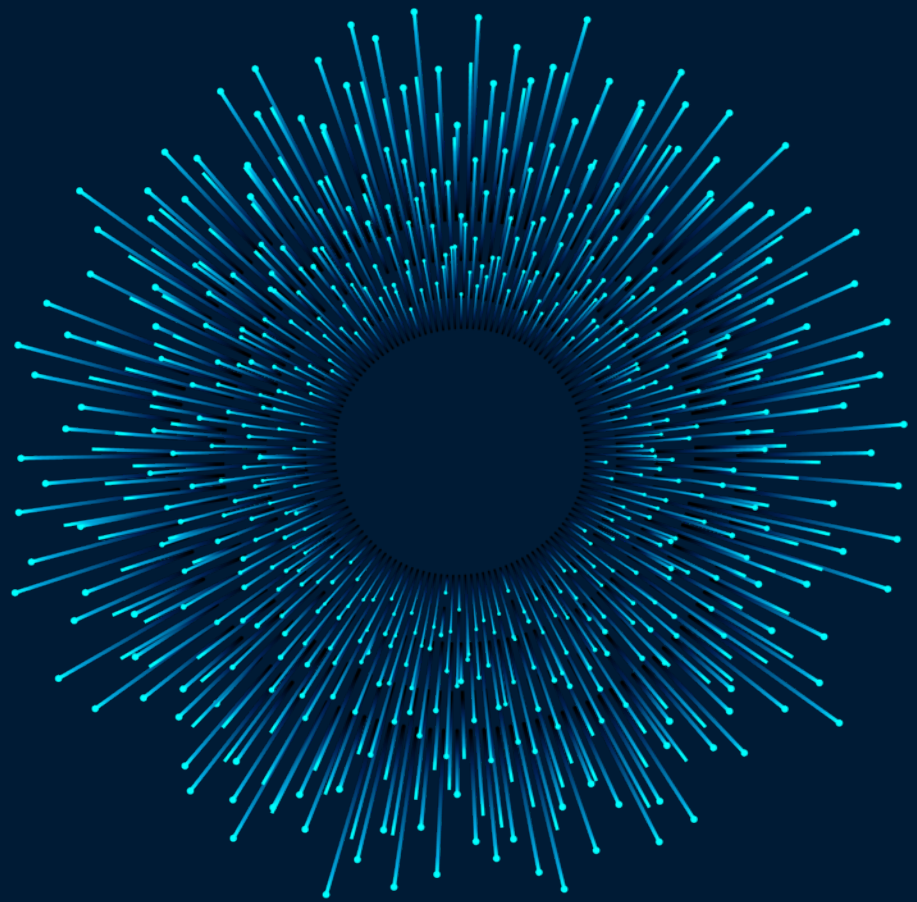
GDP-B: A New Measure of Economic Welfare

ESCoE Conference 2025

London, May 21

David Nguyen

Stanford University & ESCoE



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Stanford University Human-Centered Artificial Intelligence

