Fast Food Consumption and Child BMI in China: Application of Switching Regression Model

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ABSTRACT

With rapid economic growth, China has witnessed the epidemic of childhood overweight and obesity. This paper contributes to this line of empirical study by employing switching regression model to study two groups of children: those who patronize fast food and those who do not. Moreover, we estimate and compare the counterfactual weights of children in each of the two categories. Using the data from 2006 China Health and Nutrition Surveys (CHNS), we verify the positive impact of fast food consumption on children's BMI and also find that children's self-selection on fast food consumption affects two groups of children unevenly.

INTRODUCTION

The rates of child obesity are on the rise in both developed and developing countries. In the U.S., child obesity has more than tripled in the past 30 years. According to the data from Centers for Disease Control and Prevention, the percentage of children aged 6–11 years in the United States who were obese increased from 7% in 1980 to nearly 20% in 2008; similarly, the percentage of adolescents aged 12–19 years who were obese increased from 5% to 18% over the same period.

In 2008, more than one third of children and adolescents were overweight or obese. In China, 8% of 10- to 12-year-olds in China's cities are considered obese and an additional 15% are overweight, according to Chinese Ministry of Education. Figures from the China national surveys on the constitution and health of schoolchildren showed the prevalence of obesity among children aged 7 to 18 had increased four times in the 15 years between 1985 and 2000, while figures for the number of overweight children in the same age range and time period had increased 28 times over.

The epidemic of obesity among young people has attracted much attention among public health experts and researchers to investigate possible determinants. From the perspective of physiology, weight gains are simply the result of imbalance of calorie intake and energy expenditure. Fast food consumption has been the leading suspect to blame for the alarming rise of childhood obesity. In the U.S., the percentage of fast food consumption in children's total calorie-intake has gone from 2 percent to nearly 10 percent between 1970s and 1990s (Ebbeling et al., 2002). Due to efficient and widespread advertisement of fast food restaurants, the Chinese children get to know and embrace fast food at an astonishing pace. A study on an eight-province

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survey indicates, of the total calorie intake, the fat intake of urban Chinese boys aged 12-15 jumped from 17% in 1989 to almost 30% in 1993 (Chen C. 2002). Bowman et al. (2004) compared children who ate fast food with those who did not and suggested that fast food consumption among children in the U.S. appears to negatively affect the quality of children's diet in ways which may increase the risk of obesity.

However, their study did not directly estimate the impact of fast food consumption on quality of children's diet or children's weight in magnitude. Another appealing factor researchers think of often is Television viewing. In fact, TV viewing works on the both sides of energy intake and expenditure equation from several aspects. First, it reduces the physical activity level; second, it creates extra calorie intake during screen time which increases the risk of being overweight. Andersen et al., (1998) documents the children engage in the most television viewing tend to be the most overweight; third, children exposed to more advertisement through television viewing tend to be more in favor of advertised food. A report from WHO found strong evidence that food promotion affects children's food purchasing-related behaviors and therefore influences their food preference (Gerard Hastings et al. 2006). Chou et al. (2008) concluded that banning those food advertising practices could reduce the incidence of children overweight by 18%.

Furthermore, "internalities" as Cutler et al. (2002) explain as presence of poor self-control may contribute to explain the rising rate of obesity. This suggests that there are some people who are especially susceptible to overweight or obesity. They desire to eat less or more healthy food, but for some reason, it is more difficult for them to achieve the goal. Interestingly, it is similar to young children who are exposed and manipulated by fast food advertisement tend to consume more of the advertised food. Jennifer L. Harris et al. (2009) reported that the evidence indicates food advertising increases children's preferences for the food advertised and their requests to parents for those foods at both the brand and category level. Therefore, it would be ideal to track the change on children's weights when they make opposite decision on fast food consumption. However, it is not practical to examine the linkage between the choice of fast food consumption and children's average body weight unless there are two identical groups of children who make opposite decision on fast food consumption. Some other determinants were also considered in the recent studies, such as social economic status, biophysical characteristics, (Murasko 2009, Chang and Nayga 2009, Andreyeva et al 2011).

