Decomposing differences in the BMI distributions of Canada and the United States

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Obesity highlights: US & Canada

- % of obese in Canada and the US > OECD average
- In 1990, % of adult obese in the US was <15%, by 2012 more than 1/3 of adults in the US were obese (CDC, 2014)
- Between 1978/79 and 2004 adult obesity in Canada increased almost 10%; highest among morbidly obese (Tjepkema, 2006)
- By 2007/09, ¼ of adults in Canada were obese
- In 2004 % of adult obese in Canada was ~15% less than the US:
  - 20% vs. 34% in males, 21% vs. 36% in females (O’Neill and O’Neill; 2007)
Background

• Income inequality is significantly related to obesity (Pickett, Kelly, Brunner, Lobstein, & Wilkinson, 2005)
• Socioeconomic inequality in obesity in the US; across gender, age and ethnic groups (Zhang & Wang, 2004)
• Obesity is shifting towards poor (Monteiro, Conde, & Popkin, 2007)
• Food insecurity and obesity are closely linked (Che & Chen 2001)
• Higher the household income, higher the nutrition rich food purchase (Garriguet, 2004; Ricciuto & Tarasuk, 2007)
Motivation

• BMI is correlated with socio-demographics and SES
• How these factors are related are of interest:
  • in terms of their composition
  • through their reception
• Decomposition techniques allow us observe these
• Decomposing over-time: analysis of the right-shift in BMI distribution
• Decomposing cross-countries: analysis of the gap between BMI distributions of Canada and the US
Why look at whole distribution?

• Focus on certain cut-off points may be misleading
• Same prevalence levels could come from different distributions
• Concentration of individuals around cut-off points is of value

(Contoyannis and Wildman, 2007)
Literature Review

• Joliffe (2011) relationship between income and BMI categories in the US:
  • Positive income gradient for underweight and negative for obese
• Costa-Font et al. (2008, 2009, 2010) decompose BMI distributions/obesity prevalence rates of Italy and Spain
• Contoyannis and Wildman (2007) use relative distributions to look at Canada and England
• Houle (2010) extends on C&W (2007) in the US context:
  • Education and race associated with BMI on both tails
Data

- JCUSH (2002/3): single cycle cross-sectional data & dated now
  **INSTEAD**
- Canada
  CCHS 1.1 (2000/01): Early Era
  CCHS 2013: Recent Era
  Given 500 bootstrap weights to account for survey design
- US
  NHANES 1999/00 + 2001/02: Early Era
  NHANES 2009/10 + 2011/12: Recent Era
  Generated 500 bootstrap weights to account for survey design
Methods

- Oaxaca (1973) - Blinder (1973)
- RIF Regression (Firpo, Fortin & Lemiuex, 2009)
- Counterfactual decomposition (Chernozhukov, Fernandez Val & Melly, 2009; 2013)

$Y = SR$ BMI (Canada), $DM$ BMI (US)

- Correcting for measurement error?
  - Courtmanche, Pinkston & Stewart (2015): percentile ranking vs. Stats Can’s method

$X = age$, race, marital status, immigration status, education, alcohol, smoking, adjusted HH income, and food insecurity (poverty)

Male/Female separate analysis for over-time and across-countries
Statistical Inference

• Bootstrapped pivotal statistics:
  • Bootstrap with asymptotic refinement (Cameron and Trivedi, 2005)
  • Approximating p-values through distribution of test statistics (Beaumont and Bocci, 2009)
    1) Obtain t-statistics of interest in the main regression using sample weights
    2) Generate distribution of t-statistics for the same coefficient using BS weights
    3) Locate #1 in #2 to obtain p-values for statistical inference
Decomposition components

\[ \Delta_O^\mu = v(F_{Y1|T=1}) - v(F_{Y0|T=0}) = [v(F_{Y1|T=1}) - v(F_{Y0|T=1})] + [v(F_{Y0|T=1}) - v(F_{Y0|T=0})] \]

Overall Effect = Coefficient Effect + Characteristics (endowment) Effect
NHANES
Males: Characteristics Effects

![Graph showing males' characteristics effects with quartiles on the x-axis and a range of values from -0.5 to 1 on the y-axis. Two lines are present, one in green labeled CFVM and one in orange labeled Rifreg. There are also dashed lines labeled OB.](image)
Over-time results: Summary

BMI unit change before and after

• Overall difference range between -.3 and -1.3 along 10th to 90th percentile in Canada
  • Around .7 at the mean

• These differences are about -.2 units more in the US

Differences in characteristics are relatively small

• Characteristics effects range between -.3 and .3 in both countries

Overall difference is dominated by coefficients’ effects

• Coefficients effects explain why we observe higher BMI in recent era
Thank you
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References


