

# Online Prices for Computing Standards of Living Across Countries (OPSLAC)

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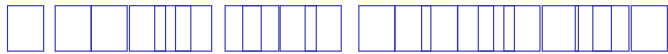
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NSF □ January 31, 2020




# Motivation

- International *real income* comparisons rely on the *country prices*  
 International Comparisons Program (ICP)
- ICP coordinates the work of dozens on National Statistical Offices to collect prices for a basket of similar goods across countries
- Many challenges:
  - Low frequency (ICP every 6 years, OECD 3 years)
  - Long delays in publication (ICP 2011 published in 2014)
  - Issues affecting comparability of products and methods across countries and time (Deaton & Heston (2010), Inklaar and Rao (2017))
  - Some countries refuse to participate (Argentina 2011), others are a source of controversy (China 2005)



- We rely on *online prices* scraped from websites of largest multi-channel retailers: same data used by the **Billion Prices Project (BPP)** to measure daily inflation
  - 12 Countries → Argentina, Australia, Brazil, Canada, China, Germany, Japan, Netherlands, South Africa, UK, US
  - 3 sectors → Food & Beverages, Fuel, Electronics
- Main advantages
  - Quarterly frequency (2011 to 2017)
  - Closely matched goods & identical methodologies
  - Full control over data collection, products chosen, methods used
- We compare **BPP price level** indices (PLIs) to **ICP** 2011 and **OECD** 2014 + we compare *real consumption* in Q4 2017 with extrapolated results

# We use **BPP** to replicate **ICP** methods as closely as possible

- Create an *Item* list (267 in total)
  - Barcodes/ids vary by country or even retailer
  -   
(different varieties, brands, package sizes, flavors, etc)
  - We use a mix of narrowly -  eg. *Ground Decaf Illy Coffee*) and broader item definitions (*Basmati Rice*)
- Match *individual products* to *items* (hardest part)
  - Using individual products with online retail prices available from  **BPP** database (collected by Alberto Cavallo)
- Compute *average national prices per quarter*.

# Matching Individual Products to Item definitions

- We search the micro data for individual products that match item definition + enter product sizes

**CANADA - Ice Cream / Haagen Dazs / Pints**

haggen dazs

Search In: Product Name, Description, Translated Product Name, Retailer Menu, Brand

Date Range: Last 30 days (128), Last 60 days (128), Last 90 days (128), Last 120 days (129)

PPP Status: In PPP (62), Previously Excluded (0), Not in PPP (194)

Retailer: CA\_GATEWAY (75), CA\_LONDONDRUGS (40), CA\_LOBLAWS (37), CA\_FRESHMARKET (35), CA\_SUNTERMARKET (20), CA\_NESTERSMARKET (15), CA\_WALMART (12), CA\_QUALITYFOODS (11)

Level 1: Food and non-alcoholic beverages (256)

Retailer Name	RID	Original Product Name	Match	S. Size	Size	MU	Bundle	Last Date	Brand
CA_WALMART	205889	Häagen-Dazs Pralines & Cream	Yes					10/31/2013	
CA_NESTERSMARKET	97367	HAAGEN DAZS CAPPUCCINO GELATO	Yes					09/29/2017	
CA_GATEWAY	00055000490696	Häagen-Dazs Stracciatella Gelato	Yes					03/07/2017	
CA_GATEWAY	00055000490702	Häagen-Dazs Limoncello Gelato	Yes					09/28/2017	
CA_GATEWAY	100149	Haagen Dazs Limoncello Gelato	Yes					05/12/2016	
CA_GATEWAY	00055000174626	Häagen-Dazs Tiramisu Gelato	Yes					03/21/2017	
CA_GATEWAY	00055000174596	Häagen-Dazs Cappuccino Gelato	Yes					04/18/2017	
CA_GATEWAY	103095	Haagen Dazs Gelato Cappuccino	Yes					06/14/2016	
CA_GATEWAY	103096	Haagen Dazs Gelato Limoncello	Yes					05/16/2016	
CA_WALMART	6000001837939	Häagen-Dazs Pralines & Cream	Yes					11/17/2013	

