mg were classified as the last category, equally mixed up, of which both types of price discrimination were equally contributed to overall price difference, although the extent of the third degree of diltiazem 30 mg was less than 0.500.

Among products available through single source including diltiazem 90 mg, manidipine 20 mg, nicardipine injection 2 mg/2 ml, 10 mg/10 ml, and nifedipine 30 mg, most of them signaled G and T indices that were crucial enough to raise awareness of the first degree price discrimination except diltiazem 90 mg. Nifedipine 20 mg, with many competitors available, showed a strong evidence price discrimination pattern. All but its popular brand were detected first degree price discrimination behaviors. It was one of the two products in this group of which the popular brand did not show first degree price discrimination. The other was diltiazem 90 mg. Verapamil 40 mg was the only item rarely detected with price discrimination behavior.

4.2.1.5 Serum lipid reducing agents

a. Group overview

This group was composed of 12 items of 5 generic drugs with overall 50 available brand entities. Sixteen applicable brand entities were included in the analysis. As a whole, the occurrence of first degree price discrimination was evenly distributed in all markets. One from two applicable brands was marked as awareness of third degree price discrimination as shown in table 4.16 .

Table 4.16 Overview Situation (Serum Lipid Reducing Agent)

Items	Available Entities	Applicable Entities	First Degree PD			Third Degree
			Primary	Secondary	Tertiary	
Atorvastatin 10 mg	1	1	n/a	1/1*	1/1	n/a
Atorvastatin 20 mg	1	1	1/1	n/a	0/1	n/a
Gemfibrozil 300 mg	20	4	2/4	0/1	1/1	1/1
Gemfibrozil 600 mg	8	1	0/1	n/a	n/a	n/a
Fenofibrate 300 mg	2	1	1/1	n/a	n/a	n/a
Simvastatin 10 mg	7	4	2/4	0/1	0/1	0/1
Simvastatin 20 mg	3	2	1/2	n/a	1/1	n/a
Simvastatin 40 mg	3	1	n/a	1/1	n/a	n/a
Simvastatin 80 mg	1	1	n/a	1/1	0/1	n/a
Fluvastatin 40 mg	1	0	-	-	-	-
Fluvastatin 80 mg	1	0	-	-	-	-
Gemfibrozil 900 mg	2	0	-	-	-	-
Total	**50**	**16**	**7/13**	**3/5**	**3/6**	**1/2**
Percentage	**100**	**32.00**	**53.85**	**60.00**	**50.00**	**50.00**

__Note__ n/a= the data was not enough for calculation
**1/1=There were one entity from an applicable entity detected the crucial magnitude of first degree price discrimination among secondary hospitals.*

b. Types and the extent of price discrimination

From table 4.17, three single source products, atorvastatin 10 mg, 20 mg, and simvastatin 80 mg, engaged in some first degree price discrimination in either primary or secondary hospital markets with atorvastatin 10 mg and simvastatin 80 mg showing decisive extent of G and T indices among secondary hospitals. First degree price discrimination in the primary hospital market could also be realized in some but not all of products that could be acquired thru multiple sources.

Table 4.17 Extent of Price Discrimination (Serum Lipid Reducing Agent)

Items	TradeName	Data	First Degree PD Primary	First Degree PD Secondary	First Degree PD Tertiary	Third Degree	%con-tribution
Atorvastatin 10 mg	Single Brand	G	n/a	* **0.663**	0.470	n/a	n/a
		T	n/a	* **0.866**	0.397	n/a	n/a
Atorvastatin 20 mg	Single Brand	G	0.457	n/a	0.276	n/a	n/a
		T	* **0.513**	n/a	0.291	n/a	n/a
Gemfibrozil 300 mg	Popular Brand	G	* **0.618**	0.327	0.499	* **0.588**	50.78
		T	* **0.703**	0.306	* **0.531**	* **0.736**	53.64
	Brand A	G	0.479	n/a	n/a	n/a	n/a
		T	0.483	n/a	n/a	n/a	n/a
	Brand B	G	* **0.750**	n/a	n/a	n/a	n/a
		T	* **1.386**	n/a	n/a	n/a	n/a
	Brand C	G	0.385	n/a	n/a	n/a	n/a
		T	0.370	n/a	n/a	n/a	n/a
Gemfibrozil 600 mg	Popular Brand	G	0.320	n/a	n/a	n/a	n/a
		T	0.303	n/a	n/a	n/a	n/a
Fenofibrate 300 mg	Popular Brand	G	* **0.600**	n/a	n/a	n/a	n/a
		T	* **0.916**	n/a	n/a	n/a	n/a
Simvastatin 10 mg	Popular Brand	G	* **0.557**	0.464	0.454	0.390	43.72
		T	* **0.542**	0.413	0.365	0.420	48.10
	Brand A	G	* **0.762**	n/a	n/a	n/a	n/a
		T	* **1.251**	n/a	n/a	n/a	n/a
	Brand B	G	0.453	n/a	n/a	n/a	n/a
		T	0.382	n/a	n/a	n/a	n/a
	Brand C	G	0.464	n/a	n/a	n/a	n/a
		T	0.452	n/a	n/a	n/a	n/a
Simvastatin 20 mg	Popular Brand	G	* **0.520**	n/a	* **0.572**	n/a	n/a
		T	0.491	n/a	* **0.644**	n/a	n/a
	Brand A	G	0.367	n/a	n/a	n/a	n/a
		T	0.349	n/a	n/a	n/a	n/a
Simvastatin 40 mg	Popular Brand	G	n/a	* **0.517**	n/a	n/a	n/a
		T	n/a	* **0.574**	n/a	n/a	n/a
Simvastatin 80 mg	Single Brand	G	n/a	* **0.800**	0.000	n/a	n/a
		T	n/a	* **1.609**	0.000	n/a	n/a

Note *Popular Brand = Brand which was purchased by the most purchasers*
Single Brand = The only one available brand in the database of that particular item
G = Gini index *T = Theil index*
PD = Price discrimination *n/a = not applicable*
%contribution = percentage of third degree price discrimination contributed to overall inequality

The popular brands of simvastatin demonstrated different pricing strategies across products and across markets. Whereas the popular brand of simvastatin 80 mg was discriminatorily priced in the secondary hospital market, single price policy was strictly applied in the tertiary hospital market (G and T indices = 0.000). It was therefore required detailed investigation.