The linkage between fast food consumption and children's BMI has been mainly focused on how factors such as advertisement, television viewing increase the amount of fast food consumption, and therefore, increase the risk of being overweight and obese. Little has been done to look at the impact of the decision to adopt fast food by children on their weight. Although young children may be questioned on their ability to make rational decisions, they are old enough to have preference and make requests for food, which is vividly demonstrated in China. Due to China's one-child policy, meaning a married couple is allowed to have only one child in the family, the 2-4-8 structure of extended family (two parents, four grandparents and eight great grandparents) usually lead to overfeeding the "little emperor" and being manipulated by his/her food preference. Therefore, it is appropriate to examine the impact of children's decisions on whether to adopt fast food on their weights. This paper aims to contribute to the literature on fast food consumption on children's weight gains by providing a micro perspective on the topic of fast food adoption and children's BMI in China.

Our research employs switching regression model to investigate two groups of children in China: those who patronize fast food and their counterparts who do not. Moreover, we estimate and compare the counterfactual weights of children in each of the two categories. Thus, the counterfactual weights of children who patronize fast food is compared with their counterparts who do not eat past food; and the counterfactual weights of the children who do not eat the fast food is compared with those who patronize it. Our empirical results support the hypothesis that fast food consumption has positive impact on BMI of children in China. Children who select to eat fast food, are from wealthier households, or live in urban areas, or have parents who have relatively higher formal education or older fathers, or have mothers who have relatively lower BMIs. Among those who eat the fast food, boys and children whose mothers are not engaged in primary production activities such as fishing, farming and hunting tend to have higher risk of being overweight and obese.

The rest of this paper is organized as follows. The econometric model is introduced in Part Two. Part Three describes the data. Empirical models and results are presented in Part Four. And Part Five concludes.

THE ECONOMETRIC MODEL

In order to determine the counterfactual BMI of children who eat fast food (i.e., fast food eaters (FFE)) and non fast food eaters (NFFE), an endogenous switching regression model of fast food eating decision is employed. The model uses a probit model in a first stage to determine the relationship between the decision to eat the fast food and possible determinants of BMI. The second stage regression estimates the determinants of BMI for FFE and NFFE conditional on specific criterion function. To clarify the method, consider a situation where a child could consider eating the fast food or not. Let $A_i^* > 0$ be a latent variable capturing the expected BMI from eating the fast food. We specify the probit model of the decision to eat the fast food as

$$A_i^* = Z_i\alpha + \eta_i \text{ with } A_i = \begin{cases} 1 & \text{if } A_i^* > 0 \\ 0 & \text{otherwise,} \end{cases} \qquad (1)$$

Where Z_i is a vector of factors influencing decision to eat fast food; α is a vector of unknown parameters; and η is an error term with mean zero and variance of σ_η^2. Probit maximum likelihood estimation is employed to estimate the parameters of equation 1. The decision to eat fast food or not is influenced by BMI. Let the child's BMI function be $y = f(X)$, where y is BMI and X is a vector of possible factors that determines a child BMI. To estimate a separate regression function for each of the two situations, we specify the following BMI functions:

$$\text{Regime 1 } (FFE)\text{: } y_{1i} = X_{1i}\beta_1 + \varepsilon_{1i} \quad if \ A_i = 1 \qquad (2a)$$

$$\text{Regime 2 } (NFFE)\text{: } y_{2i} = X_{2i}\beta_2 + \varepsilon_{2i} \quad if \ A_i = 0 \qquad (2b)$$

Where y_{1i} and y_{2i} are BMI of FFE and NFFE respectively, and β is the vector of parameters to be estimated. The error terms in equations (1), (2a) and (2b) are assumed to have a triumvirate normal distribution with zero mean and covariant matrix $\sum$, (i.e., $(\eta,\varepsilon_1,\varepsilon_2) \sim N(0,\sum)$), with $\Sigma = \begin{bmatrix} \sigma_\eta^2 & \sigma_{\eta 1} & \sigma_{\eta 2} \\ \sigma_{1\eta} & \sigma_1^2 & . \\ \sigma_{2\eta} & . & \sigma_2^2 \end{bmatrix}$.

