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Does the alternative food supply network affect the human health?

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Abstract

In the last years the promotion of alternative food supply networks has grown in many developed countries as tool of Rural Development. There are evidences about the potential beneficial role of these networks in promoting healthy eating habits becoming also an important measure of health policy.

Our study explore the effect of the local food supply networks on adult Italian BMI taking into account for each individual the relative socio-economic status, the eating habits and other social behaviors.

We use a cross-section of individual-level data, from the Multipurpose Survey of Households, matched with regional-level data on food outlets density and we adopt an IV estimation method to account the food stores potential endogenity.

Results show that having access to alternative food supply network lead to a reduction on adult Italian BMI and contribute to improve human health. and consequently to reduce public health expenditure.

1. INTRODUCTION

In these last years, agricultural policies not only impacted farmers' income, quality of the environment and food security but also played a central role in affecting eating habits pernicious for health (Hawkes, 2007; Wallinga, 2010; Hawkes C. et al., 2012). It has been shown that the European Common Agricultural Policy (CAP) has contributed to the reduction in the consumption of fruit and vegetables (European Heart Network, 2005) as well as to the increase in the intake of saturated fat (Hawkes C. et al., 2012) leading to an increment of inequality in health in European region (Lloyd-Williams et al., 2008; Schafer Elinder et al., 2003; WHO, 2009). The same was true also in the United States where agricultural subsidies have led to greater supply and use of corn and oil seed derivatives in energy-dense processed foods and beverage largely blamed to promote the global obesity (Golan and Unnevehr, 2008; Fields, 2004; Morrill and Chinn 2004).

Concurring in the diffusion of high-calories diets rich in fats, free sugars and salt and low in fruits, vegetables, pulses and whole grains, agricultural policies have then contributed to

shape the health agendas of developed countries. In particular, they have fostered obesity and related non-communicable diseases that appear to be a main health issue in Europe and U.S. (WHO, 2003; WHO, 2007)[1]. In fact, the estimates annual direct costs of medical expenses associated with overweight and obesity in the U.S. are $147 while in the EU-15 are approximately €100 billion (Fry and Finley, 2005; Hammond and Levine, 2010)[2].

In such a frame, it does not sound surprising the growing interest among researchers and practitioners to design new agricultural policies that can also take into account the improvement of eating habits and the impact on human health. Among those, a feasible area of intervention seems to be the promotion of local food supply networks. Preliminary evidence about the potential beneficial role of such networks in addressing unhealthy eating, obesity and associated disease come from U.S. and they could appear a promising tool of Rural Development Policy in promoting healthy eating habits and reducing obesity rate also in Europe (Alston, J.M. et al., 2006; Hawkes, 2007; Pascucci et al., 2011; Berning, 2012; Hawkes, C. et al., 2012).

Following this studies, our intent is to evaluate the impact of important forms of alternative supply network, namely farmers'market and farmers who practice direct sale, on an individual health outcome correlated to a risk of several chronic diseases such as body mass index (BMI).

In our analysis we explore the effect of these local food supply networks on adult Italian BMI taking into account for each individual the relative socio-economic status, the eating habits and other social behaviors.This study boosts the existing literature since, as long as we know, it is the first referred to an European country. Moreover, it has some methodological features since it accounts for local food potential endogeneity and introduces the BMI as a continuous variable without reducing the information contained in it. On the other hand, no previous research has accounted for individual eating habits, which could result in overestimation of the impact of food access on BMI.

In the next section we give some highlights about the relation between alternative food supply network and health and then we will explore the model and methodology in more detail. Empirical findings and conclusive remarks will end the paper.

2. THE ALTERNATIVE FOOD SUPPLY NETWORK: HEALTH NEXUS AND RELEVANCE IN ITALY.

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1. As a matter of fact obesity has reached epidemic proportions, with more than 1 billion adults overweight at least 300 million clinically obese, and it is a major contributor to the global burden of chronic disease and disability while obesity related NCDs such as, diabetes, high blood pressure, high cholesterol, low fruit/vegetable intake appear responsible of 19% of global deaths (Abelson and Kennedy, 2004; WHO, 2009). In developed Countries obesity and overweight rate is still increasing generating an higher demand of health-care service such as medical consultation, hospital treatment and medicines but also the globally increment in average body weight caused a loss of productivity of the whole economic system (Fry and Finley, 2005).
2. Although these data give an idea about the magnitude of this phenomena they not reflect the real cost since they not include the obesity indirect cost such as lost productivity, disability support, early pension payments and increased demand on community resources

Alternative food supply networks refers to all forms of short direct sale from farmers to consumer that born in contrast to the mainstream food supply systems based on large-scale production and standardization. These forms of short supply chain include: direct sales at farms, farmers' markets, group of solitary purchase and all others selling schemes that could be defined as zero level channel (Kotler and Turner, 1993).

