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**Optimal Pricing of Online Group-buying: An Empirical Analysis of  
Food-Away-From-Home in China**

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# Optimal Pricing of Online Group-buying: An Empirical Analysis of Food-Away- From-Home in China

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## INTRODUCTION

### Background

- Online Group-buying is a new and quite popular buying model since Groupon is established. Not just in America, China, it received hot trends all over the world.
- Optimal pricing set by merchants, not only gain great profit and higher marketing share for merchants, but also bring benefits to customers and medium platform—Online group-buying websites.

Online group-buying marketing conditions of China, 2012

- Deal revenue is 21.4 billions yuan, increased by 93.05%
- Approximately 456 millions of customers involve in the purchases
- About 2.5 millions of items posted on the website, 4.7 times than last year
- The overall market shows oligarch

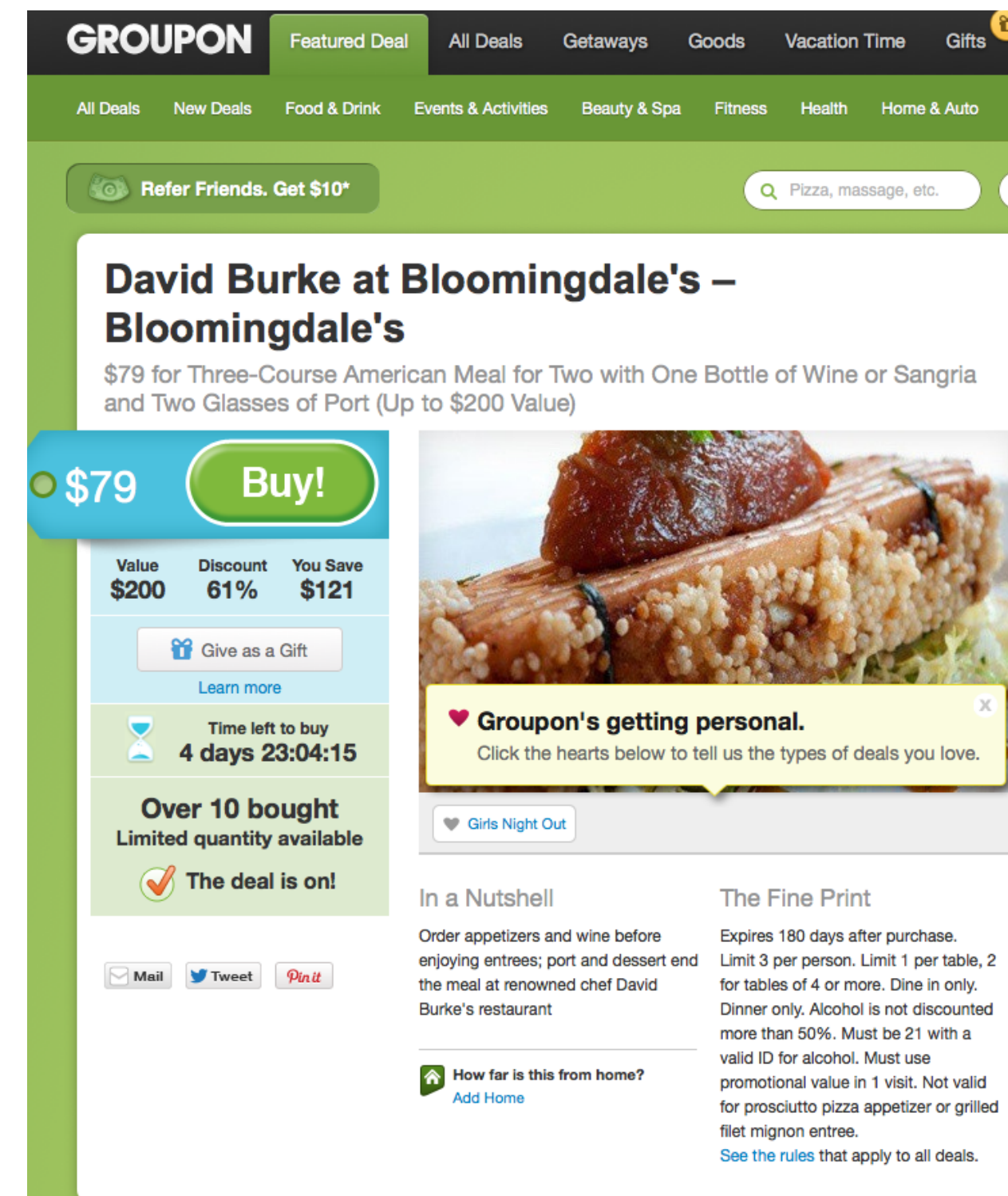
### Problems

- Fierce competition within merchants
- Low survival rate of online group buying websites

## Groupon

VS

## Chinese Online Group buying websites



## Research question

Every though it seems that China is experiencing an increasing development of online group buying website, behind this prosperous, there are still serious issues:

- For merchants, similar items between each other, difficult to compete
- For websites, low agency rate, difficult to survive
- For customers, how to pick up the best from huge volumes of items.