Today

1. Intro to GDP-B
2. Constructing a digital basket of goods
3. GDP-B 2025: Results
4. Aggregation problem
5. Next steps

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1. GDP v welfare

GDP ≠ welfare

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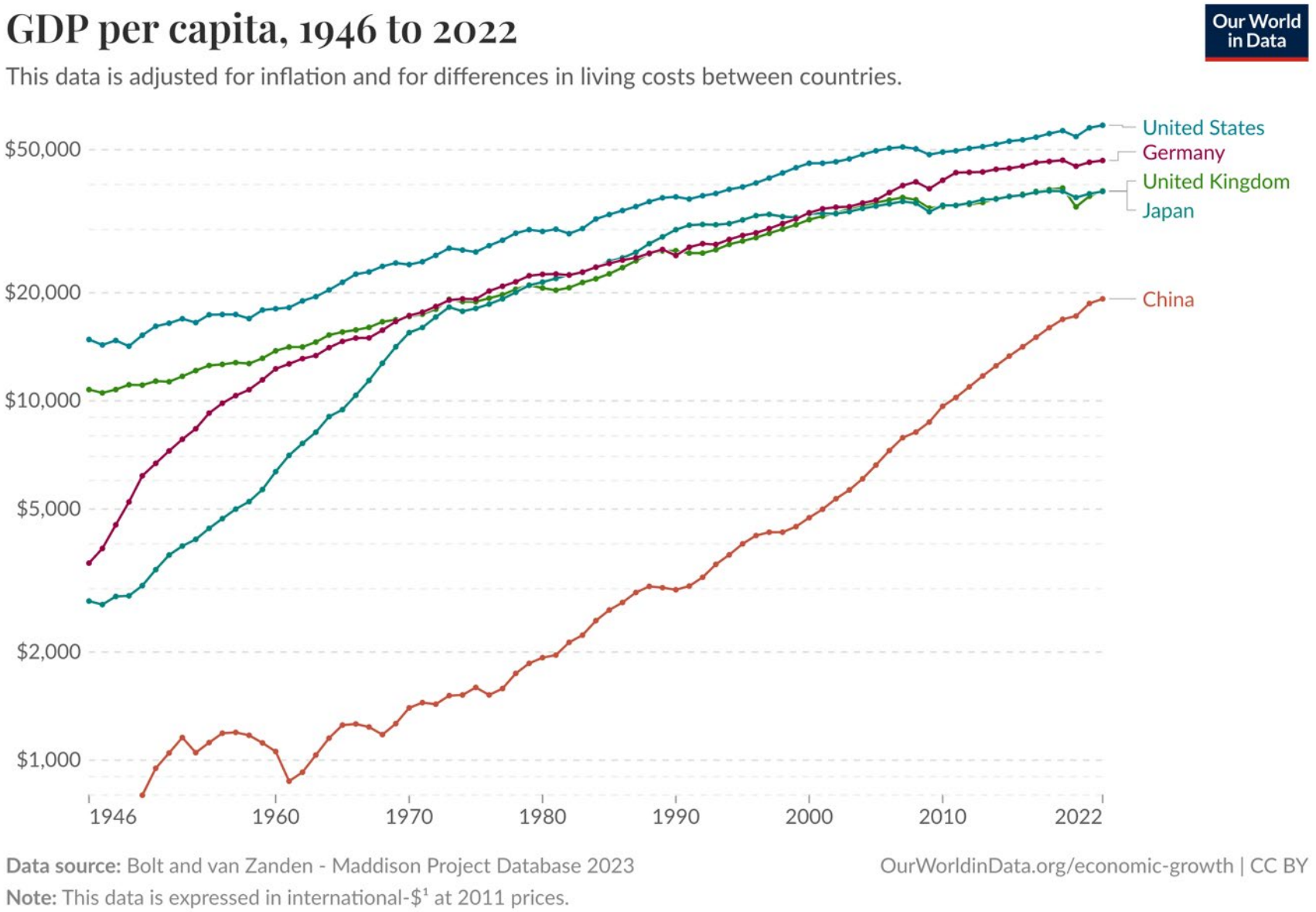

100%
80%
66%
33%

Logs!