**Product Details**  
Retailer: CA\_FRESHMARKET RID: 110114 RID ID: 2264

**Products**  
Name: Haagen Dazs Gelato Ice Cream Salted Caramel Italian  
Start: 01/13/2016 End: 09/29/2017 Desc: Brand: S.I.: Size: MU: Count: Sold By: ea

**Pricing**  
Total Prices: 622 Min Price: 3.99 Avg Price: 6.85 Max Price: 7.49  
Raw Price History Clean Price History

**Category and Size**  
Category L&L: Ice Cream Category L&L7: Haagen Dazs - Pints Size: 500.0 MU: (MILLILITER) Bundle: 1.0 Start Date: End Date: Delete

Exclude Save Changes

- ~100K products matched from 100 million available in the **BPP** databases for these countries

# Many reasons to expect differences with ICP 2011

- Different item list
- Temporal aggregation (quarterly vs yearly data)
- Our matched-data coverage is not so good for 2011

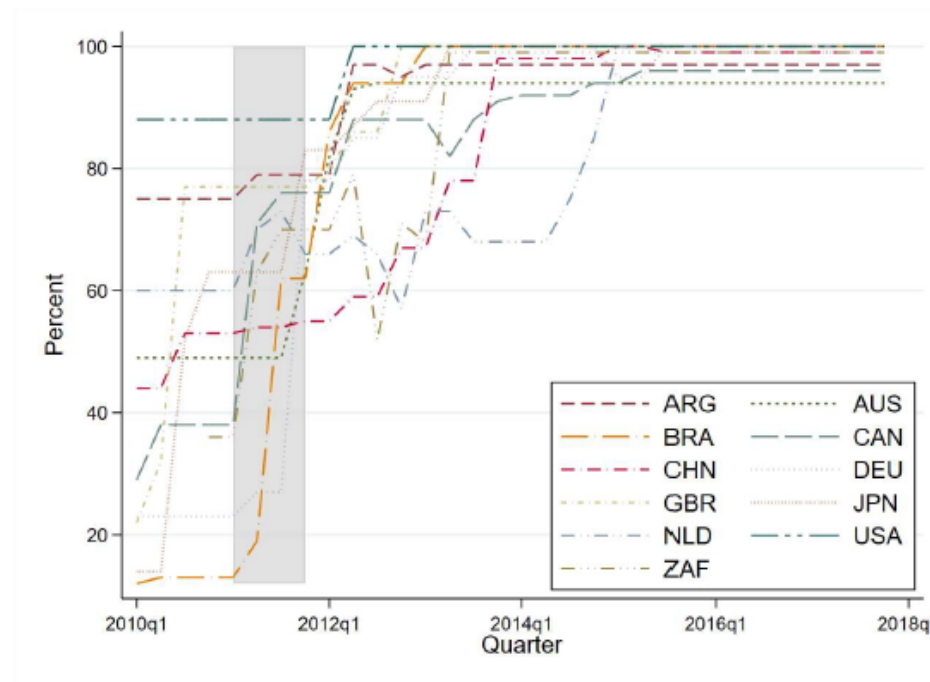
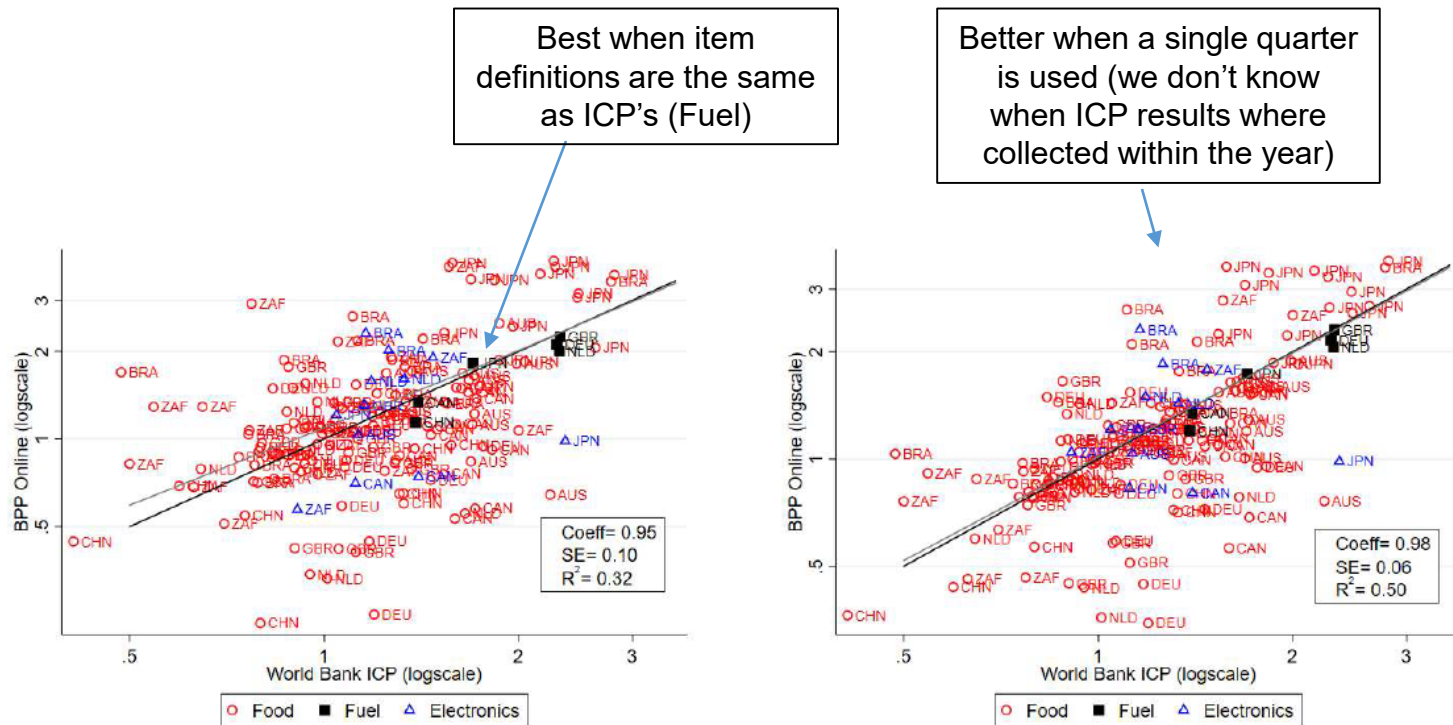