The popular brands of simvastatin 10 mg and 20 mg with competitors in the market also engaged in some degree of price discrimination even in the tertiary hospital market.

The next section showed in-depth analysis of the price discrimination incidence. Each of indicated brands was further explored in order to thoroughly understand the situation. The analysis was done for every brand by the same course of actions. The popular brand of enalapril 5 mg was chosen as a demonstrated example for this purpose, while complete profiles of other products were summarized in the appendices.

4.2.2 The analysis for detailed investigation

- **Brand Level of Aggregation**

  First Degree Price Discrimination

Table 4.18 Descriptive Summary of Popular Brand Enalapril 5 mg

Market	N	TotalQ	Qmin	Qmax	Pmin	Pmax	Mean	SD	CV	WAP	$\overline{MAC}$	G
Primary	39	2864100	5000	220000	0.210	0.380	0.265	0.029	0.109	0.262	**3.014**	**0.620**
Secondary	8	2646500	141000	845500	0.210	0.340	0.259	0.042	0.162	0.247	**1.071**	**0.355**
Tertiary	4	1707000	168000	669000	0.230	0.290	0.258	0.025	0.097	0.251	**0.168**	**0.402**

Note: *n* = *number of hospitals in the market* — *Qmin* = *the minimum purchasing size*
Qtotal = *summation of purchasing size in a market* — *Qmax* = *the maximum purchasing size*
SD = *the standard deviation of contract price* — *Pmin* = *the minimum contract price*
Pmean = *the arithmetic mean of contract price* — *Pmax* = *the maximum contract price*
CV = *coefficient of variation equal to the proportion of SD above Pmean*
WAP = *weighted average price by purchasing size* — *G* = *Gini coefficient*
$\overline{MAC}$ = *Arithmetic Mean of MAC, Market MAC* — *T* = *Theil Index*

From table 4.18, value of Gini coefficient showed the rigorous level of first degree price discrimination among primary hospitals (G=0.620). The result was also illustrated in the Lorenz curve as following figure 4.2. The largest area between Lorenz and equality line was belonged to primary hospital market. Price behavior of this brand in primary hospital market was then prioritized to be explored, while that in other 2 markets was not considerably momentous.

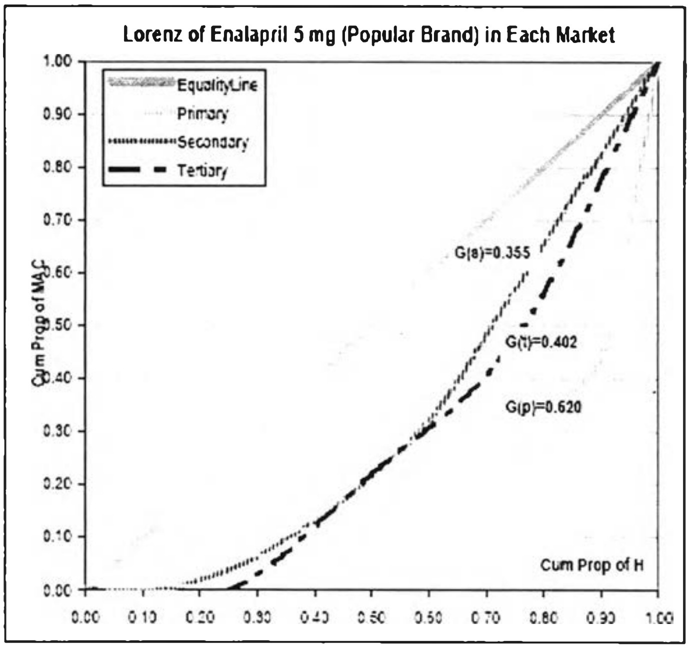


Figure 4.7 Lorenz Curve of Popular Brand of Enalapril 5 mg

Gini coefficient bigger than 0.500 reflected the magnitude of situation which the low prices in the system were obtained by small buyers, at the same time the big buyers got high prices. Big Gini also implied that most of primary hospitals utilized their MAC lower than average MAC to purchase this brand. Several contracts were made at too high prices than what should be based on their purchasing volume capabilities in the system. This situation could graphically be displayed in term of P and Q relationship as in figure 4.3.

The average MAC of the market (3.014) was selected to estimate market price schedule drawn as the black line in figure. Ideally the larger the purchased quantity (Qi/Qmax), the lower the price (Pi/Pmax) could be offered. However, in practice, prices were generally varied in a limited range. The gray line was then drawn to reflect the current actual minimum price. The adjusted price schedule with current minimum price was thus recommended. Each scatter dot belonged to one primary hospital representing its actual purchased price and quantity. The figure showed majority fell above the reference line of market price schedule. It confirmed that most of primary hospitals dealt this item at too high prices judged against their purchasing sizes and market price schedule.