To solve this problem, from customer preference, we want to ① find out an optimal price not only brings optimal profit to merchants, but also very attractive to customers. And also from the demand model, we try to ② find out the factors that how to influence the demand.

## Methodology

According to the previous literature review, we here apply two methods. Firstly, we use UPE to calculate optimal price of each item; secondly, by linear regression model, we can estimate each parameter; and then, take the optimal price of each item to the linear regression model, and estimate the deal size next term.

### Undercut-proof Equilibrium (UPE)

In 2000, Oz Shy and Peter Morgan propose an equilibrium concept, called Undercut-Proof equilibrium, for price competition between firms producing differentiated brands.

In an Undercut-Proof equilibrium, each firm chooses its price so as to maximize profit while ensuring that its price is sufficiently low that any rival firm would not find it profitable to set a lower price in order to grab all of the first firm's customers.

- For two merchants only

$$U_A = \begin{cases} -p_A & \text{buying from A} \\ -p_B - S & \text{buying from B} \end{cases} \quad U_B = \begin{cases} -p_A - S & \text{buying from A} \\ -p_B & \text{buying from B} \end{cases}$$

$$n_A = \begin{cases} 0 & \text{if } p_A > p_B + S \\ N_A & \text{if } p_B - S \leq p_A \leq p_B + S \\ N_A + N_B & \text{if } p_A < p_B - S \end{cases} \quad n_B = \begin{cases} 0 & \text{if } p_B > p_A + S \\ N_B & \text{if } p_A - T \leq p_B \leq p_A + S \\ N_A + N_B & \text{if } p_B < p_A - S \end{cases}$$

$$s.t. \begin{cases} \max p_A, p_B \\ p_B n_B \geq (p_A - S)(N_A + N_B) \\ p_A n_A \geq (p_B - S)(N_A + N_B) \\ p_B \geq 0, n_B \geq 0, p_A \geq 0, n_A \geq 0 \end{cases}$$

From the equation, we will optimal  $p_A$  and  $p_B$

- For general model

$$U_i = \begin{cases} -p_i & \text{if buying brand } i \\ -p_j - T & \text{if buying brand } j, \text{ for all } j \neq i. \end{cases}$$

$$p_j^U N_j \geq (p_i - S)(N_i + N_j) \quad \text{for every restaurant } j, j \neq i;$$

### Double huddle Panel Probit Regression

According to the literature review, we find out the factors that influence deal size of online group buying items.

$$dsss = \begin{cases} 1 & \text{if } ds > 0 \\ 0 & \text{if } ds = 0 \end{cases}$$

$$DS = \beta_0 + \beta_1 CP + \beta_2 AE + \beta_3 AE^2 + \beta_4 DIS + \beta_5 DATE + \beta_6 FEATURED$$

