The Impact of Globalization on Obesity Epidemic in Brazil

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Outline

I - Introduction

- Ongoing research

- There are debates about the externalities caused by trade liberalization, such as the environmental degradation.

- As globalization is a broader process compared to trade liberalization, other externalities might exist such as adverse impacts on cultural diversity, spreading infectious diseases and obesity global epidemic

- Obesity has increased in developed countries as well as developing countries.

  - FAO (2008): *obesity increases rapidly in developing countries, even in those where hunger still exists*

Figure 1 – Brazilian Agribusiness and total trade balance: imports and exports (Current US$ Billion). Brazil: 1989-2011. Source: based on Agrostat database, apud MAPA
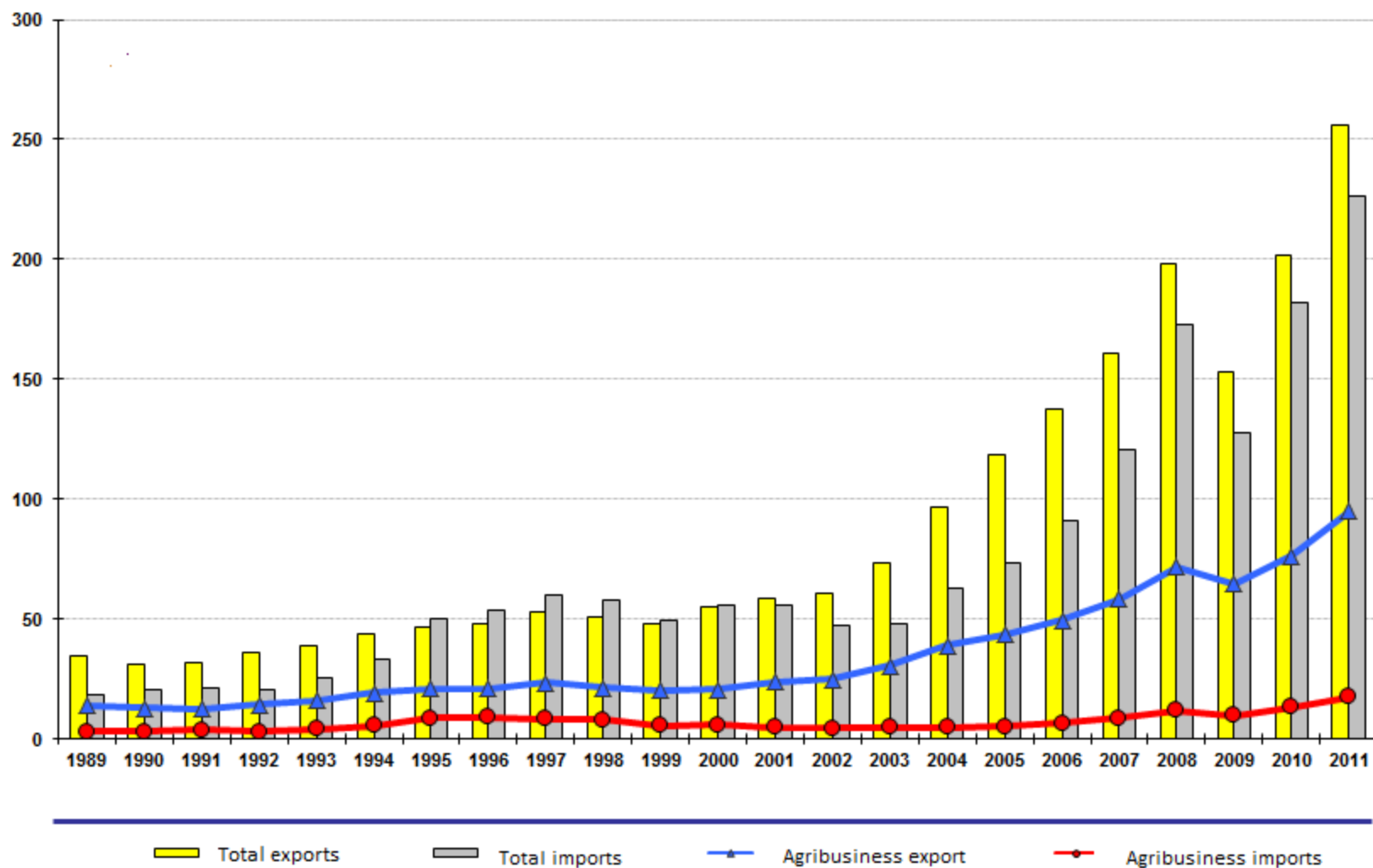
Figure 2 – Foreign Direct Investment in Brazil, 1975-2011 (US$ Million). Source: Payment Balance. Source: Bacen (www.bacen.gov.br).
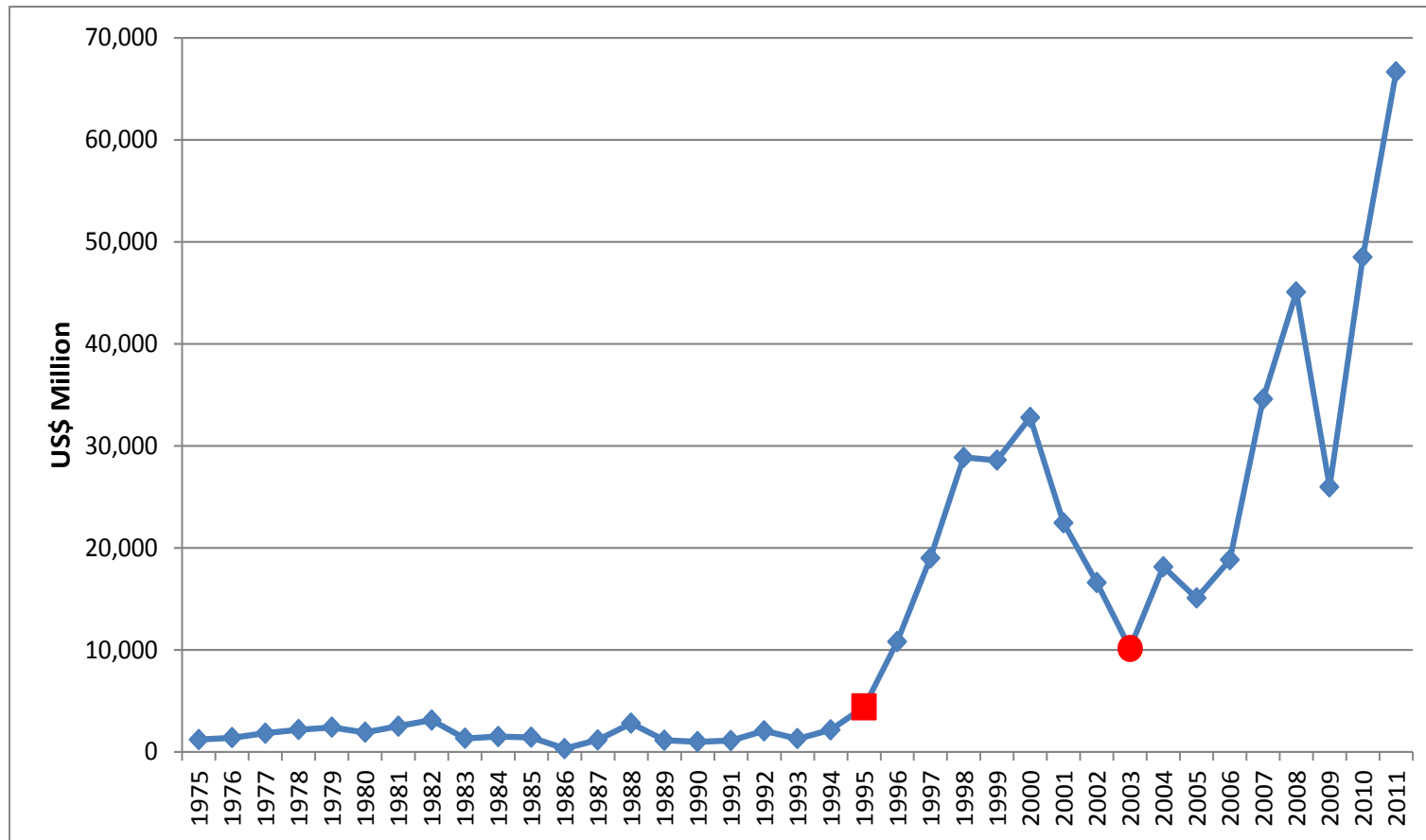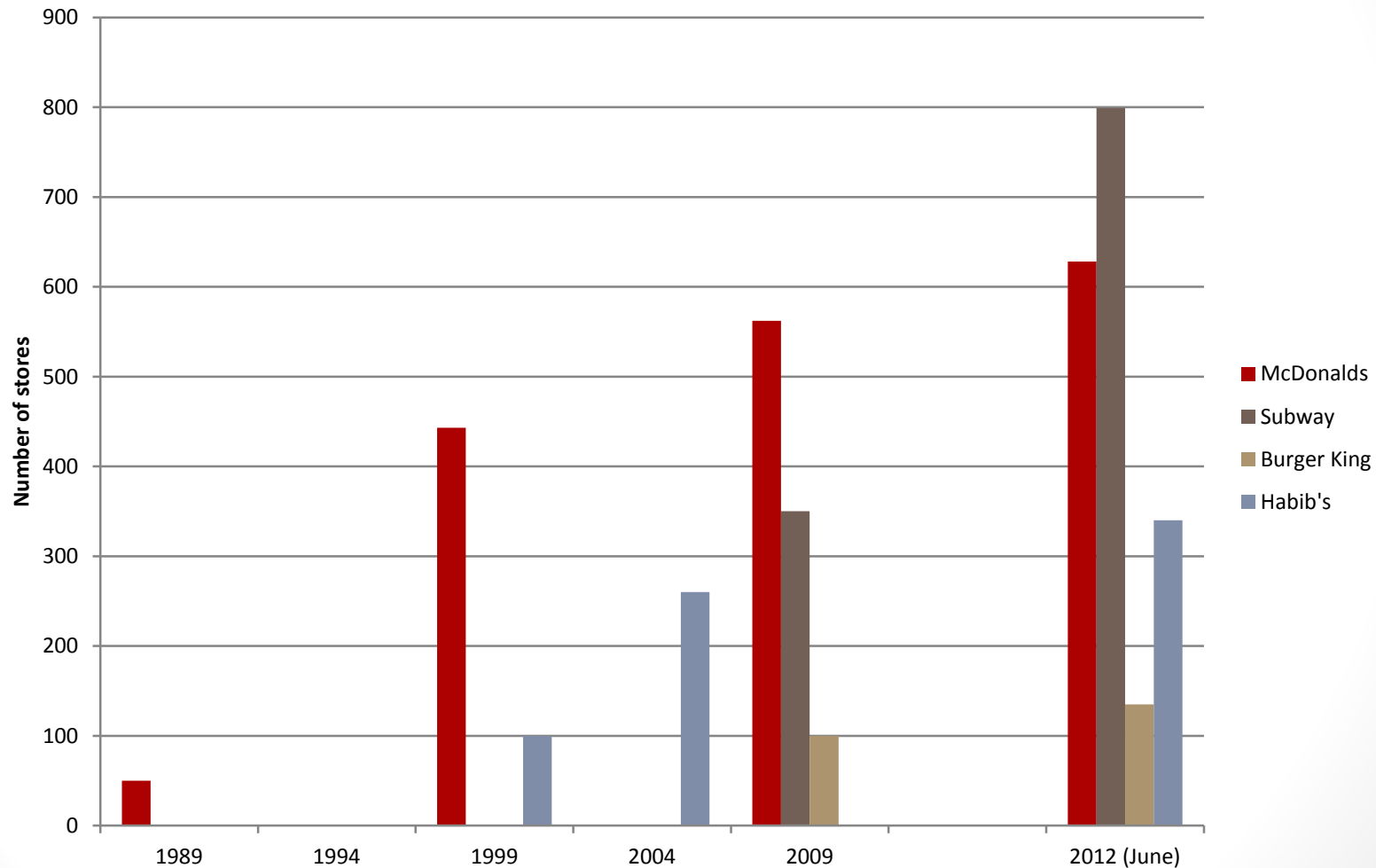
Figure 3 - Evolution of stores of some fast-food chains in Brazil. 1989 – 2012. Source: websites Mc Donalds, Burgerking, Habibs websites, Alvarega (2012) and *Subway atinge* (2012).