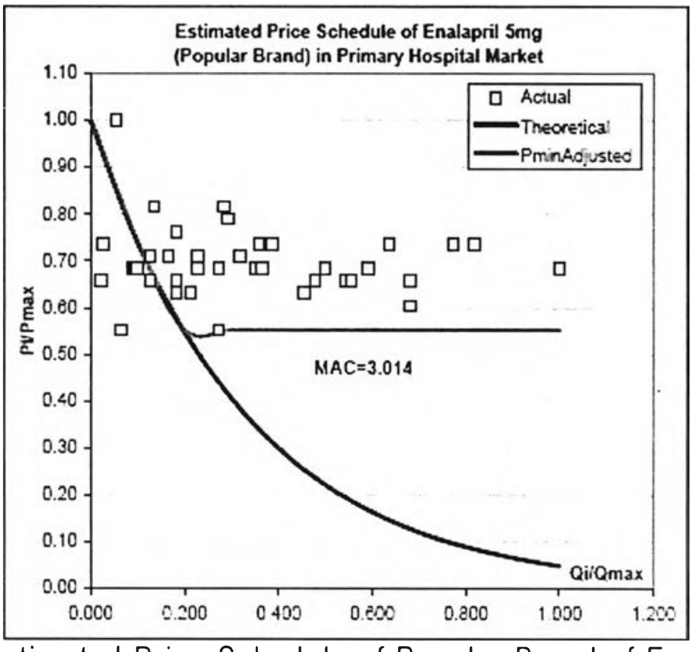
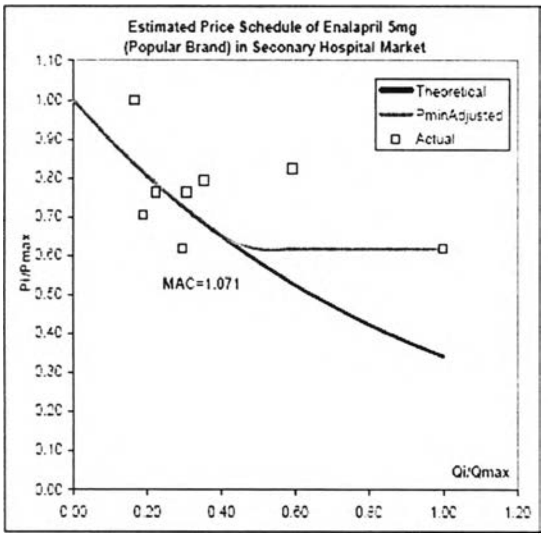


Figure 4.8 Estimated Price Schedule of Popular Brand of Enalapril 5 mg in Primary Hospital Market



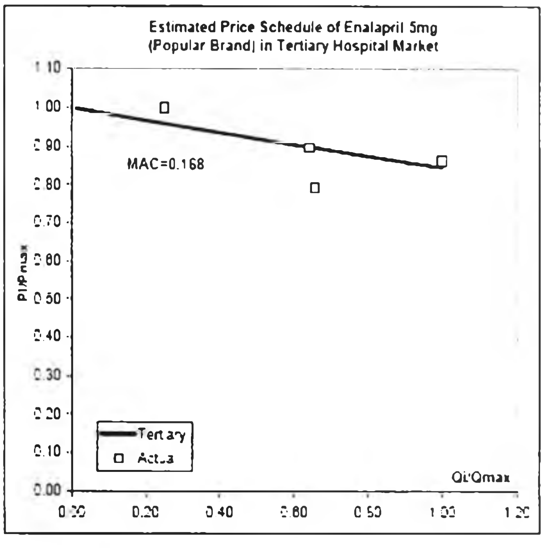


Figure 4.9 Estimated Price Schedule of Popular Brand of Enalapril 5 mg in Secondary and Tertiary Hospital Markets

Third Degree Price discrimination

Pricing behavior of the popular brand of enalapril 5 mg was comparatively explored among the markets by using first order stochastic approach illustrated in figure 4.10. When a vertical line was drawn from x-axis at 0.80 of cumulative proportion of purchasing size, it was found that the mass in tertiary hospitals were purchased at the price lower than 0.25 baht comparing with secondary (≈0.27 baht) and primary (≈0.28 baht) markets.

However, the stochastic plots of each level of care were cross each other in this case which brought up the awareness to make the conclusion as usual. Descriptive statistics would be concurrently considered. The secondary hospital market acquired the cheaper WAP (0.247 baht) than tertiary (0.251 baht) and primary (0.262 baht) hospital markets respectively as shown in table 4.18. Although, at 80 percentile, the price offered to tertiary hospitals was the lowest, secondary hospitals purchased the product on the average at cheaper prices, as only small quantities were slightly more expensive than price offered to tertiary hospitals. However, for this particular product of enalapril 5 mg, the price differences across markets were marginal.

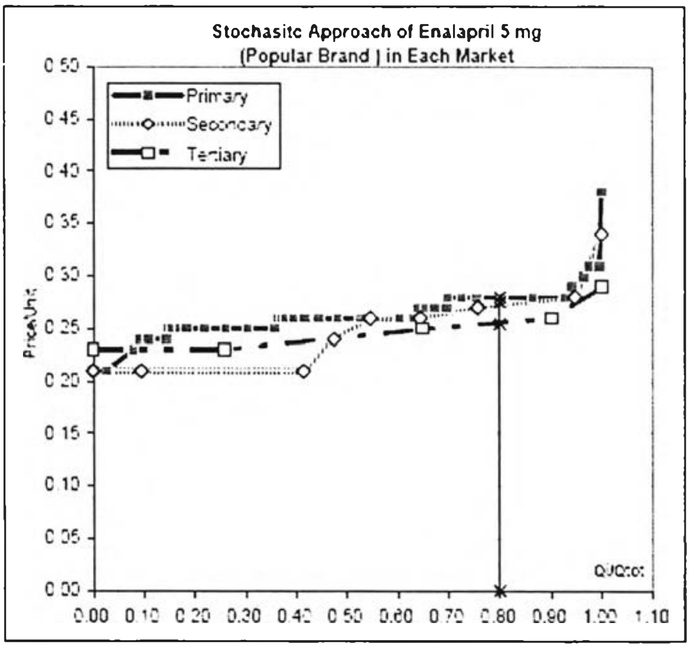


Figure 4.10 First Order Stochastic Dominance of Popular Brand Enalapril 5 mg in Different Markets

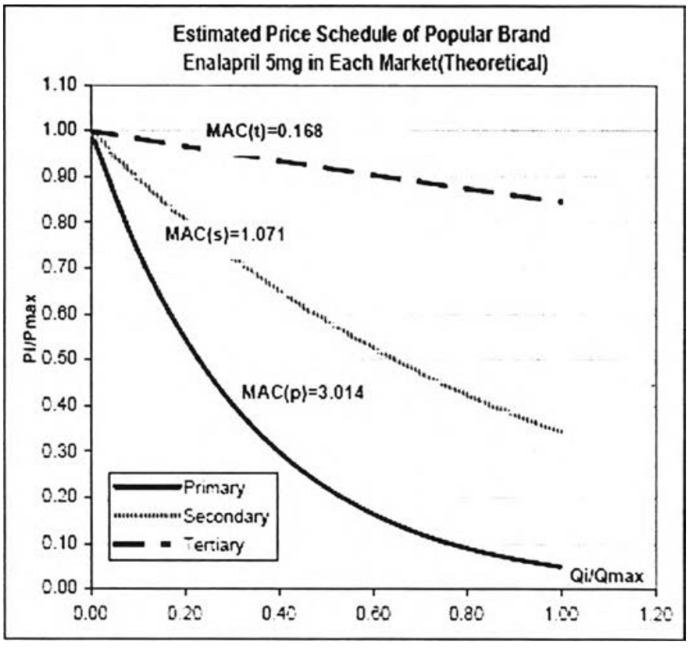


Figure 4.11 Theoretical and Estimated Price Schedule of Popular Brand of Enalapril 5 mg in Different Markets