DS: Deal size, amount of items have been sold

DSSS: Dummy variable

CP: Coupon price, price after discount

AE: Average expenditure, coupon price/numbers of customers

AE2: Square of average expenditure

DIS: Discount set by merchants

DATE: Duration posted online

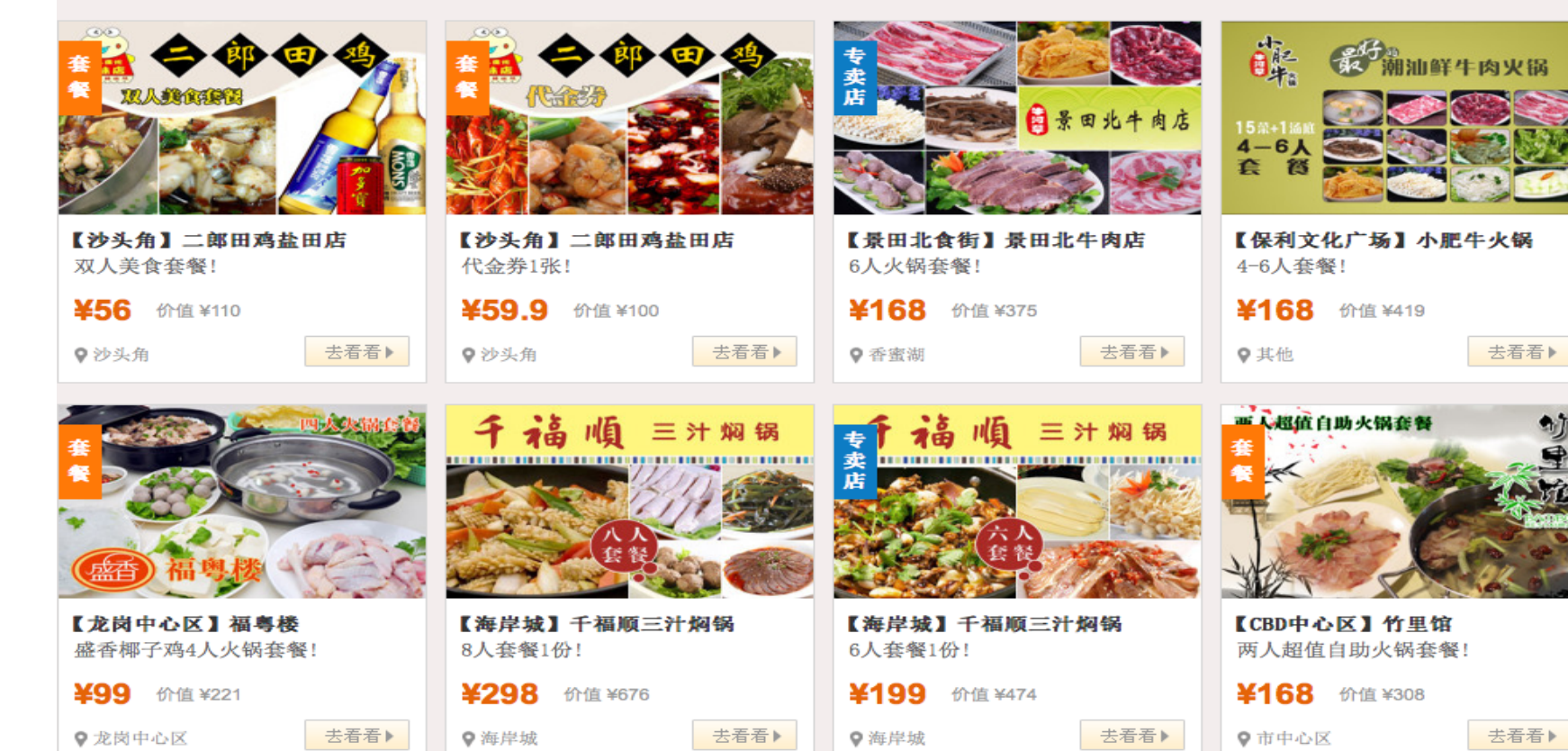
FEATURED: Featured or not, dummy variable

## Data Collection



Hotpot is very popular and traditional food in China. Because of comparatively little differences between each item, we prefer hotpot items as our data source.

We collect 149 hotpot online group buying items from 55tuan.com, four times a day, from Nov 24, 2012 to Dec 31, 2012. Totally we collect 8741 observations.



## Preliminary RESULTS

### Double huddle Panel Probit Regression

- Firstly, we use dummy variable dsss to do probit panel regression, to see when dsss=1 or 0, how the factors influence deal size.
- Secondly, when dsss=1, we apply panel model to do fixed-effect regression, random-effect regression and between-effect regression.
- Thirdly, by Hausman Test, we reject null hypothesis of no correlation, then apply between effect regression.

### Results

Between regression (regression on group means)	Number of obs	=	7969		
Group variable: item	Number of groups	=	93		
R-sq: within	=	0.3690	Obs per group: min	=	2
between	=	0.4988	avg	=	85.7
overall	=	0.2279	max	=	149
	F(5, 87)	=	17.32		
	Prob > F	=	0.0000		

logds	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
cp	-.0059725	.00245	-2.44	0.017	-.0108421 - .0011028
dis	-.5908473	1.270706	-0.46	0.643	-3.116514 1.934819
ae2	-.0000456	.0001669	-0.27	0.785	-.0003774 .0002862
featured	1.694907	.3353022	5.05	0.000	1.028457 2.361356
date	.0327108	.0040648	8.05	0.000	.0246317 .04079
_cons	1.307256	.6465619	2.02	0.046	.0221446 2.592368

From the results table above, coefficient of coupon price is negative and significant, with the higher price, less deal size; similar to coefficient of discount, with higher discount, less %off; however, it is not significant, which means customers don't pay much attention to the discount. Coefficients of featured and date are positive and significant, indeed they have positive effects on deal size.