Where σ_η^2 is the variance of the error term in the selection equation (1) which can be assumed to be equal to 1 since the coefficients are estimable only up to a scale factor (Lee, 1978; Maddala, 1983), σ_1^2 and σ_2^2 are the variances of the error terms in the productivity functions (2a) and (2b), $\sigma_{1\eta}$ represent the covariance of η_i and ε_{1i}, and $\sigma_{2\eta}$ is the covariance of η_i and ε_{2i}. Note that y_{1i} and y_{2i} are not observed simultaneously implying the covariance between ε_{1i} and ε_{2i} is not defined and therefore indicated as dots in the covariance matrix. Since the error term of the selection equation (1) is correlated with the error terms of the BMI functions (2a) and (2b), the expected values of ε_{1i} and ε_{2i} conditional on the sample selection are nonzero and are defined as:

$$E\left[\varepsilon_{1i} \middle| A_i = 1\right] = \sigma_{1\eta} \frac{\phi(Z_i\alpha)}{\Phi(Z_i\alpha)} = \sigma_{1\eta}\lambda_{1i}, \qquad (3a)$$

$$E\left[\varepsilon_{2i} \middle| A_i = 0\right] = \sigma_{2\eta} \frac{\phi(Z_i\alpha)}{1-\Phi(Z_i\alpha)} = \sigma_{2\eta}\lambda_{2i}, \qquad (3b)$$

Where ϕ(.) and Φ(.) are the standard normal probability density function and normal cumulative density function respectively, $\lambda_{1i} = \frac{\phi(Z_i\alpha)}{\Phi(Z_i\alpha)}$, and $\lambda_{2i} = \frac{\phi(Z_i\alpha)}{1-\Phi(Z_i\alpha)}$. It is noteworthy that if the estimated covariance $\hat{\sigma}_{1\eta}$ and $\hat{\sigma}_{2\eta}$ are statistically significant then the decision to eat and the BMI are correlated. This implies there is evidence of endogenous switching and the null hypothesis of the absence of sample selectivity bias is rejected.

A more efficient method of estimating endogenous switching regression models is full information maximum likelihood (FIML) method (Lokshin and Sajaia, 2004; Greene, 2000). The logarithmic likelihood function given the previous assumptions regarding the distribution of the error terms is

$$\text{In}L_i = \sum_{i=1}^{N} \left\{ A_i \left[\text{In}\phi\left(\frac{\varepsilon_{1i}}{\sigma_1}\right) - \text{In}\sigma_1 + \text{In}\Phi\left(\theta_{1i}\right) \right] + (1-A_i) \left[\text{In}\phi\left(\frac{\varepsilon_{2i}}{\sigma_2}\right) - \text{In}\sigma_2 + \text{In}(1-\Phi(\theta_{2i})) \right] \right\} \qquad (4)$$

where $\theta_{ji} = \frac{Z_i\alpha + \rho_j\varepsilon_{ji}/\sigma_j}{\sqrt{1-\rho_j^2}} \; \frac{1}{2}$, with $j = 1,2$, and ρ_j denoting the correlation coefficient between the error term η_i of the selection equation (1) and the error term ε_{ji} of equations (2a) and (2b), respectively.

CONDITIONAL EXPECTATIONS, TREATMENT, AND HETEROGENITY EFFECTS

The endogenous switching regression model can be used to compare observed and counterfactual BMIs. Thus we could compare the expected BMI of the child who eats fast food (i.e., (a)) with the BMI of a child who does not eat (i.e., (b)); and to investigate the expected BMI in the counterfactual hypothetical cases (i.e., (c)) that the child who eats fast food does not eat it, and (i.e., (d)) that the child who does not eat fast food eats it. The conditional expectations of the BMI in the four cases are presented in Table 1 and defined as follows:

$$E(y_{1i}|A_i=1)=X_{1i}\beta_1+\sigma_{1\eta}\lambda_{1i} \quad (5a)$$
$$E(y_{2i}|A_i=0)=X_{2i}\beta_2+\sigma_{2\eta}\lambda_{2i} \quad (5b)$$
$$E(y_{2i}|A_i=1)=X_{1i}\beta_2+\sigma_{2\eta}\lambda_{1i} \quad (5c)$$
$$E(y_{1i}|A_i=0)=X_{2i}\beta_1+\sigma_{1\eta}\lambda_{2i} \quad (5d)$$

Cases (a) and (b) along the diagonal of Table 1 represent the actual expectations observed in the sample. Cases (c) and (d) represent the counterfactual expected outcomes.

Table 1: Conditional Expectations, Treatment, and Heterogeneity

	Decision Stage		
Subsamples	**To Eat**	**Not to Eat**	**Treatment Effects**
Fast Food Eaters	(a) $E(y_{1i}|A_i=1)$	(c) (c) $E(y_{2i}|A_i=1)$	TT
Non Fast Food Eaters	(d) $E(y_{1i}|A_i=0)$	(b) $E(y_{2i}|A_i=0)$	TU
Heterogeneity effects	BH_1	BH_2	TH

Note (a) and (b) represent observed expected BMI, and; (c) and (d) represent counterfactual BMI.