The difference in terms of price schedule among markets was graphically presented. The price schedule of each market was estimated and compared. It was revealed that pricing of this product brand was positioned differently among markets as shown in figure 4.6.

From stochastic approach, the price at 80 percentile, of the studied product, in the tertiary hospital market were generally cheaper than other 2 markets. These lower prices in tertiary hospitals were conformed to large purchasing volume per buyer. These hospitals had no need to exercise their MAC or other factors to acquire their prices. Tertiary hospitals then utilized less MAC ($\overline{MAC}$=0.168) than secondary ($\overline{MAC}$=1.071) and primary hospitals ($\overline{MAC}$=3.014) to obtain their current prices as depicted in figure 4.6. It could additionally be explained in terms of elasticity, as the bigger $\overline{MAC}$ signaled higher elasticity price schedule. Since the offered price was already low, the schedule couldn't be much elastic in the tertiary hospital market, while it was more responsive to purchasing volume in the secondary and the primary hospital markets. This evidence would be marked as the existing of third degree price discrimination in trading of the popular brand of enalapril 5 mg across different level of care markets. However, the extent of third degree price discrimination seemed not as crucial as the first degree that was supported by the decomposition analysis presented in table 4.19.

Table 4.19 Decomposition of the Popular Brand of Enalapril 5mg Partitioned by Markets

Market Partition	Index	%
G-Within	0.562	62.69
G-Between	0.334	37.31
T-Within	0.660	61.93
T-Between	0.405	38.07

Note: *G-within and G-between were calculated using Gini coefficient.*
T-within and T-between were calculated using Thiel index.

Index integers indicated greater extent of price discrimination among hospitals in the same level of care (first degree) than across markets (third degree). Calculated by using Gini coefficient, the price discrimination by the studied brand of enalapril 5mg was accounted for 62.69% by the first degree price discrimination or price differences within the same market and 37.31% by the third degree price discrimination or price differences across markets. The first degree price discrimination was then the main concern for this product. The Gini coefficient of 0.620 representing the magnitude of the first degree price discrimination of this studied entity also suggested some actions should be taken.

- **Generic level of aggregation**

The previous level of analysis has shown the picture of each brand in different markets. This part depicted the aggregation analysis of price behavior across brands for the same generic drug in each market. Here each brand was the unit of analysis instead of each hospital as used in previous level of analysis. The first order stochastic approach, with each line representing the behavior of each applicable brand, was employed to run through price behavior of each brand as shown in figure 4.12.

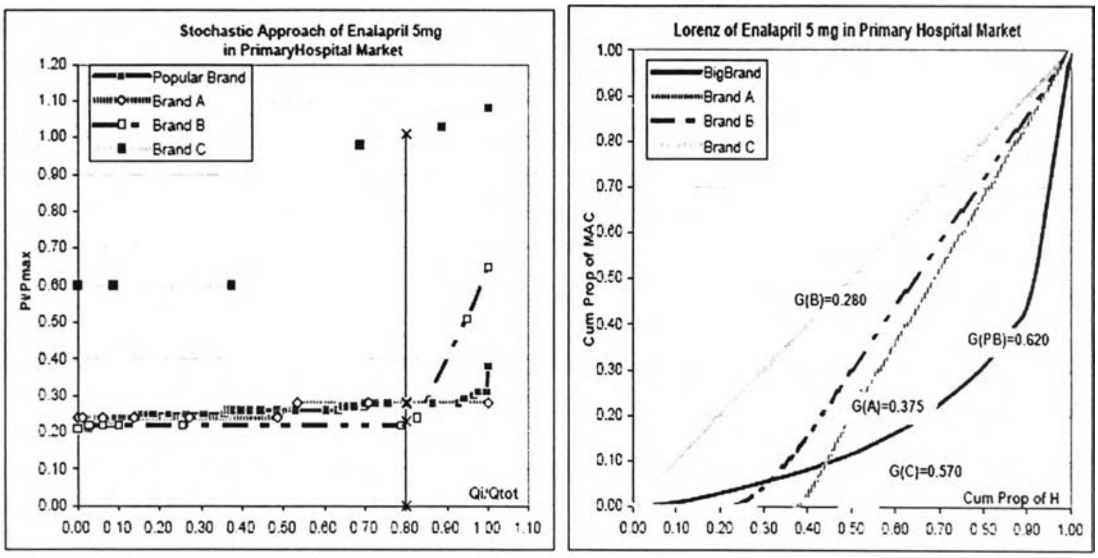


Figure 4.12 First Order and Lorenz Dominance of Enalapril 5 mg (Each Brand) in Primary Hospital Market

Different pricing strategies of each brand were roughly implied. Brand A positioned its price similarly to the popular brand, and price positioning of brand B was set at lower to compete, while brand C enjoying a smaller market size uniquely placed its price higher than others.