Alternative food supply networks is often synonymous of "local food", "food community networks", "local food system" and "re-localization", often used to refers to food produced near the place (Peters et al., 2008). However geographic proximity is only one attribute of local food definition since it is also associated to other characteristics that may be used by consumers to define local food system and derived from the production methods or are part of what defines local food (Thompson E. et al., 2008).

For some consumers local production and distribution is environmentally friendly since it is often based on low chemicals input and reduces the greenhouse gas emissions due to the geographical proximity from production place and where food stuff are sell and consumed.

Also, buying food stuff from alternative food supply networks is often chosen by consumer since it is produced according to methods or tradition of production that are imputable to local influence, this attribute is commonly definite with term "provenance" (Thompson et al., 2008). Lastly, local food is also synonymous of willingness to help artisan firms, connected to the place through social and economic relationships that promote social relationship, mutual exchange and use "natural" model and extensive production method respecting biodiversity (Hughes et al., 2007; Hinrichs, 2003).

Alternative food supply networks, or local food, are so far amply explored from agricultural to sociological aspect. Evidence shows that shopping in farmers markets increase customer satisfaction due to freshness and quality of products (Govindasamy, R., et al., 2002), reconnect people to the local community (Gale, F., 1997) and create the conditions for a pleasant social interaction (Hunt, A., 2007). But shopping in farmers' markets may also have a positive influence on food habits since consumers who shop in farmers market report an increased consumption of organic products and vegetables with a certainly positive impact on health, as well as a broader impact on the economic, environmental, and social sustainability of the area (Pascucci et al., 2011).

Examining the impact of the built environment on health outcomes such as obesity, it has been found that the greater availability of local food, via farmers market and direct sell, is negatively associated with individual weight outcomes (Berning, 2012). Also Salois showed that that local food has a significant and negative association with the obesity rate and diabetes prevalence (Salois, 2012).

These evidence mainly come from U.S. where unlike the Europe and Italy the growth of local food market is precedent. In Italy the policy regulation of direct sale from farmers to consumer is dated back to 2001 by Law Enacted 228/01 while only Finance Act (article 1, paragraph 1065) in 2007 set a policy for farmers' market.

In meantime, the rising of food price led to regional administrations to support farmers' market through Rural Development Programs 2007-2013 in order to reduce the final price of food and promote the rural development improving the vitality and the quality of life in rural areas (Aguglia, 2009; Galisai et al., 2009).

Nowadays thanks to policy regulation and incentives, farmers' markets are rapidly spread all over across the Country. Coldiretti, the largest farmers' association that include over than 90% of farmers' market, reported 550 farmers' market in 2009, 705 in 2010 and 878 in 2011 that involve 20.800 famers with a total estimated value of trade of 484 million euro in 2011 (Coldiretti, 2012).

In 2007 a survey conducted by Coldiretti point out that 30% of respondent shop directly from farmers mainly to save money; 1 in 2 consumers shopping reason is the producer-consumer relationship but also the freshness and genuineness of food. While the rest of respondent shop directly from farmers to preservation of cultural and gastronomy traditions (12%), and finally reduced pollution, energy saving, environmental protection (9%).

On the other hand, farms that sell directly to consumers are 63,600 (Coldiretti 2009) and their number is almost two times than 2001, when the direct sale from farmers to consumer was regulated by law.

Both farmers' markets than farms that sell directly to consumer are located in north and centre of Italy. Piedmont and Lombardy are the regions with the highest number of farmers' market while Tuscany and Lombardy are the region with the highest number of sales at the farm level (Coldiretti 2009; Coldiretti, 2012). Although these form of direct sale are still a marginal reality compared to the organization distribution, the number of people who shops from farms and farmers' markets is rapidly increasing with 9,2 million of Italian that in 2011 decided to shop local food, almost 1 in 6 people (Lazzarin and Gardini 2007; Coldiretti, 2012).

3. MODEL AND METHODOLOGY

In order to explore the impact of local food outlet on adult Italian BMI we posit a simple linear empirical relation build on previous literature and based on household maximization (Bonanno and Goetz 2010). The model accounts for socio-demographic variable, eating habits behavioral characteristic and access to different kind of food:

where **SES** is a vector of consumers' socio-economic characteristics, **EH** captures individual eating habits, **B** comprehends individual behavioral variables and **F** is the vector of variables that capture the access to alternative local food stores.