GDP ≠ welfare

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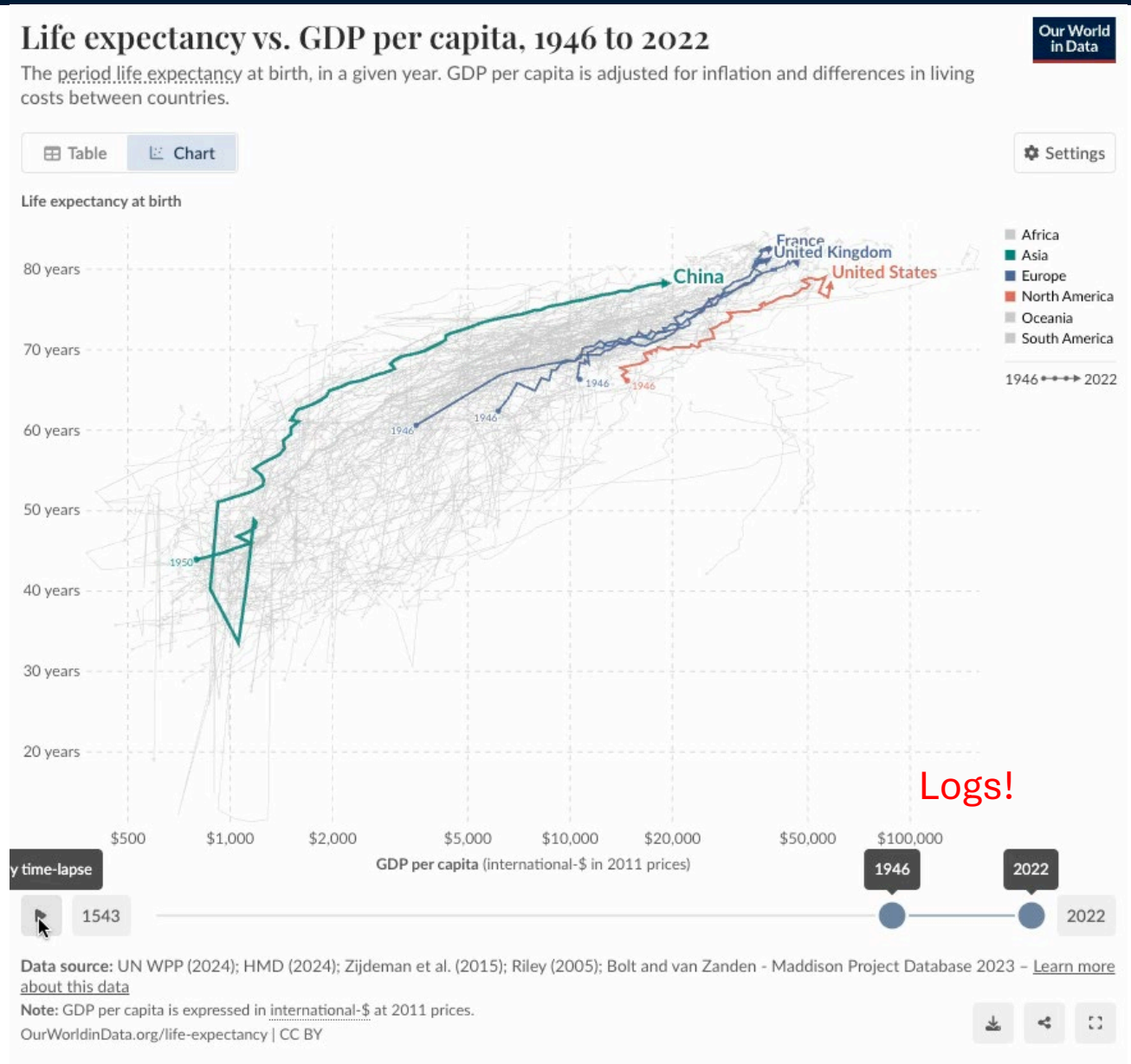