A_i = 1 if the child eats the fast food; and A_i = 0 if fisher does not eat the fast food

y_{1i} = BMI of the child if the child eats fast food

y_{2i} = BMI of the child does not eat fast food.

TT: the effect of the treatment (i.e. eating) on the treated group (i.e. children who eat the fast food);

TU: the effect of the treatment (i.e. , eating fast food) on the untreated group (i.e., children who do not eat fast food);

BH_1: the effect of base heterogeneity for children who eat the fast food (*i=1*), and do not eat the fast food (*i=2*)

TH= (TT-TU), i.e., transitional heterogeneity.

In addition, following Heckman *et al*, (2001) and Di Falco et al (2011) we calculate the following effects:

$$TT=E(y_{1i}|A_i=1)-E(y_{2i}|A_i=1)=X_{1i}(\beta_1-\beta_2)+(\sigma_{1\eta}-\sigma_{2\eta})\lambda_{1i} \quad (6a)$$
$$TU=E(y_{1i}|A_i=0)-E(y_{2i}|A_i=0)=X_{2i}(\beta_1-\beta_2)+(\sigma_{1\eta}-\sigma_{2\eta})\lambda_{2i.} \quad (6b)$$
$$BH_1=E(y_{1i}|A_i=1)-E(y_{1i}|A_i=0)=(X_{1i}-X_{2i})\beta_{1i}+\sigma_{1\eta}(\lambda_{1i}-\lambda_{2i}) \quad (6c)$$
$$BH_2=E(y_{2i}|A_i=1)-E(y_{2i}|A_i=0)=(X_{1i}-X_{2i})\beta_{2i}+\sigma_{2\eta}(\lambda_{1i}-\lambda_{2i}) \quad (6d)$$

(1) The treatment “eating fast food ” on violation (TT) is the difference between (a) and (c), which is given by equation (6a); (2) The effect of the treatment on non-eaters of fast food (TU), i.e., children who do not eat the fast food, is the difference between (d) and (b) which is given by equation (6b); (3) The effect of heterogeneity of the eaters of the fast food is the difference between (a) and (d); (4) The effect of base heterogeneity of children who do not eat the fast food is the difference between (a) and (d); (5) The transitional heterogeneity (TH) is obtained by comparing as the difference between (TT) and (TU). Thus we seek to determine whether the effect of eating fast food is smaller or larger for children who actually eat the fast food and those who do not eat the fast food relative to their counter factual case.

DATA DESCRIPTION

The data are drawn from China Health and Nutrition Survey (CHNS) in the year 2006. CHNS, a nationally representative survey conducted under Carolina Population Center and the National Institute of Nutrition and Food Safety at the Chinese Center for Disease Control and Prevention, was designed to collect data on issues related with health, nutrition, family planning at the community, household, individual level for both adults and children. The data were collected through face-to-face interview with questionnaires and physical examination. The sample in this study includes children aged 2-12 who have information on the variables of interests listed as below. Measurement for height and weight were taken in person by doctors or trained examinee.

From the data set, the variables of interest include BMI of a child and his/her mother, whether the child eats fast food or not, the gender of the child, years of education of the child (which is a proxy for the child’s age), whether the child is currently in school or not, whether the child lives in an urban or rural area, whether the child likes watching TV or not, household income, mother’s years of formal education, father has high blood pressure, father’s age, mother’s age, whether father lives in the same house or not, and whether mother’s occupation is in primary production or not. The descriptive statistics of the variables is presented in Table 2 (available upon request). The mean BMI of both groups of children (i.e., those eat the fast food and those who do not eat it) is 18.09. Comparing the two groups, the mean of those who eat it is slightly higher than that of their counterparts who do not. Secondly, the proportion of males in the total sample is 0.53. However, there are more females among fast food eaters and fewer females among their counterparts who do not eat fast food. Thirdly, only less than one percent of the children are not currently in school and the mean years of education is about 6. Furthermore, 30 percent of all the children like watching TV. However, among those who eat fast food, 43 percent like watching TV while only 41 percent likes watching it among their counterparts who do eat fast food. Finally, a high proportion of the households (around 90 percent) have both parents in the household, with the proportion being higher for children who patronize fast food than for the others who do not eat it. Although the number of observation for each variable exceeds a thousand, due to missing observations across variables, the number of complete observations used for the actual estimation is slightly below seven-hundred.