FIGURE A1: SHARE OF BASIC HEADINGS COVERED BY BPP

*Note:* Share of all basic headings in ICP food, fuel, and electronics categories. 2011 quarters shaded in gray.

# Basic Headings Price Levels (2011), relative to U.S.



PANEL A: ONLINE PPP IS AN ANNUAL AVERAGE

PANEL B: ONLINE PPP FROM QUARTER WITH SMALLEST DIFFERENCE

FIGURE A2. BASIC HEADING COMPARISON ICP VS BPP FOR 2011

# Sectors and Countries (2011)

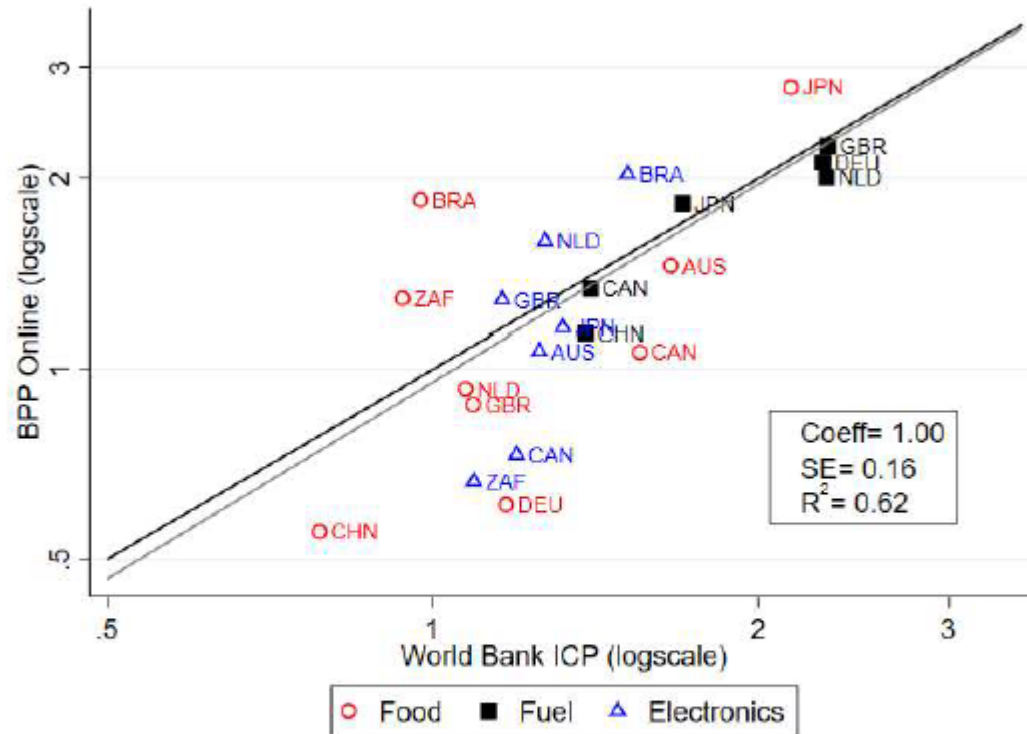


FIGURE 1. BPP VS ICP PRICE LEVEL INDEXES - 2011




# Multilateral Price Levels 2011 and 2014

TABLE 1- MULTILATERAL PRICE LEVEL INDEX (PLI=PPP/E), USA=1

	2011		2014	
	ICP FFE	BPP FFE	OECD FFE	BPP FFE
Argentina	n.a.	0.79	n.a.	1.05
Australia	1.53	1.52	1.36	1.24
Brazil	1.20	1.44	n.a.	1.17
Canada	1.30	1.08	1.29	1.15
China	0.93	0.71	n.a.	0.97
Germany	1.30	1.12	1.35	1.20
Japan	2.01	2.57	1.42	1.58
Netherlands	1.29	1.21	1.27	1.22
South Africa	0.96	1.11	n.a.	0.91
United Kingdom	1.25	1.14	1.37	1.26
United States	1.00	1.00	1.00	1.00
Mean Abs. Difference				
All		15%		
OECD		17%		9%

Smaller differences in 2014, when online BH coverage is complete



*Notes:* Multi-lateral GEKS PLIs covering all basic headings available in Food, Fuel, and Electronics. BPP numbers are yearly averages (from quarterly PLIs). Argentina refused to

# Real Consumption in 2017 - Q4

TABLE 2 – REAL HOUSEHOLD CONSUMPTION PER CAPITA OF FOOD, FUEL AND ELECTRONICS BASED ON BPP PRICE DATA FOR 2017Q4 (USA=1)

	Actual	Extrapolated
Argentina	0.41	0.70
Australia	0.76	0.74
Brazil	0.20	0.22
Canada	0.61	0.89
China	0.11	0.18
Germany	0.60	0.76
Japan	0.45	0.40
Netherlands	0.57	0.70
South Africa	0.18	0.20
United Kingdom	0.72	0.76
United States	1.00	1.00

*Sources:* Total household consumption expenditure in local currency units, total population, the consumer price index and the exchange relative to the US dollar is taken from the *OECD Main Economic Outlook*, no. 102 (November 2017). For China, household

# Limitations

- Few sectors and only 12 countries
  - Our target is 15, **BPP** has *some* data for ~60
  - Online data still not available in many countries/regions
- Online prices may not be representative of national averages
  - online-offline price differences are small *within* retailers (Cavallo (2017))
- Single price for all locations?
  - Mostly urban retailers with uniform pricing
  - Can be complemented by scraping smaller local retailers
- No expenditure weights (same problem as in **ICP**)
  - Combined with scanner data?