GDP ≠ welfare

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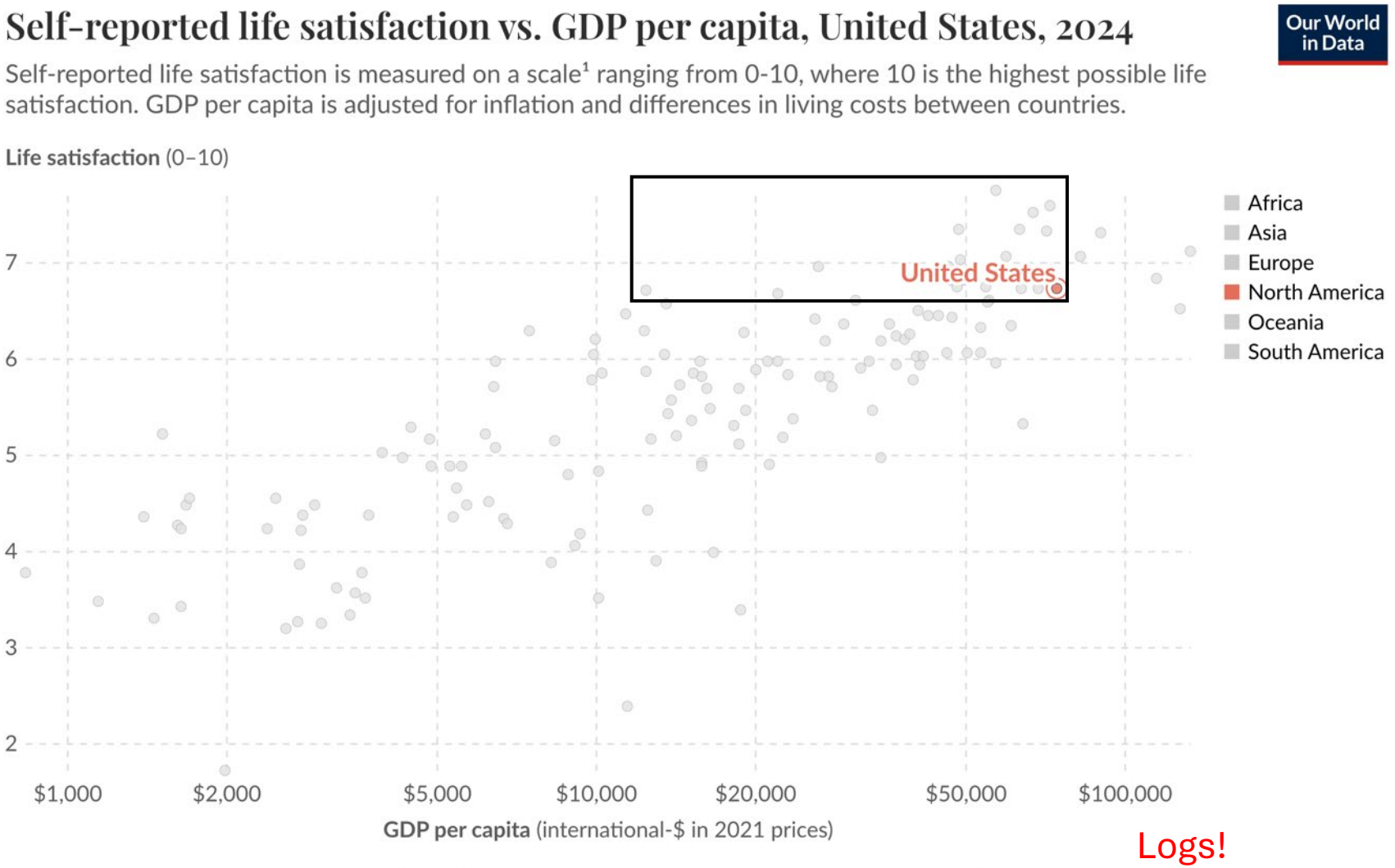

Logs!

GDP-B is our attempt to directly measure consumer welfare

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*"The **welfare of a nation** can scarcely be inferred from a measurement of national income as defined [by GDP.]"* (Simon Kuznets, 1934)

"[GDP] measures everything in short, **except that which makes life worthwhile**… [it] does not allow for the health of our children, the quality of their education or the joy of their play." (Robert F. Kennedy, 1968)

"A general increase in the availability of information can **increase consumer utility without increasing GDP**." (Hulten & Nakamura, 2017)

Selected studies

- Renewed interest after report from Stiglitz-Sen-Fitoussi Commission in 2009, calling for welfare measures beyond GDP.
- Ahmad & Schreyer (2016) highlight how the digital economy poses challenges to GDP (without invalidating it).
- Nakamura, Samuels, Soloveichik (2017) model free digital goods as barter transactions.
- GDP-B as measure of consumer surplus pioneered by Brynjolfsson, Collis, Eggers (PNAS: 2019) + theory paper with Diewert & Fox (AEJ: 2025).
- Coyle & Nguyen (2023), exploit sudden COVID lockdown and expand number of items in UK studies.