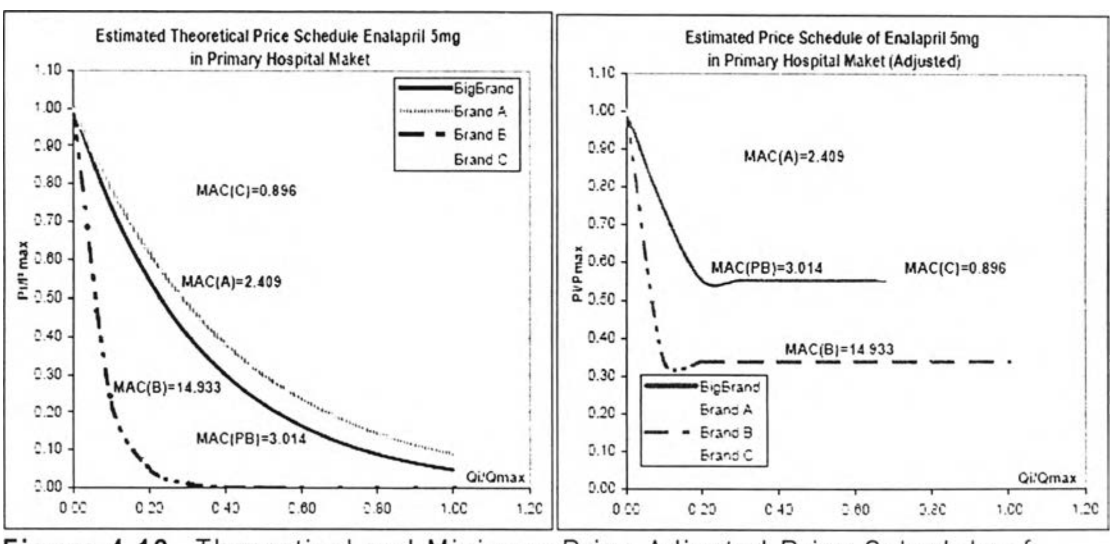


Figure 4.13 Theoretical and Minimum Price-Adjusted Price Schedule of Enalapril 5 mg (Each Brand) in Primary Hospital Market

Estimated price schedules of each brand illustrated different pricing strategies as shown in figure 4.13. Brand B priced the product most sensitive to purchasing size. Most of quantities (≈ 80%) were bought at minimum price causing low Gini coefficient of 0.280 in spite of wide range between minimum and maximum prices. Brand C positioned its price at the highest and least sensitive to purchasing sizes with the offer of wide range between minimum and maximum prices, Gini detected discrimination of 0.570. The popular brand (G=0.620) and brand B (G=0.375) were priced similarly to each other. However, the popular brand offered a broader price range than brand B causing a bigger Gini. These descriptive detections denoted that price dispersion among a particular generic name drug in a market grounded not only on first degree price discrimination of each brands, but also on some degrees of price dispersion across brands as demonstrated by the decomposition analysis in table 4.20.

Table 4.20 Decomposition of Enalapril 5 mg Partitioned by Brand

Brand Partition	Index	%
G-Within	0.538	57.79
G-Between	0.393	42.21
T-Within	0.662	63.39
T-Between	0.382	36.61

Note: *G-within and T-within referred to the dispersion within the same brand.*
G-between and T-between referred to the dispersion across brands.

Enalapril 5 mg price dispersion was contributed more to first degree price discrimination within the same brand (approximately 60%) than price dispersion acorss brands (approximately 40%). A low Gini coefficient between brands (0.397) reflected that most of contracts of this drug belonged to the cheaper brands. In other words, the brands with larger market share tended to offer cheaper prices than those with smaller market share. It also implied high intensity of price competition in the market. The competitors priced their product not quite different to each other. They instead differentiated prices among their buyers. In summary, the main concern for enalapril 5 mg was the first degree price discrimination within the same brand.

4.2.3 Extreme Case Review

This section was aimed to display market categorization using extreme value of $\overline{MAC}$ and Gini coefficient. These indicators could be used together as a thermometer monitoring market health in terms of buyer strengths and suppliers' pricing behavior. Data analysis classified markets into 5 categories by these indicators: "Low G but High $\overline{MAC}$", "Low G and Low $\overline{MAC}$", "High G and high $\overline{MAC}$", "High G but Low $\overline{MAC}$" and "Zero $\overline{MAC}$ and G". One applicable brand in a particular market of each category was chosen for illustration.

- **Low G but High $\overline{MAC}$ - the purchaser-favored market**

The indicators denoted the situation that majority of purchasers spent quite extensive effort to contract the product at their current prices. In this kind of market, buyers seemed to have power over suppliers, since increasing purchasing size by a unit could cause relatively large price reduction. Moreover, most contracts were made at a low price despite small purchasing sizes. This category was then the desired situation from buyer and societal perspectives.

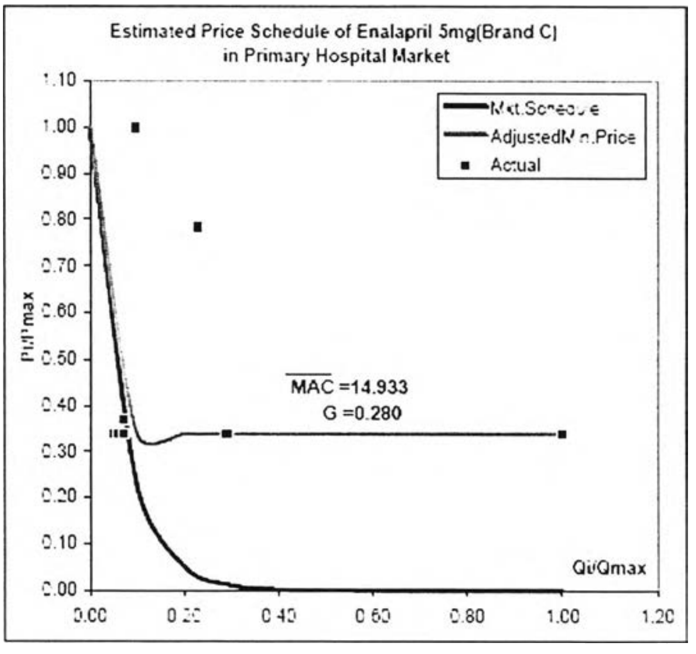


Figure 4.14 Actual Contracts and Price Schedule Pattern of Low G but High $\overline{MAC}$ Market

Brand C of enalapril 5 mg in the primary hospital market was an example of this category. The figure 4.14 showed estimated market price schedule of this product. The schedule indicated that the buyers in this market while employing $\overline{MAC}$ of 14.933 required only 15% of maximum purchasing size to obtain the lowest price. Low Gini (0.280) confirmed the actual contracts were not much deviated from the estimated schedule, since only 2 with relatively small purchasing size from 8 buyers bought this product at too high prices. The public was benefited in this situation because majority of purchasing unit were dealt at good prices by the reliably big effort of buyers.