EMPIRICAL MODEL AND RESULTS

THE EMPIRICAL MODEL

The empirical equations to be estimated are probit regression of decision to eat fast food or not; and a regression equation of determinants of BMI of the children. The decision (selection) equation, which is equivalent to equation (1), is specified as:

$$EFF = f\left(\mathbf{A}\right), \quad (7)$$

The dependent variable is binary taking the value 1 if the child eats fast food and 0 otherwise. The vector of explanatory variables $\left(i.e., \mathbf{A}\right)$ include the gender of the child, years of education of the child, whether the child is currently in school or not, whether the child lives in an urban or rural area, whether child likes watching TV or not, mother's BMI, household income, mother's years of formal education, whether father has high blood pressure or not, father's age, mother's age, and whether the father lives in the same household or not.

The separate BMI function for eaters of fast food and non-eaters similar to equation (2) is as follows:

$$\ln(BMI) = g\left(\mathbf{A}_1, \mathbf{Z}\right) \quad (8)$$

Where ln is a notation for natural logarithm, $\mathbf{A}_1$ includes all the variables in the vector $\mathbf{A}$, except father's years of formal education; and the vector $\mathbf{Z}$ includes additional variables like father lives in the same household and whether mother is engaged or not in primary production activities such as fishing, faming and hunting.

RESULTS

Estimated results for the endogenous switching regressions are columns 3 and 4 (i.e., denoted (2) and (3)) in the Table 3, respectively. The estimations were implemented in STATA using the *movestay* command (Lokshin and Sajaia, 2004). The result of the likelihood ratio test reported in the table rejects the hypothesis at 1 percent significant level that the three equations are jointly independent. In addition, the correlation term ρ_i in one equation is negative and statistically significant at 1% level indicating we fail to reject the hypothesis of sample selection bias. The parameter has a negative sign in the equation for fast food eaters implying children who chose to eat fast food have significantly higher BMI than a randomly selected child from the sample; and on the other hand, the parameter was not significant in the non-eaters' equation indicating those who select not to eat fast food do not have higher or lower BMI than a randomly selected child from the sample.

Table 3: Full Information Maximum Likelihood Estimate of the Switching Regression

	(1)	(2)	(3)
		Endogenous Switching Regression	
Model	**Logit**	**Fast Food Eaters**	**Non-Fast Food Eaters**
Dependent Variable	**Eat Fast Food (1/0)**	**Log(BMI)**	**Log(BMI)**
Male Children	-0.018	0.078	0.008
	(0.117)	(0.034)**	(0.019)
Years of Education of Child	-0.001	0.0178	0.202
	(0.026)	(0.007) ***	(0.004)***
Currently in school	-0.017	-0.0226	-0.046
	(0.225)	(0.056)	(0.026)*
Urban dweller	0.991	0.008	-0.077
	(0.134)***	(0.051)	(0.030)***
Likes watching TV	0.0005	-0.005	0.0183
	(0.163)	(0.040)	(0.025)
Mother's BMI	-0.0135	0.005	0.0046
	(0.007)*	(0.004)	(0.0026)*
Household Income (1,000.00)	0.197	0.004	-0.038
	(0.067)***	(0.0123)	(0.020)*
Mother's years of formal education	0.055	0.0004	0.0048
	(0.021)***	(0.006)	(0.0034)
Father's years of formal education	0.077		
	(0.230)***		
Father has High Blood Pressure	-0.300	0.007	-0.0046
	(0.416)	(0.0719)	(0.0710)
Father's Age	0.034	-0.007	0.006
	(0.019)*	(0.005)	(0.0036)*
Mother's Age	-0.029	0.001	-0.0062
	(0.023)	(0.006)	(0.0030)**
Father Lives in the House			-0.069
			(0.0266)***
Mothers in Primary Production		-0.107	-0.010
		(0.049)**	(0.018)
Constant	-2.270	2.936	2.697
	(0.687)***	(0.211)***	(0.113)***
σ_i		0.214***	0.208***
		(0.015)	(0.020)
ρ_i		- 0.782***	-0.041
		(0.082)	(0.257)
Likelihood Ratio (LR) test of independent Equations: chi2(2) = 24.31 Prob > chi2 = 0.0000			