A dashboard of indicators

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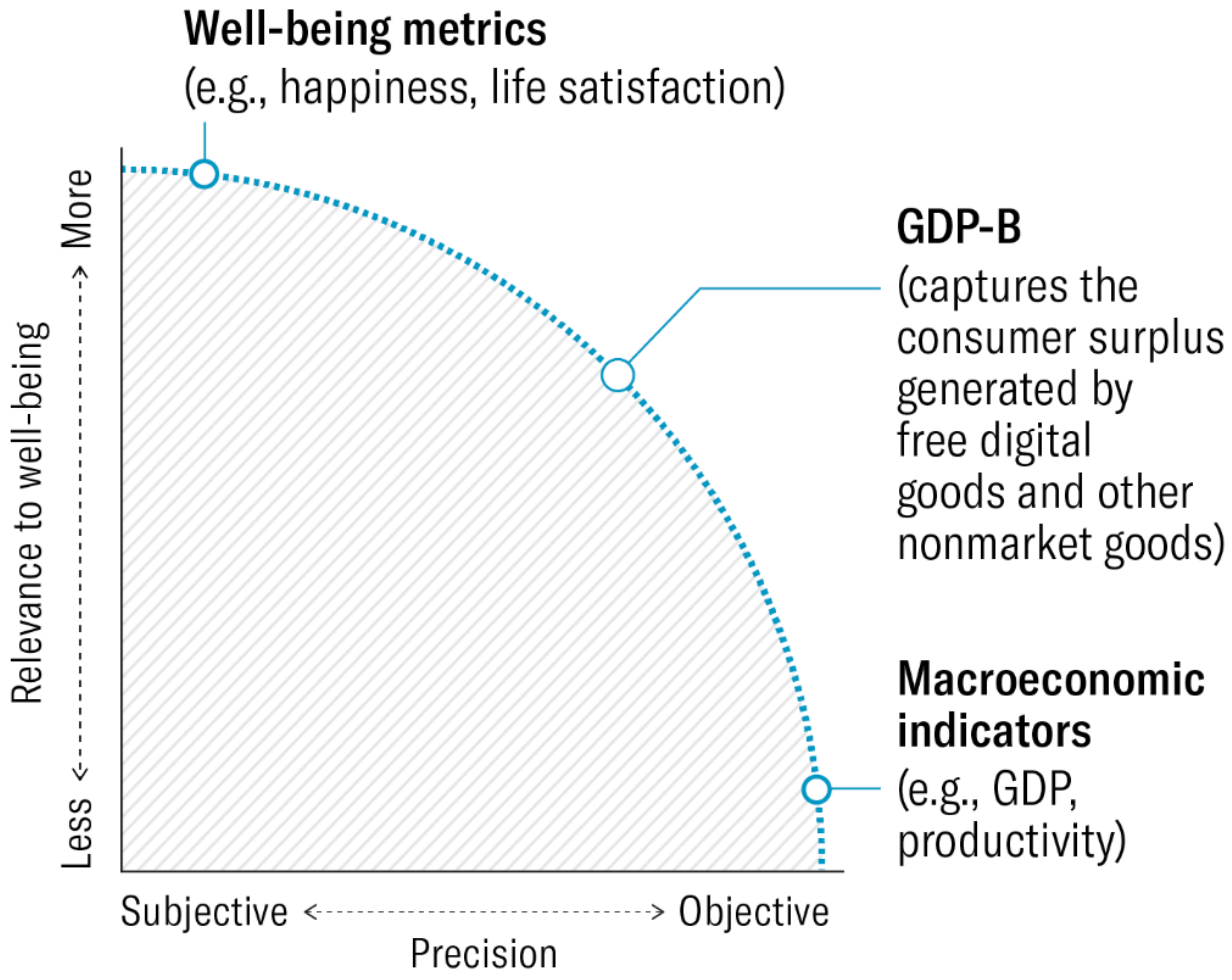
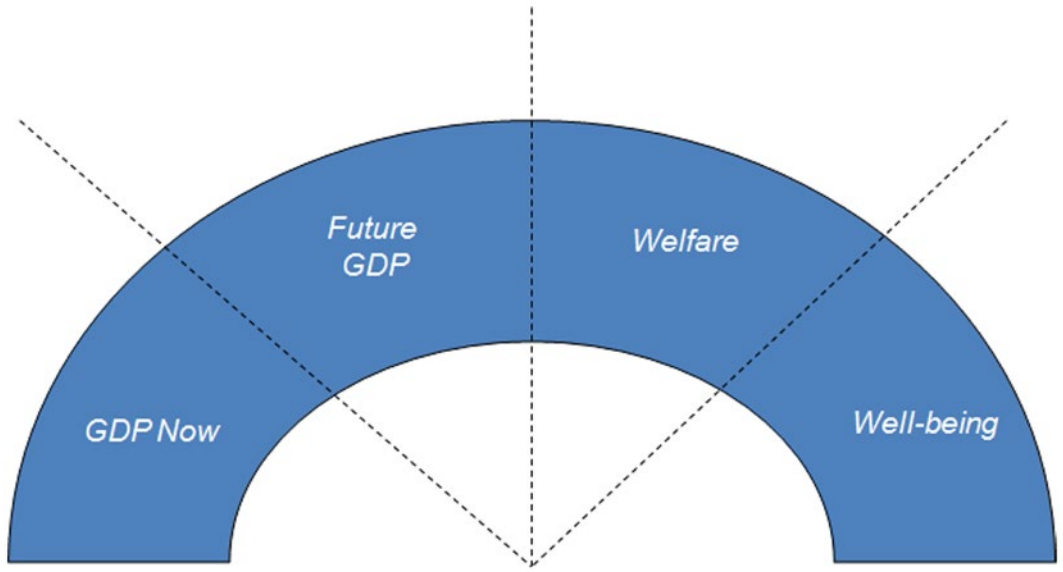