- **Low G and Low $\overline{MAC}$ - Potential monopoly power market**

The low G ensured there was no significant magnitude of first degree price discrimination. The public was still benefited from the majority contracts, as nearly all of purchasing units were bought at low price. However, the low $\overline{MAC}$ signified that increasing of purchasing sizes could not make much price reduction. This evidence could imply either monopoly power of the supplier or the low offered price was close to marginal cost of product. More detailed analysis was needed for identification. It was Gini between markets reflecting magnitude of third degree price discrimination from decomposition analysis. If there was considerable magnitude of third degree detected, challenging the hospital for bigger $\overline{MAC}$ would be the recommendation. The following figure was the estimated price schedule of carvidilol 25 mg in the tertiary hospital market representing this category.

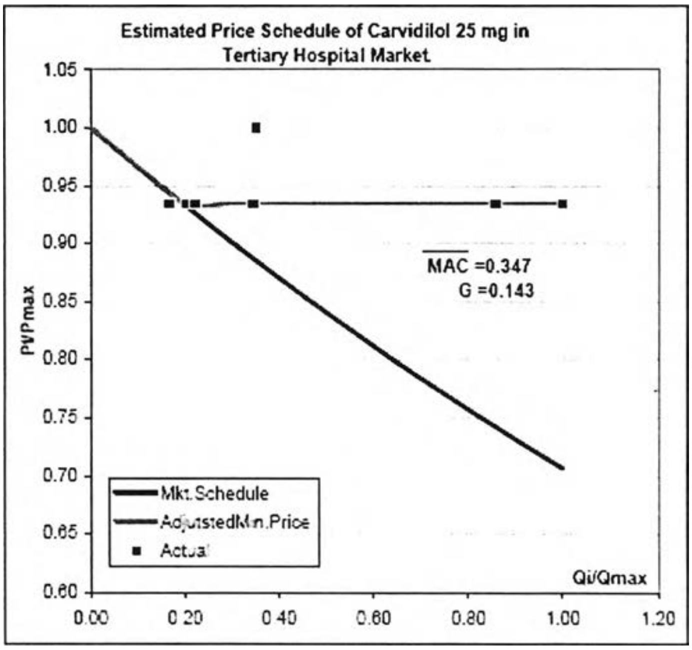


Figure 4.15 Actual Contracts and Price Schedule Pattern of Low G and Low $\overline{MAC}$ Market

Figure 4.15 illustrated that there were only 2 different prices offered in this market. Most of buyers purchased this product at the lowest price, while only one with relatively small purchasing size was contracted at the maximum price. The society to some extent gained benefits in this situation, since majority could obtain this product at a low price. The low Gini was consequently produced in this case. This was a strong feature of Gini reflecting social welfare where majority gained more benefits. However, the secondary hospital market with the smaller overall purchasing size could obtain this product at the lowest single price while the tertiary hospital market, on the average, obtained higher prices even holding a larger overall purchasing size. As a result, the secondary hospital market employed relatively bigger MAC than the tertiary hospital market. Challenging tertiary hospitals to achieve the secondary hospital market MAC would be the recommendation in this case.

- **High G but Low** $\overline{MAC}$

This category was opposite to the previous one. This situation was found when there were also few offered prices but the majority buyers particularly the large volume buyers bought the product at high prices. At the same time, few buyers with small purchasing sizes obtained low prices. The society was, in this case, worse off, since the majority were supplied this product at high prices. Big Gini was then resulted which signaled the critical extent of first degree price discrimination. Manidipine 20 mg in the tertiary hospital market was shown as a representative of this market category in figure 4.16.

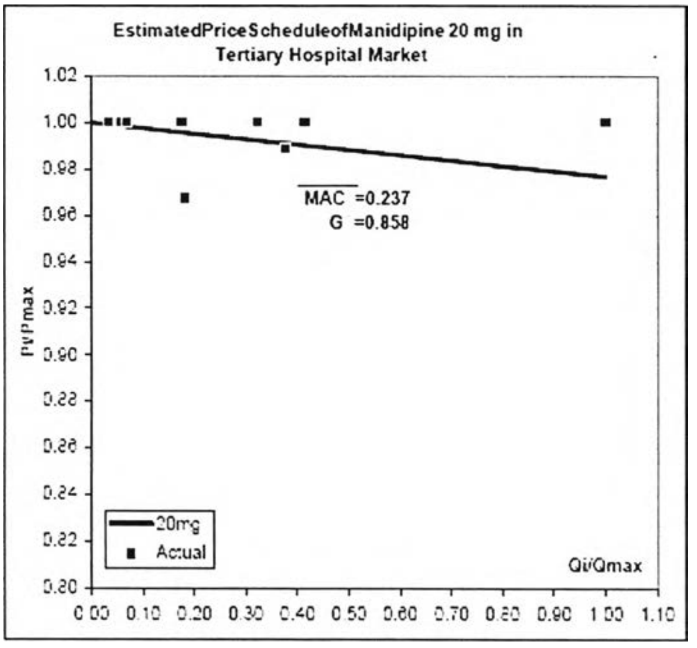


Figure 4.16 Actual Contracts and Price Schedule Pattern of High G but Low $\overline{MAC}$ Market

In this kind of market, Gini reduction would be prioritized. The feedback information allowing every buyer to know their MACs and optimal prices based on their purchasing sizes and market MAC ($\overline{MAC}$) would be a mean to decrease Gini of the market.

- **High G and High $\overline{MAC}$**

High $\overline{MAC}$ was not always a good and desired situation in case that it was detected together with high Gini. The high $\overline{MAC}$ in this case was stemmed from huge different MACs across buyers. However majority of buyers exercised relatively low MAC to the average $\overline{MAC}$. To aggravate the situation, the large volume buyer in the market purchased the product at higher prices than the smaller purchasing size buyers. High Gini was then assumed indicating societal worse off in this category of market. The popular brand of nifedipine 5 mg in the primary hospital market was selected for this instance as demonstrated in figure 4.17.