***, **, * signify significant at 1%, 5% and 10% respectively.

In the selection (i.e., Logit /Probi) regression, the probability of selecting into eating fast food depends on whether the child lives in an urban or rural area, the mother's BMI, household income, father or mother's years of formal education, and father's age. Except father's age and mother's BMI which are significant at 10 percent level, all these variables are highly significant at 1 percent level. Computed average partial effects indicates, on the average, the probability that a child eats fast food increases by 0.3 if the child lives in an urban area. Secondly, a child whose mother has a relatively high BMI is less likely (albeit weakly) to patronize fast food. Indeed, one percentage increase in a child's mother's BMI lowers the probability of eating fast food by 0.003. Thirdly, children from homes that are relatively well-off are more likely to eat fast food. A percentage increase in household income increases the probability of eating fast food by 0.05. Fourthly, the years of formal education of both parents increases the probability of the child eating fast food. The corresponding elasticity is approximately 0.02 for each of the parents. Finally, the older the father is the more likely it is for the child to eat fast food. Specifically, on the average, the probability of a child eating fast food increases by 0.008 if the father's age increases by 1 percent.

Next, regarding the determinants of BMI among the children who eat fast food, we found that boys weigh more than girls; years of the child's education positively correlates with BMI and mothers who are into primary production have children with lower BMIs. Specifically, on the average, boys have 0.04 percent higher BMI that their female counterparts. Secondly, a percentage increase in a child's education increases the BMI, on the average, by 0.11 percent. Finally, children whose mothers are into primary production activities such as farming, hunting and fishing, have 0.01 percent lower BMI. This finding is interesting and underpins the fact that mothers are likely to engage their children in primary production activities and this is likely to reduce their BMI. Consequently, for children who eat fast food; engaging them in physical activities could reduce their BMI.

Among the children who do not eat fast food, years of education and fathers age positively correlates with their BMI; while BMI decreases if a child is currently in school, dwells in an urban area, come from a relatively well-off household, the mother is relatively older, and father lives in the same household. The computed elasticities show BMI will increase by 1.11 and 0.24 percent, respectively, if the child's years of education or father's age increases by one percent. Secondly, a child who is in school has a 0.04 percent lower BMI than his/her counterparts who are not currently in school. Thirdly, children in urban areas or have their father living in the same house have 0.017 and 0.062 percent lower BMI respectively than their counterparts. Furthermore, while increasing household income by one percent decreases the child's BMI by 0.005 percent, the BMI will decrease by 0.23 percent if the mother's age is 1 percent higher.

Finally, Table 4 clearly reveals eating fast food increases BMI among eaters of fast food; and if those who do not currently eat the fast food were to eat it, they would have had increased BMI as well. Specifically, the average BMI of a typical child who eats fast food is 19.24 but would have been lower (18.61) if the child did not select to eat the fast food. On the other hand, for a typical child who does not eat fast food, eating fast food would have increased his/her BMI by 3.88 percent.

Table 4: Conditional Expectations, Treatment, and Heterogeneity

	Decision Stage		
Subsamples	**Eating**	**Not Eating**	**Treatment Effects**
Fast Food Eaters	(a) 19.2448	(c) 18.6108	**TT**=0.634
Non Fast Food Eaters	(d) 17.7338	(b) 13.8545	**TU**= 3.8793
Heterogeneity effects	**BH**$_1$ = 1.511	**BH**$_2$ = 4.7563	**TH** =-3.2453

CONCLUSION

This study which sought to investigate the impact of fast food consumption on BMI of children in China has unearthed some interesting results with far reaching policy implications. First the results support the hypothesis that fast food consumption has positive impact on BMI of children in China. Children who select to eat fast food, are from wealthier households, or live in urban areas, or have parents who are have relatively higher formal education or older fathers, or have mothers who have relatively lower BMIs. In order to discourage these children from patronizing such foods, public policy must target urban households with educated parents who are relatively better off. Among those who eat the fast food, policy must be directed to boys, and mothers who are not engaged in primary production activities such as fishing, farming and hunting which engage children in physical activities that could reduce their weights. Finally we found that children who self- select to eating fast food have higher BMI than a child selected at random, and those who refrain from patronizing such foods are of BMI not different from that of a child selected at random.

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