Brynjolfsson & Collis (2019), HBR



Heys et al. (2019), ESCoE DP

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2. Surveys

Production vs consumer surplus

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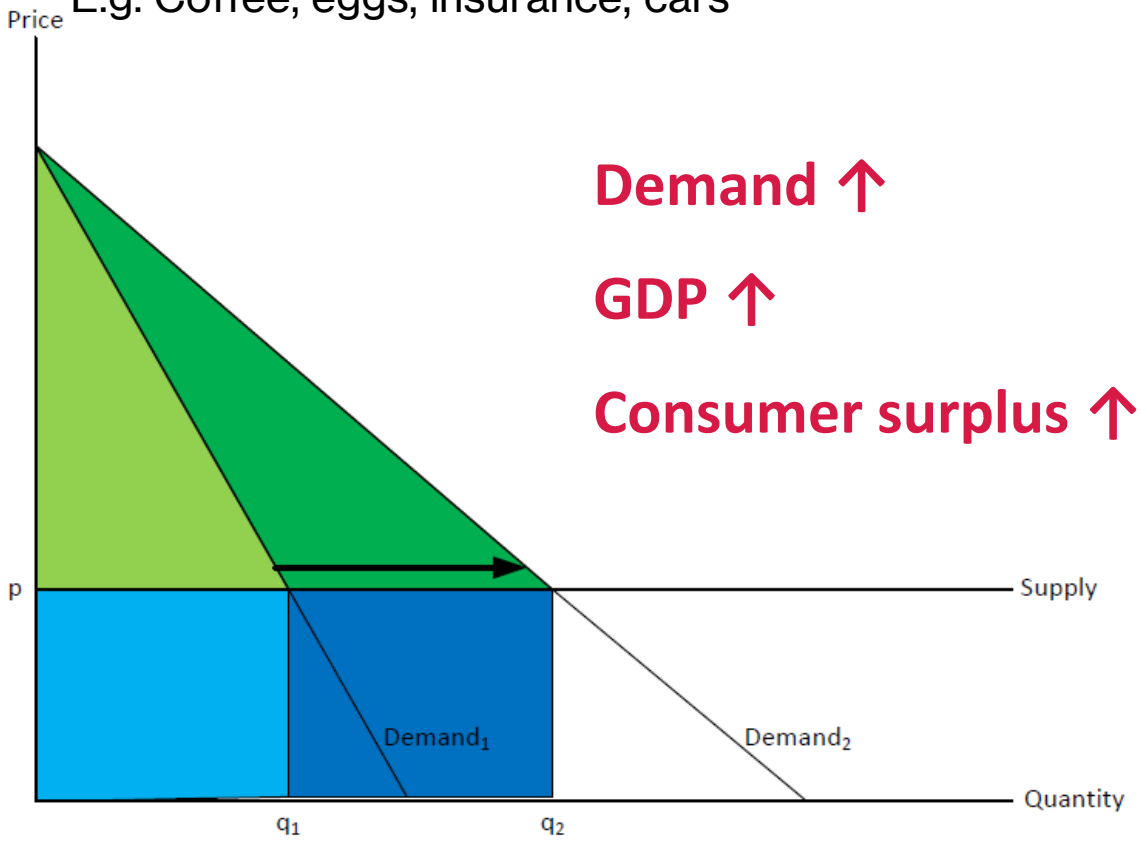
Case 1: Classic goods