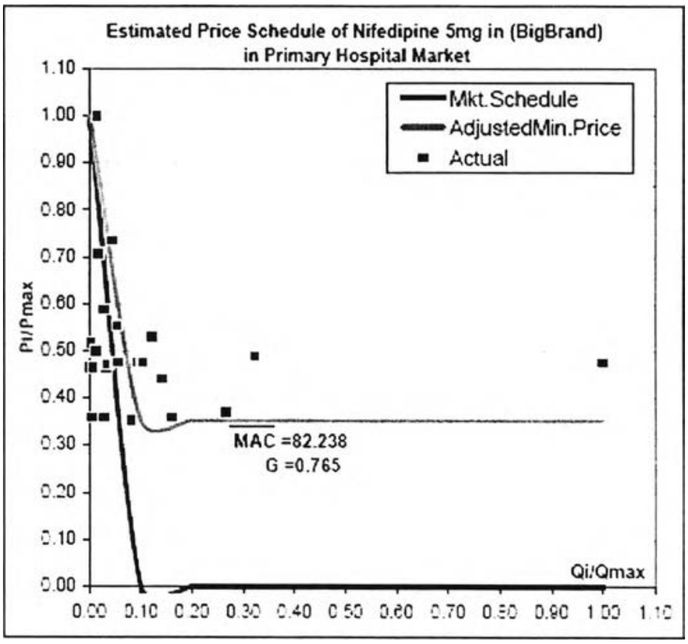


Figure 4.17 Actual Contracts and Price Schedule Pattern of High G and High $\overline{MAC}$ Market

Similar to the previous category, Gini reduction would be prioritized. The feedback information was also an instant mean to decrease Gini.

- **Zero $\overline{MAC}$ and G –strictly single price market**

In this category of market, the supplier adopted one price policy without taking purchasing size of buyers into consideration. The $\overline{MAC}$ was zero, since no effort could be made to achieve different prices. Buyers did not need to exercise their MACs to obtain this price. Gini was consequently zero. The single source simvastatin 80 mg in the tertiary hospital market was used for illustration as in figure 4.18.

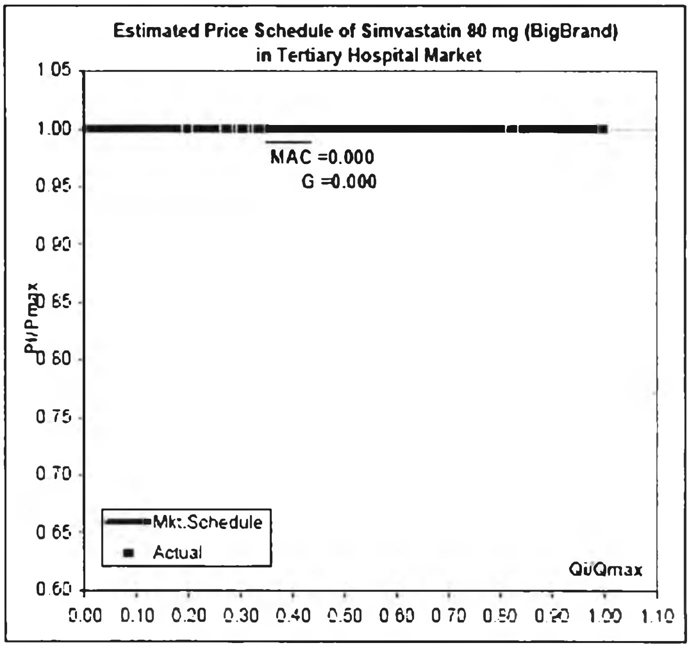


Figure 4.18 Actual Contracts and Price Schedule Pattern of Zero G and $\overline{MAC}$ Market

This category seemed to be a good condition if the single offered price was the lowest price. The question "How could it be certain this single price was the lowest?" was asked in this kind of market. The third degree price discrimination detection was used as a mean to justify this situation. By comparing with prices in other markets thru the analysis of third degree price discrimination would convince whether the price was the lowest price. Number of competitive brands could as well indicate whether the product was marketed thru single source or multiple sources. The single source was usually hypothesized to price the product at the high end, while the multiple sources were normally in a more difficult situation to set high single price. The buyers of high single price brands were then challenged to enhance their MACs to negotiate this product for a better price.

4.2.4 Influencing of market structure variables on PD

Eight independent variables were entered in the multiple regression analysis to examine whether the extent of price discrimination could be explained and how it would be explained. Most of independent variables were market structure variables from the supplier side, while the hospital type (level of care) was the only buyer-side factor. The examined market structure variables included number of competitors, market concentration, market share, popularity, market power, supplier type, and being in essential drug list, which were all operationalized as following.

- **Number of competitors** was operationalized as number of available brands which belonged to the same item (identical generic name, strength, dosage form, package size) in a particular market. It was measured by simple counting number of available brands which belonged to the same item in each market.

- **Market concentration** was operationalized as average market size per brand belonged to the same item dealt in a particular market. Herfindahl index, the proportion of total market size and number of competitors in a particular market of an identical item, was employed as market concentration indicator.

- **Market Share** was market size of a particular brand shared from a whole identical item market size. It was continuously measured by percentage of the proportion of a particular product purchased value above total purchased value of identical item in a particular market. Market size could be determined either in term of money as mentioned above or by number of the product buyers. Using number of product buyers instead to purchased value in the same calculation came up with another independent variable which was named as **Popularity**

- **Market Power** was power to reside in the market by charging higher price than other products which were belonged to the same item. When cost indifference was assumed, the more expensive products hold bigger market power than the cheaper substitutable products. It could be assessed by the proportion of a particular product price above the lowest price of substitutable product.

- **Pharmaceutical Supplier Type** is the type of the manufacturer categorized according to owner nationality. There are 3 attributes of firm type: Foreign R&D based firm, foreign generic, and Local generic.

- **Essential Drug List Status** indicated whether each particular item was listed in Thai National Essential Drug List or not. It could be categorically measured into 2 groups; listed item (ED) or out of the list item (Non-ED).