In this paper we control for socio-economics variables since social scientists and economists have demonstrated that obesity rates are related to individual and household's characteristics such as age, sex, race/ethnicity, socioeconomic status, family size and social

norms (Loureiro and Nayga, 2005; Banterle and Cavaliere 2009); in particular, higher obesity rates are recorded among low income people and ethnic minorities (Black, Hispanic) characterized by a lower education level, larger household size and who live in densely populated or in rural areas (Drewnowski and Darmon, 2005).

The impact on obesity of eating habits, such as the frequent consumption of fruit and vegetables or meat, is clear (Hu and Willett; 1998, Key et al., 2006; Wang and Beydoun 2009) while individual behavioral variables may affect human health in different ways (Lakdawalla and Philipson 2009; Dunn et al. 2005; Duffey et al. 2007; WHO, 2004). Alternative local food stores variables include farmers' markets (FM) and direct sale from farm (AZ) variables that are expected to have a negative impact on the obesity rate since access to short supply chain allows consumers to substitute away from high caloric food and promote fresher food consumption and fruit and vegetable consumption (Berning, 2012). Also buying "local food" is boosted since it price is about 40% lower than in other stores (Vecchio, 2010). Lastly, have shopping to farmers market or directly in a farm produces social interactions that facilitated the involvement and sensitiveness towards high-quality consumption stimulating consumers to switch their food purchases towards foods of higher quality and healthiness (Pascucci et al., 2011).

To estimate (1) we start to posit a linear relationship between BMI and others explanatory variables. In this sense, we specify:

where all the groups of variables are illustrated above, α are parameters to be estimated and ε_{ir} is an idiosyncratic error term.

BMI is used in the model as continuous variable while local food stores variables while local food variables are expressed as a "store density" measures, i.e. the ratio of the number of stores divided by population or square kilometers. Testing the impact of local food outlet on individual weight we expect in a ceteris paribus criteria the following results:

In order to evaluate the impact of alternative food supply network on human health could emerges an additional empirical issue such as the potential endogeneity caused by a non-randomness food outlets' location decision. This issue is common in food access researches since it's clear that food outlets' location decision is in part determinate by supply side factors and it could lead a biased results (Salois, 2012).

To solve for this problem we may use an identification strategy based on isolating the supply-side drivers of food stores' location decision, capturing the non-randomness of such choice. This approach is typically used in food access literature (see Anderson and Matsa, 2011

that evaluate fast food impact on individual BMI using access to interstate highway as instrumental variable).

In the case of "local food" one may argue that outlet supply-side drivers could be the presence of regional food local specialty (eg. POD and PGI) and also an adequate space available inner city, indispensable to organize local food market since they typically occur in centre of town (Bachmann, 2008).

Rural studies found that, farmers who adopt POD or PGI schemes are more likely to sell their product using shorter supply chains in order to provide consumers with direct additional information about origin and quality of product (Marsden et al., 2000; Ilbery et al., 2004). Also the direct sale of POD or IGP product from farm is the one of most common marketing choice adopted by Italian farmers who produce according to this schemes since it allows to reduce the food's price respect those practiced in the organized distribution (Manco, 2007).

4. DATA AND ESTIMATION

The database used in the analysis is a Multipurpose Household Survey (MHS). MHS is a cross-section of individual-level observations conducted annually by the Italian National Institute of Statistics, for the year 2009. This survey records information on household characteristics (household size, type of household), individual characteristics (age, gender, education, level of education, smoking habits, sport activity, time spent watching television, etc…) health and other characteristics. Also, the MHS contains self-reported individuals weight and height which allows calculating adult's BMI.

MHS database also contains information about the number of portion of fruit and vegetables consumed for day by each respondents and this variable was used to create a dummy variable used as proxy for healthy eating habits, as suggested by Bonanno and Goetz 2010. Value 1 was assigned for people who have consumed fruits and vegetables five or more times per day and 0 for those who eats fruit and vegetable less that 5 time per day .

A proxy for personal income, since it was not contained in MHS database, was obtained assigning a pro-capita average income on the basis of the sector and type of employment declared in the MHS by each respondent. Average salary data come from Italian National Institute of Statistics - Retribuzioni contrattuali: dati congiunturali. All unemployed were assigned income equal zero. Retirees were assigned income equal to the average pension on the basis of their self-reported last sector of activity. Households with a family income equal zero were excluded from the analysis. People who failed to report their employment and sector of activity were eliminated from the sample. Observations with missing values in the MHS survey were dropped, along with those for individuals below 18 years of age whose weight and height are not recorded, and misreported values, resulting in a sample size of 22.164 observations.