Objective

To determine the likely effects of globalization on the global epidemic of obesity, and particularly to examine the Brazilian case.

Theoretical Model's Outcome

- Assumption: Trade produces an externality-obesity in this case.

- The first-best policy for a country that wishes to manipulate its terms of trade is, of a course, an import tariff.

- As such an instrument is unavailable because of the free-trade agreement, the obesity (externality) tax is a second-best policy.

- It is inferior to the tariff in that it induces firms to spend resources on obesity reduction (a worthless, but costly, activity to the citizens of foreign country), and so the obesity (externality) tax will be imposed at a lower effective level than that of the optimal tariff.

- The outcome for the home country is that, under a free-trade agreement, it has lost any influence over the level of the externality (obesity), through relinquishing its import tariff, as well as having no means of retaliating against the behavior of the foreign country.

II – Empirical model and database: Database

Table 1 – Prevalence of overweight and obesity in population older than 20 years, by gender. Brazil, ENDEF (1974-75), PNSN (1989) and POF (2002-03, 2008-09). In % of population

	ENDEF (1974-1975)	PNSN (1989)	POF (2002-2003)	POF (2008-2009*)
Overweight				
Male	18.6	29.5	41.0	50.1
Female	28.6	40.7	39.2	48.0
Obesity				
Male	2.8	5.1	8.8	12.4
Female	7.8	12.8	12.7	16.9
Total	-	11.7	13.1	

Database

- PANEL – 26 states plus the Federal District
- Period - 1989, 2002 and 2008
  - *Restrictions on anthropometric statistics*
- **Independent variables:** number of overweight and obese people (or percent in total population)
- **Explanatory variables** - trade (exports/imports flow), average income, schooling years, economically active people, consumption of sugar, sodas, beans (traditional staple food in Brazil) and prepared food
- Several control variables - race, male/female and age of population.
- Source: POF, PNAD (IBGE) and PNSA (Ministry of Health)

Empirical Model

- The empirical study is conducted using a balanced panel data model (Greene, 2004), i.e., the same number of observations for each cross-section unit (states), which consist on i = 1, 2,...,26 states and the Federal District. For each year there is information related to three different surveys conducted in 1988(or 1989), 2002 and 2008 (t = 1,2,3).

- Let y_{it} be the average obesity or overweight measures for each state i and time t such as,

$$y_{it} = X_{it}^{j}\beta + \varepsilon_{it} \tag{1}$$

- Where X_{it}^{j} is the value of jth explanatory variable (imports, average income, age, race, unemployment and so on) for unit i at t and ε_{it} is the error term for the ith unit in t.

- In this model there could be unobservable variables correlated to the X variables causing bias and inconsistency in the estimated coefficients that could be controlled for using a fixed effect model if we assume they do not vary with time. For example in areas less developed and with less

Results and Discussion

Table 2 – Average household purchase of some food categories per capita year, Brazil and selected states. 1989, 2002 and 2008 (Kg)

Food	State	1989	2002	2008
Sugar	Brazil	14.5	20.5	17
	Amazonas (N)	22.8	16.6	16.9
	Bahia (NE)	31.1	24.1	18.7
	São Paulo (SE)	23	17.4	13.2
	Mato Grosso (CW)	22.8	19	16.9
	Rio Grande do Sul (S)	22.4	18.6	16.4
Sodas (liters)	Brazil	2.7	23.4	24
	Amazonas (N)	2.2	14	20
	Bahia (NE)	6.0	12.1	12.1
	São Paulo (SE)	8.4	33.4	32.9
	Mato Grosso (CW)	2.2	19.7	16.8
	Rio Grande do Sul (S)	5	38.9	45.5
Beans	Brazil	9.9	12.3	9.2
	Amazonas (N)	16.9	7.9	8.3
	Bahia (NE)	11.1	18.5	13.4
	São Paulo (SE)	8.1	8.4	6.3
	Mato Grosso (CW)	16.9	10.5	8.1
	Rio Grande do Sul (S)	11.6	10	5.9
Prepared food	Brazil	–	2.4	3.2
	Amazonas (N)	–	2.4	2.8
	Bahia (NE)	–	0.5	1.0
	São Paulo (SE)	–	3.5	5.3
	Mato Grosso (CW)	–	1.9	1.8
	Rio Grande do Sul (S)	–	5	4.0