Two dependent variables were inspected. One was market MAC ($\overline{MAC}$) exercised by each hospital in purchasing each particular product. Another was Gini coefficient as the extent of price discrimination of each product trading. The unit of analysis would be a product trading in a market such as Brand A purchased by primary hospital market was one analysis unit, while Brand A purchased by secondary hospital market was another one. The models were summarized in table 4.21.

Table 4.21 MRA Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Model Summary(DV=MeanMAC)				
All	0.305	0.093	0.023	7.837
Demand Factor	0.236	0.056	0.040	7.767
Supply Factors	0.186	0.035	-0.023	8.017
Model Summary(DV=Gini Coefficient)				
All	0.316	0.100	0.030	0.212
Demand Factor	0.148	0.022	0.006	0.215
Supply Factors	0.202	0.041	-0.016	0.217

It was founded that entering all independent variables into the regression model could explain only 9.3% of $\overline{MAC}$ variation and 10% of G variation. The demand factor (level of care in this case) could explain $\overline{MAC}$ variation more than all supply factors together, while Gini variation was conversely explained by all supply factors more than the demand factor. The small proportion of explained variance by the set of hypothesized independent variables was not surprised. Furthermore, this finding to a certain extent confirmed that $\overline{MAC}$ and Gini across different contracts were a result of miscellaneous factors, so it was hardly explained by this hypothesized independent variable set. In summary, the existing first degree price discrimination in the market was stemmed from miscellaneous factors much more than known systematic market structure variable together with the ability embedded in level of care the hospital belonged to.

However, within a small proportion of explained variance, there was one variable significantly explaining both $\overline{MAC}$ and Gini. That one was being primary hospital (a dummy of the level of care with the tertiary hospital as a reference) as shown in the table 4.22.

Table 4.22 MRA Result by Independent Variables in Model(DV= $\overline{MAC}$)

	Unstandardized Coefficients		Standardized Coefficients		
Independent Variables	**B**	**Std. Error**	**Beta**	**T**	**Sig.**
(Constant)	-3.741	5.366		-0.697	0.487
Primary (Dummied)	**5.569**	**2.191**	**0.345**	**2.542**	**0.012**
Secondary (Dummied)	0.723	1.858	0.042	0.389	0.698
# Competitors	-0.141	0.239	-0.085	-0.589	0.557
Mkt. Concentration	0.000	0.000	0.017	0.159	0.874
Popularity	0.045	0.043	0.187	1.047	0.297
Mkt. Power	-0.968	1.262	-0.079	-0.767	0.445
ED	1.289	2.705	0.058	0.476	0.635
Import Generic (Dummied)	3.761	3.464	0.145	1.086	0.280
Local Generic (Dummied)	4.029	3.023	0.244	1.333	0.185

Dependent variable = $\overline{MAC}$

Being a primary hospital could significantly explain the variation of both $\overline{MAC}$ and Gini coefficient. The primary hospital market utilized larger MAC to purchase a product than the other two markets.

At the same time, the primary hospital market also had significantly higher Gini coefficient than the other two markets as in table 4.23. This could be interpreted that broader range of MACs in primary hospitals was significantly found. In other words, there was extensive price discrimination among products in the primary hospital market than the other two markets.

Table 4.23 MRA Result by Independent Variables in Model(DV=G)

Independent Variables	Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	T	Sig.
(Constant)	0.431	0.145		2.963	0.004
Primary (Dummied)	**0.161**	**0.059**	**0.366**	**2.705**	**0.008**
Secondary (Dummied)	0.046	0.050	0.097	0.906	0.367
# Competitors	-0.006	0.006	-0.136	-0.941	0.349
Mkt. Concentration	0.000	0.000	0.138	1:261	0.210
Popularity	0.000	0.001	0.010	0.058	0.954
Mkt. Power	-0.026	0.034	-0.076	-0.747	0.457
ED	0.022	0.073	0.037	0.305	0.761
Import Generic(Dummied)	0.032	0.094	0.045	0.339	0.735
Local Generic (Dummied)	-0.049	0.082	-0.108	-0.593	0.554

Dependent variable =G

An interesting result of the number of competitors was observed even its low explaining power in the model. The negative impact on the number of competitors in explaining $\overline{MAC}$ and Gini variation reflected that more competitors or sellers in the market reduced the MACs and Gini. With fewer competitors, buyers would have to exercise more extensive MACs. In the less competitive market, price collusion could also be easily occurred and higher Gini could be a result. If this factor was added into the model with only the significant demand factor included, the power of primary hospitals in explaining both $\overline{MAC}$ and Gini variation was increased (table 4.24). The number of competitors while was not statistically significant in the $\overline{MAC}$ model, it now significantly explained Gini. At the same time the ability of 2 dummied variables representing level of care to explain the both price dispersion variables had been increased. This new model could be explained that the primary hospital market needed to exercise more effort or higher $\overline{MAC}$ in purchasing fewer-competitors products and also produced a larger extent of price discrimination than multiple-competitors products purchasing.

Although the model could explain very small amount of $\overline{MAC}$ and Gini variance, the informative conclusion in term of problem prioritizing was able to be structured. The multiple regression analysis observably indicated that first degree price discrimination was momentous among the contracts of fewer-competitors products in the primary hospital market. This will be helpful for policy makers at least to identify where would be a beneficial beginning of more powerful investigation.

Table 4.24 Increasing of Explain Ability

DV	IV	Beta	Sig.
$\overline{MAC}$	(Constant)		0.306
	Primary (Dummied)	**0.255**	**0.015**
	Secondary (Dummied)	0.040	0.697
	(Constant)		0.194
	Primary (Dummied)	**0.325**	**0.011**
	Secondary (Dummied)	0.051	0.621
	#Competitors	**-0.106**	**0.339**
Gini	(Constant)		0.000
	Primary (Dummied)	**0.170**	0.106
	Secondary (Dummied)	0.063	0.550
	(Constant)		0.000
	Primary (Dummied)	**0.340**	**0.008**
	Secondary (Dummied)	0.090	0.387
	#Competitors	**-0.256**	**0.023**