The MHS individual-level data were matched with regional data of farmers' market and farms who sell direct to consumer. Farmers' market data was obtained from the CampagnaAmica, a Coldiretti's foundation that comprehends over the 90% of the Italian

farmers market while the data about farms who sell direct to consumer was obtained from Coldiretti.

Local food outlet density measures were obtained dividing the region-level store counts by population and regional surface obtaining different proxy to access as typically used in food access literature (Dunn, 2010; Barder et al. 2010).

The farmers' market density (FM) was obtained dividing the region-level store counts by population in 100.000 while farms who sell direct to consumer density (AZ) was obtained dividing by population in 1,000.

The second proxy of "local food" access was obtained dividing farmers' market region-level counts by regional surface expressed in 100.000 Km^2 while the regional numbers of farms who sell direct to consumer by regional surface expressed in 1.000 Km^2. Population and regional surface data come from Italian National Institute of Statistics. Summary of the variables used in the estimation is presented in Table 1.

Table 1 : Variables used in the estimation

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
BMI	22164	25.089	3.812	15.571	41.667
House_size	22164	2.907	1.247	1.000	12.000
Age	22164	50.781	17.171	18.000	102.000
Age^2	22164	2873.510	1837.362	324.000	10404.000
Gender (Male = 0)	22164	0.452	0.498	0.000	1.000
Years Education	22164	9.976	4.481	0.000	21.000
Married	22164	0.617	0.486	0.000	1.000
Smoke	22164	0.252	0.434	0.000	1.000
Sport	22164	0.183	0.387	0.000	1.000
TV_Time (hours)	22164	2.845	1.701	0.000	15.000
Income (€/10000)	22164	1.689	0.629	0.000	3.357
Income^2 (€/10000)	22164	3.249	1.882	0.000	11.271
F&V_consumption	22164	0.040	0.197	0.000	1.000
AZ_population_density	22164	1.252	0.877	0.159	4.141
FM_population_density	22164	0.926	0.506	0.000	1.917
AZ_regional_density	22164	1.260	0.883	0.159	4.159
FM_regional_density	22164	0.932	0.510	0.000	1.919
SAUDOP(%)	22164	0.338	0.610	0.000	2.224
Pedestrian Area (m^2/100inhabitants)	22164	34.328	25.906	5.650	108.460
Parking Area (Km^2/100Km^2)	22164	49.540	16.893	23.180	95.390

Source: own elaboration

We estimate equation (2) using both OLS than Generalized Method of Moment (GMM). Endogeneity of farmers' market and farmers who sell direct to consumers and we test their potential endogeneity using GMM-C statistic while the instruments' validity is evaluated by means of Hansen's J statistic and F-statistic (2009).

We use the following supply-side variables as instruments for the local food variables: Percent of country cropland destined to traditional productions - SAU (%); Pedestrian area inner city – PA (m2/100inhabitants) and Parking area inner city - PAR (Km2/100Km2). These data come from "Noi Italia. 100 statistiche per comprendere il Paese in cui viviamo" Estimation and data manipulation were performed in STATA v. 10.

Table 2 :Estimate coefficient: Equation (2) controlling and not for local food variables' endogeneity