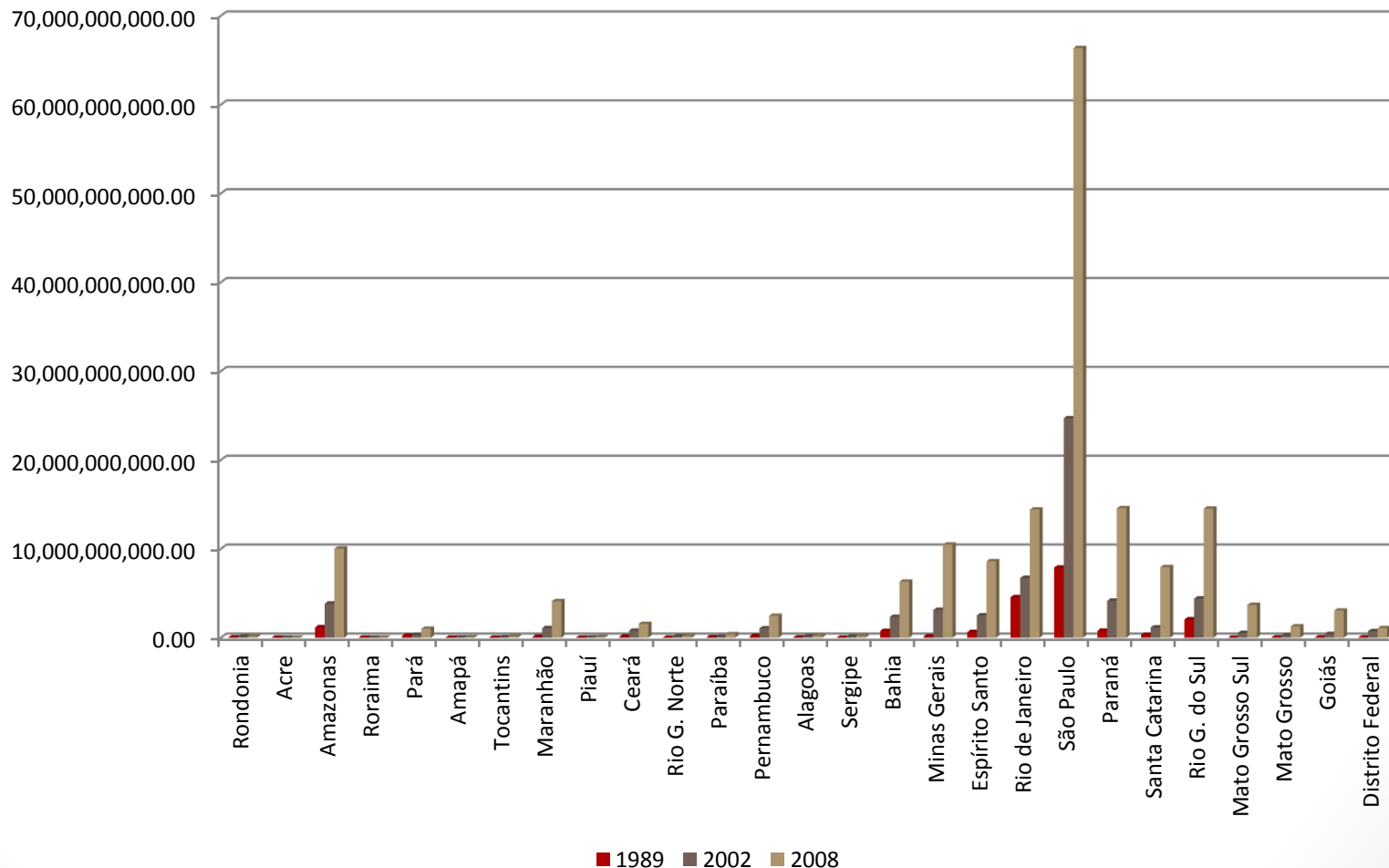# Figure 4 – Total imports by Brazilian state, in real US$ billion values

Table 3 - Some anthropometric, household and social data for selected states. Brazil. 1989, 2002 and 2003. Sources: POF, PNAD, PNSA

State	Overweigh (% pop.)	Obesity (% pop.)	Household income p.c./ year* (R$ real values 2008)	Average schooling years for people older than 10 years
Brazil - 1989	25.62	8.8		4.4
Amazonas (N)	27.12	8.64	366.30	4.8
Bahia (NE)	20.64	5.14	229.78	3.1
São Paulo (SE)	27.42	9.89	608.70	5.2
Mato Grosso (CW)	24.80	7.87	392.41	4.0
Rio Grande Sul (S)	28.42	11.86	423.75	4.9
Brazil - 2002	28.78	10.51		6.4
Amazonas (N)	25.62	7.81	500.27	6.8
Bahia (NE)	24.25	7.80	375.45	5.0
São Paulo (SE)	30.66	12.36	924.44	7.5
Mato Grosso (CW)	28.78	8.83	643.80	6.3
Rio Grande Sul (S)	32.54	14.45	781.19	6.9
Brazil - 2008	33.97	14.64		7.3
Amazonas (N)	36.19	11.01	563.43	7.2
Bahia (NE)	29.78	11.14	503.38	6.1
São Paulo (SE)	35.45	16.31	1002.84	8.3
Mato Grosso (CW)	32.19	14.50	828.39	7.2
Rio GrandeSul (S)	37.09	19.82	934.19	7.7