# Conclusions

- *Online data* can provide *prices* in high-frequency, no delays, close similarity in products, more control and transparency in data collection and methods used. So **BPP** can possibly supplement (or replace) the very labor-intensive methods of the **ICP**.
- Matching of individual products is still hard
  - Barcodes and product descriptions not standardized
  - Not simple to automate via machine learning
- Besides **retail products**, what other prices are available?
  - Rental prices for housing
  - Wages for contract work
  - Other?

# Additional Slides

# Data Comparison with ICP

TABLE A1 —DATA SOURCE COMPARISON

For Food, Fuel, and Electronics*	BPP (2017)	ICP (2011)
Data collection	Daily	Few times a year
Publication frequency	Quarterly	~6 years (3 years for OECD)
Number of items	267	238
Products per item-country (mean)	30	10-15 homogeneous** 70-100 heterogeneous
Type of coverage	Goods	Goods & Services
Locations	Urban	Urban & Rural
Countries	11	199

Notes: \*COICOP codes for Food and Beverages (01), Fuel (07.2.2), and Electronics (From 09.1.1 to 09.1.4) \*\*Estimates in World Bank (2013).

Source: Authors' calculations based on World Bank (2013)

# Item list

TABLE A2—ITEM LIST EXAMPLES

Basic Heading	Number of Items		Item Definition Examples	
	BPP	ICP	BPP	ICP
Rice	4	9	White Rice, All Brands, Basmati White Rice, All Brands, Long-grain	Basmati Rice Long-grain rice – Family Pack
Other cereals, flour and other products	12	6	All-purpose Flour, All Brands, Wheat All-purpose Flour, All Brands, All Other Cereal for Breakfast, Kellogg's, All Other	Wheat flour, not self-rising Wheat flour, not self-rising Cornflakes (Kellogg's)
Pasta	7	6	Pasta, All Brands, Spaghetti Pasta, Barilla, Penne (including whole grain)	Spaghetti Short Pasta
Beef and Veal	2	8	Beef, All Brands, Tenderloin roast or steak Beef, All Brands, Ground	Beef, fillet 100% Beef, minced
Poultry	1	6	Chicken, All Brands, Breasts	Chicken breast without skin
Fresh, chilled or frozen sea food	2	13	Shrimp, All Brands, Fresh Uncooked Shrimp, All Brands, Frozen Uncooked	Whole Shrimps Shrimps
Audio-visual, photographic and information processing equipment	82	27	Laptop, Apple, MacBook, 13 inch Laptop, Acer, 14-16 inch Television, Phillips, LED 32" Television, Samsung, LED 32" Television, All Brands, LED 32" Television, LED, 40-43", LG Camera Compact, Canon, 20-24mpx Camera Compact, Nikon, 20-24mpx Camera Compact, Sony, 20-24mpx	Apple MacBook laptop computer Acer Aspire One netbook Phillips 3000 series LCD TV 32" Samsung Series 5 LCD TV 32 Inches LCD Television LG LD Series LCD TV 42" Digital Compact Camera Digital Compact Camera Digital Compact Camera

# Note on Sales Taxes

- Prices collected online include sales tax except for USA, Japan, Germany.
- Current **OPSLAC** prices are being adjusted
  - USA → food = 0.9%, electronics 5.08%, Fuel includes tax (average sales tax for all states (unweighted) after taking into account food exceptions -source Federation of Tax Administrators Report 2015)
  - Germany → food taxed at 7%, the rest at 19%, fuel includes tax
  - Japan → 5% before 3/ 2014, 8% after.