	OLS	OLS	IV/GMM	IV/GMM
House_size	0.102***	0.102***	0.096***	0.096***
	(0.023)	(0.023)	(0.023)	(0.023)
Age	0.240***	0.240***	0.241***	0.241***
	(0.009)	(0.009)	(0.009)	(0.009)
Age^2	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Gender (Male = 0)	-2.072***	-2.072***	-2.060***	-2.060***
	(0.050)	(0.050)	(0.050)	(0.050)
Years Education	-0.103***	-0.103***	-0.102***	-0.102***
	(0.006)	(0.006)	(0.006)	(0.006)
Married	-0.120**	-0.120**	-0.130**	-0.129**
	(0.006)	(0.006)	(0.006)	(0.006)
Smoke	-0.478***	-0.478***	-0.478***	-0.478***
	(0.054)	(0.054)	(0.054)	(0.054)
Sport	-0.559***	-0.558***	-0.531***	-0.531***
	(0.056)	(0.056)	(0.056)	(0.056)
TV_Time (hours)	0.130***	0.130***	0.124***	0.124***
	(0.016)	(0.016)	(0.016)	(0.016)
Income (€/10000)	-0.450***	-0.450***	-0.419***	-0.419***
	(0.130)	(0.130)	(0.130)	(0.130)
Income^2 (€/10000)	0.102**	0.102**	0.088**	0.088**
	(0.042)	(0.042)	(0.042)	(0.042)
F&V_consumption	-0.459***	-0.458***	-0.466***	-0.465***
	(0.097)	(0.097)	(0.098)	(0.098)
AZ_population_density	-0.084***		-0.320***	
	(0.026)		(0.056)	
FM_population_density	-0.181***		-0.305***	
	(0.047)		(0.067)	
AZ_regional_density		-0.090***		-0.314***
		(0.026)		(0.055)
FM_regional_density		-0.201***		-0.303***
		(0.047)		(0.067)
Constant	20.728***	20.730***	21.131***	21.125***
	(0.279)	(0.279)	(0.290)	(0.289)
r2	0.177	0.177	0.174	0.174
Hansen *J*			$\chi^2_{(1)}$= 0.51 *p-val*=0.47	$\chi^2_{(1)}$= 0.53 *p-val*=0.46
GMM C statistic			$\chi^2_{(2)}$=29.4 *p-val*=0.00	$\chi^2_{(2)}$= 24.6 *p-val*=0.00
F-stat				

AZ (3, 22148)	3039.26	3126.63
FM (3, 22148)	11043.2	11122.08

*Note: *, ** and *** are 10, 5 and 1% significance levels – Standard errors in parenthesis*
Source: own elaboration

Table 2 presents the estimated parameters for equation 2 by OLS (first and second column) and GMM (third and fourth column) using local food per capita and square kilometers. The models present similar values of goodness of fit (the R-squared are 0.177, 0.177, 0.174 and 0.174, respectively).

Firstly we test for local food outlets' endogeneity using GMM C-statistic: the p-values of C statistic are 0.0001 and 0.0003 respectively using the different measures of local food access and rejecting the null hypothesis that local food outlets variables are exogenous.

The overidentifying instruments used to correct for FA's endogeneity in the models estimated via GMM satisfy the orthogonality conditions: the p-value of Hansen's J statistics are 0.46 and 0.47, respectively. The values of F statistic for the joint significance of the instruments are large enough to ensure that the instruments are not weak the values ranging from 3039.26 circa to 1.1122.08 (in all cases the values exceed the rule of thumb of 10 set by Staiger and Stock, 1997).

Firstly estimated socioeconomic and behavioral coefficients show similar magnitude and significance across the four estimations.

The estimated coefficients of the socio–economic variables are consistent with previous literature: household size, age, being married have a positive and significant effect on BMI while years of education and being female are negatively related to it (Baum and Ruhm, 2009). The estimated coefficients of behavioral variables show that physical activity and smoking have a negative and significant impact on BMI, while that of time spent in front of the TV is positive. Lastly a marginal effect of income on individual BMI is negative and significant as well as having healthy eating habits is associated to a BMI reduction from 0.459 to 0.466.

Moving on "local food" access coefficients estimated via OLS they are significant negative and indicate that greater access to farmers' market and to farmers who sell directly to consumers is related to lower weight outcome.

The marginal effect of the local food access variables indicate how an increase in one unit of their density impacts adult Italians BMI: a marginal increase of farmers' market per 100,000 people leads to a BMI reduction of 0.181 while 1 more farmers who practices direct sale per 1,000 people have a beneficial impact on BMI of 0.084, the results is similar in a model estimated using OLS and square kilometers normalization.

Using a GMM estimation the marginal effect of local food access density variables on BMI is still negative but larger form 2 or 4 time than coefficient estimated via OLS. The marginal effect of 1 more farmers' market per 100,000 people leads to a BMI beneficial effect of -0.320 while the having access to 1 more farmers who practices direct sale per 1,000 people

is estimated as -0.304, also the estimated results using local food regional surface normalization appear similar -0.314 and -0.303, respectively. These results confirm that if we not control for local food endogeneity we have a biased or underestimanted results.

Additionally we perform a robustness checks (Table 3) to evaluate the sensitivity of our baseline IV, in detail we regress separately local food variables, normalized both using per capita than regional surface approaches, using their specific instruments and we compare obtained results to those obtained using GMM estimation in table 2.