Table 4 – Results of fixed effects panel model for Brazil (26 states + Federal district). Dependent variable: log of ratio of obese and overweigh people (older than 20 years) in the total population. 1989, 2002 and 2008

Variables	Overweight	Obesity
Log of trade openness	0.0440* (0.0257)	0.1017* (0.0523)
log of per capita family income (in real values for 2008)	-0.0783 (0.0971)	
Gender (female percentage in total population)	-0.0214 (0.01399)	-0.0198 (0.0319)
Average years of schooling (for people older than 10)		-0.2167** (0.0965)
"Mulato" people (% in total population)	-0.0377 (0.0482)	-0.1179 (0.1014)
Yellow people (% in total population)	-0.0341 (0.0701)	-0.1725 (0.1499)
Black people (% in total population)	-0.0457 (0.0512)	-0.1209 (0.1061)
White people (% in total population)	-0.0403 (0.0485)	-0.1160 (0.1022)
Percentage of households with TV	0.0072*** (0.0019)	0.0132*** (0.0032)
Household purchase of beans (kg p.c./year)	0.0050 (0.00352)	0.0211*** (0.0074)
Household purchase of sodas (liters p.c./year)	0.0045** (0.0022)[1]	0.0074 (0.0046)[2]
Binary variable for 2002	-0.0819 (0.0540)	0.1791 (0.2006)
Binary variable for 2008	0.0687 (0.0732)	0.7278** (0.3025)
Constant	8.0150 (5.0424)	14.3422 (10.5134)
States fixed effects (27 units)	Yes	Yes
Year fixed effects (3 years)	Yes	Yes
Number of observations	79	79

Robust standard errors. ***Significant at 1% level, ** Significant at 5% level, * Significant at 10% level.
Note: the variables gender and race are controls. In the case of race, native indian people were left out.
[1] It is significant at 5.2%   [2] It is significant at 11 percent level

Table 5 - Results of fixed effects panel model for Brazil (26 states + Federal district). Dependent variable: log of number of overweigh people and log of ratio of obese people (older than 20 years) in the total population. 2002 and 2008

Variables	Overweight	Obesity
Log of trade openness (import/GDP)	0.1026*** (0.0311)	
Log of trade openness		0.1028 ** (0.0376)
Log of per capita family income (in real values for 2008)	-0.3226* (0.1782)	0.4486 (0.2816)
Gender (female percentage in total population)	0.0130 (0.0263)	0.0768** (0.0384)
Log of PEA (economically active population)	1.0028*** (0.2409)	
"Mulato" people (% in total population)	-0.0348 (0.1509)	0.0621 (0.1066)
Yellow people (% in total population)	0.1431 (0.1956)	0.2696* (0.1537)
Black people (% in total population)	-0.0452 (0.1582)	0.0817 (0.1089)
White people (% in total population)	-0.0283 (0.1554)	0.0668 (0.1086)
Percentage of households with TV	0.0106* (0.0054)	
Household purchase of beans (kg p.c./year)	-0.0058 (0.0070)	
Household purchase of prepared food (kg p.c./year)		0.0337 (0.0245)
Household purchase of sodas (liters p.c./year)	-0.0018 (0.0039)	
Household purchase of sugar (kg p.c./year)	0.0098* (0.0051)	0.0155 (0.0073)
Binary variable for 2008	0.2176*** (0.0586)	0.2508 *** (0.0875)
Constant	2.2629 (19.1604)	-11.5473 (11.5871)
States fixed effects (27 units)	Yes	Yes
Year fixed effects (3 years)	Yes	Yes
Number of observations	54	54

Robust standar errors. ***Significant at 1% level, ** Significant at 5% level, * Significant at 10% level. Note: the variables gender and race are controls. In the case of race, native indian people were left out.

Final remarks

- The study shows limited evidence of effects of globalization over anthropometric measures in Brazil

- However there are some evidences that trade openness has positive effects on the number of overweight and obese people and effects differ according to states

- Models for overweight performed better than for obesity, with more robustness

- Database has some restrictions and they are currently being worked on to improve the treatment to FDI variable and to other variables that indicate a change of life style that could affect obesity and overweigh ratios

Acknowledgments