## Discussion & Following Study

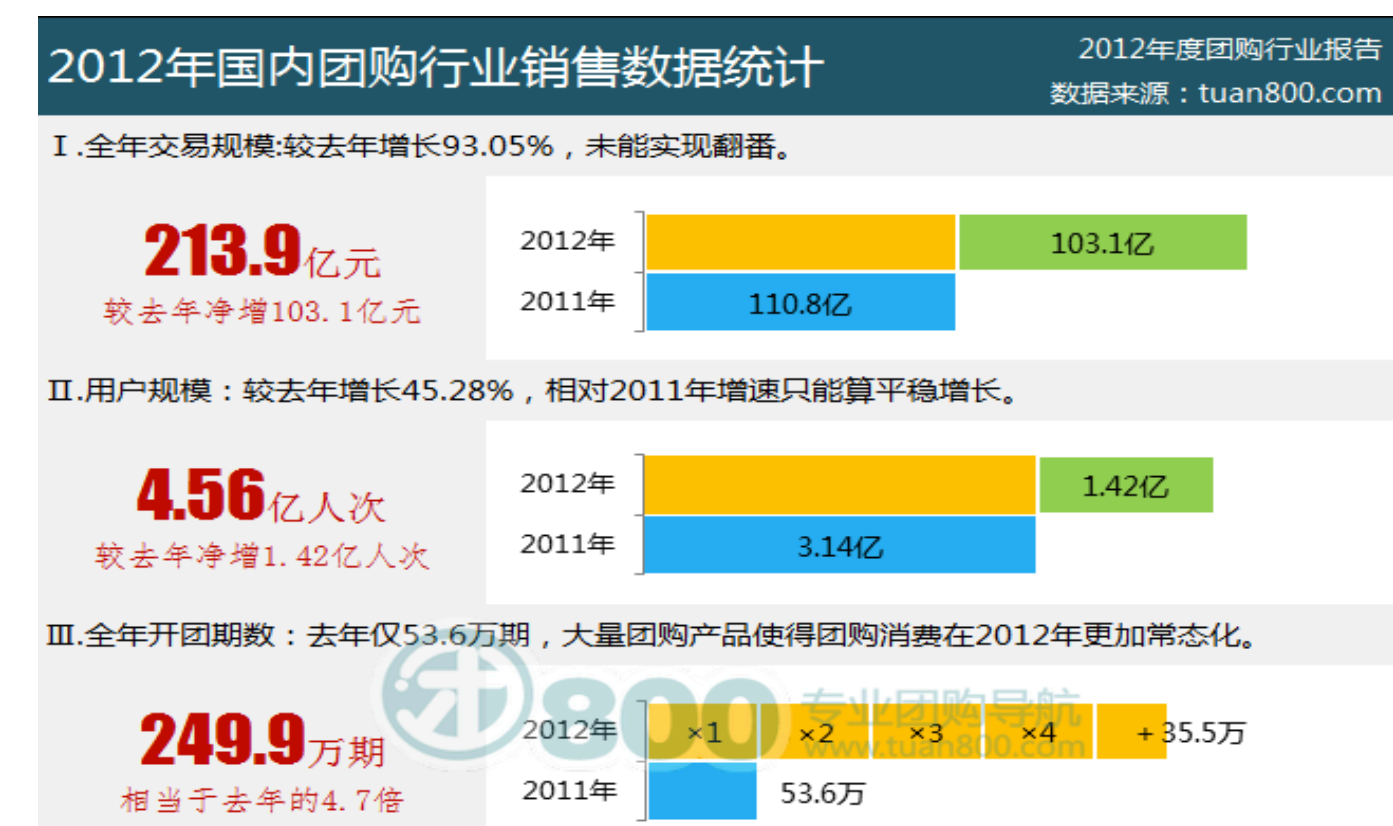
### Discussion & Following Study

Later, we will concentrate on the UPE model, find out the optimal price under different numbers of merchants. Also continue to deep research on the demand model.

### Contribution & Innovation:

Use fixed pricing mechanism to solve online group buying optimal pricing issue. Also we apply a demand model to analyze a new online buying method.

## Situations of China Online group buying 2012



### Similarities:

Including value, discount, you save, coupon price, time left to go, threshold number, information of item and restaurant.

### Differences:

- Groupon: Detail information provided by words; today's deal, usually one day.
- China's: Detail information provided by words and pictures, which is more attractive and convincing; multiple days.