Firstly the literature on regional food local specialty point out that farmers who adopt DOP or IPG schemes more often than other farmers adopt short supply chain and particularly direct sale in order to reduce the product's price and also to supply additional information to consumers (Ilbery et al., 2004; Manco, 2007). We estimate the effect of direct sale on Italian adult BMI using percentage of regional cropland designated to typical production as instrument for it. The results obtained show that impact of farmers who practice direct sale is still negative and significant but smaller (20%) than those estimate in table 2, - 0.255 and - 0.250 respect - 0.314 and - 0.303 using per capita and regional surface normalization. The p-values of C statistic is still low, rejecting the esogenity of the variable while F-statistic for the significance of the instruments is large enough to ensure that the instrument are not weak.

Then we use proxies variables of space available inner city as instruments to valuate farmers' market effect on adult Italian BMI. Using of these variables is justified since providing enough available space inner city appears a key factor to organize the farmers' market (Bachmann, 2008).

Results show that impact of farmers' market is still negative and significant both using per capita than regional surface normalization and results not show difference to those reported in table 2 and estimated via IV/GMM. The p-values of C statistic is still low, rejecting the esogenity of the variable while F-statistic for the significance of the instruments is large enough to ensure that the instrument are not weak. Nonetheless, these results show that the conclusion that local food store reduce obesity and not depend from variables as instruments as well as from the strategy used to normalize the number of local food stores.

Table 3 : Robustness checks

AZ_population_density	-0.255***	FM_population_density	-0.304***
	(0.060)		(0.067)
F(1, 22150)	5352.52 (p = 0.000)	Gmm C stat	5.42469 (p = 0.0199)
GMM C stat	8.88221 (p = 0.0029)	Hansen	1.88453 (p = 0.1698)
		F(2, 22149)	15394.58 (p= 0.000)
AZ_regional_density	-0.250***	FM_regional_density	-0.302***
	(0.059)		(0.066)
F(1, 22150)	5484.22 (p = 0.000)	Gmm C stat	5.3945 (p = 0.020)
GMM C stat	8.7352 (p = 0.0031)	Hansen	1.81759 (p = 0.177)
		F(2, 22149)	15543.91 (p=0.000)

5. CONCLUDING REMARKS

This research investigated the relationship between alternative food supply network on human health exploring the farmer's market and direct sale impact on adult Italian BMI level. The underlying background is that nowadays Rural Development Policy start to promote short supply chain with the aim to provide greater income for farmers, better price and healthy choice for consumers.

In the literature there are only few evidences of the beneficial effect of alternative food supply network on human health, at least in U.S. where short supply chain appears an effective strategy to curb obesity problem. However the effect on human health in Europe is still largely unexplored.

Using a cross sectional database of micro-level data of Italian adults' characteristics and habits (the Multipurpose Household Survey) matched with regional data on food stores density andemployed IV/GMM estimator we found that having access to alternative food supply network lead to a reduction on adult Italian BMI also using different measure for local food economy.

Our findings point out the local food stores efficacy on improving human health so that they appear not only an instrument to increase farmers' income but also as tool to promote healthy choices and consumers health and consequently to reduce public health expenditure.

These results are useful for local food movement supporter but also for policymaker that should give more emphasis to farmers' market and direct sale channel development since they have a "spill-over" effect on public health sector.

Policymakers should planning measures to increase the access to local food reducing the barriers to local market development. Potential policy actions should aimed to enhancing the infrastructure in supporting farmers' market organization, to provide aids for farmers who participate in local food market but also to create extension services and lastly to organize information campaign for consumer promoting local food shopping.

On the other hand alternative food supply network has still a marginal importance respect traditional retail channel although the number of shoppers in farmers market and in directly from farmers is rapidly increasing as record in Coldiretti's survey in 2007 and it is also due to a limited farmers business skills and networking ability.

Lastly this work shows some limitation. One of them, common to most studies on this topic, is the cross-sectional nature of the data and other one is the regional level aggregation of them so that we not take in consideration where people really buy food; owever aggregate level studies are not uncommon in the food access literature.

Using census tracts areas, arbitrary designed neighborhoods or large areal units may create spurious relationship or may not reflect significant delineation and may not accurately reflect what is truly happening in small geographical neighborhoods within census areas;

anyway is not sure that people buys food within their census tracts areas. Anyways environmental studies that use aggregate level data, as Sallis et al. suggest that may be more appropriate than individual-level studies when examining risk factors relating to the obesogenic environment.

Future researches should use panel data to evaluate the effect of local food stores on BMI, including food price and evaluate the possible interaction between having access to alternative food supply network and individual eating habits.

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