E.g. Coffee, eggs, insurance, cars



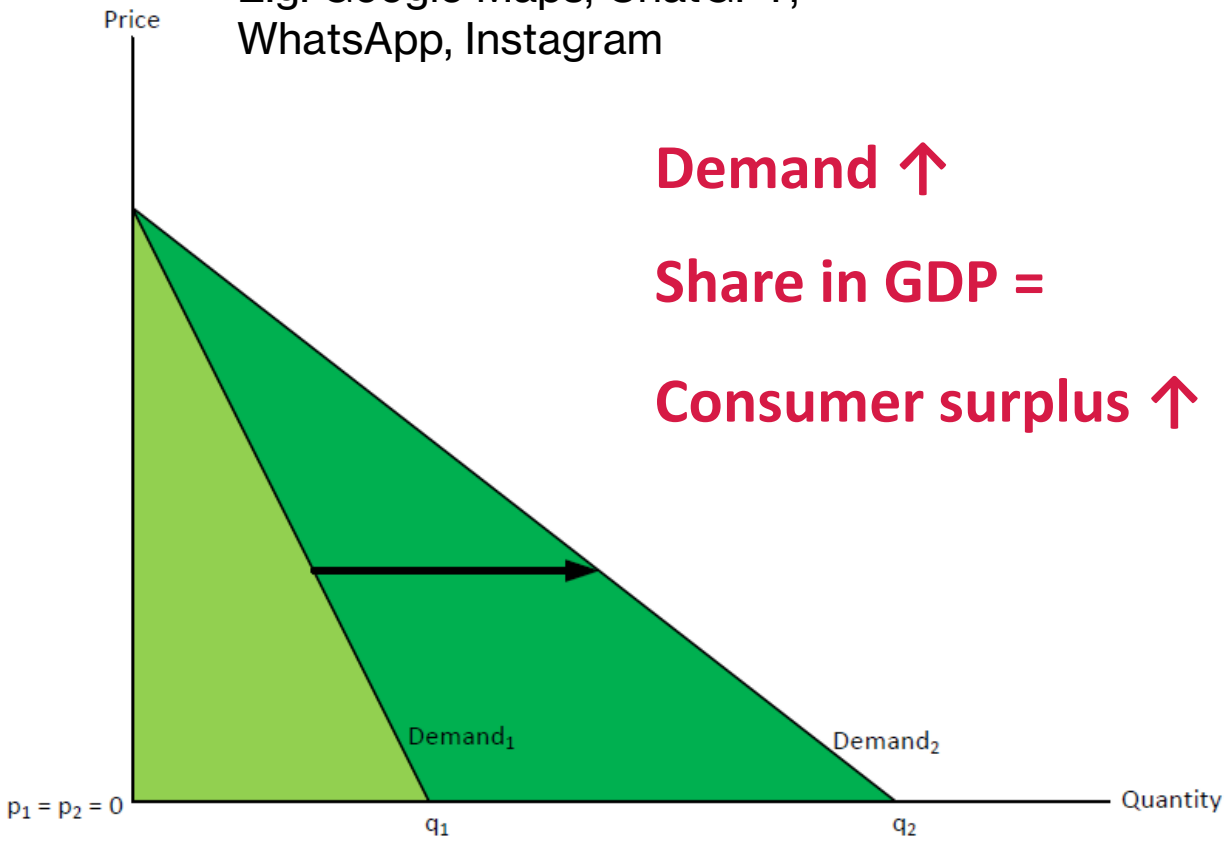
Demand ↑

GDP ↑

Consumer surplus ↑

Case 2: Digital goods

E.g. Google Maps, ChatGPT, WhatsApp, Instagram



Demand ↑

Share in GDP =

Consumer surplus ↑

Massive online discrete choice experiments

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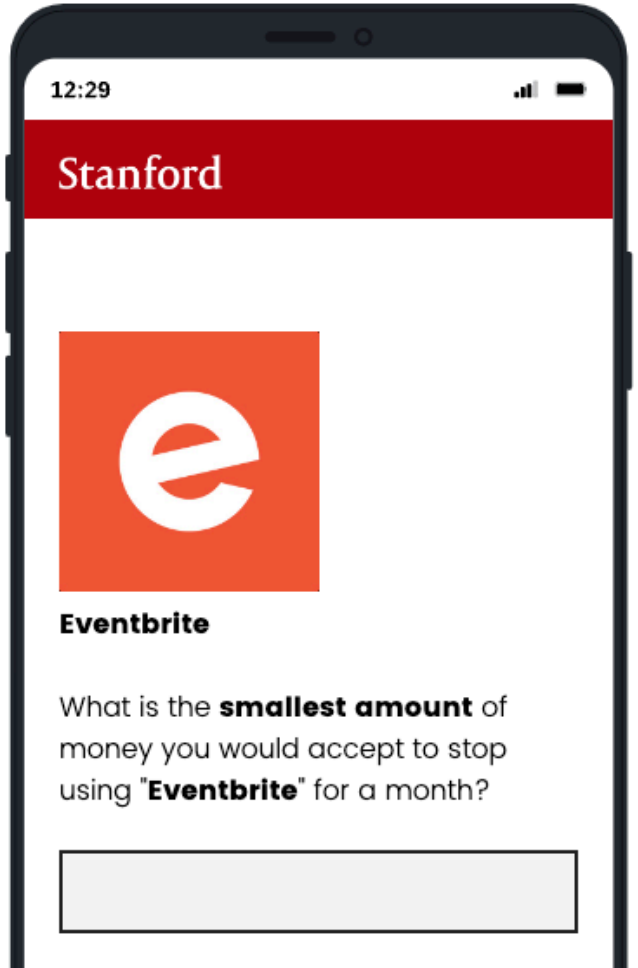
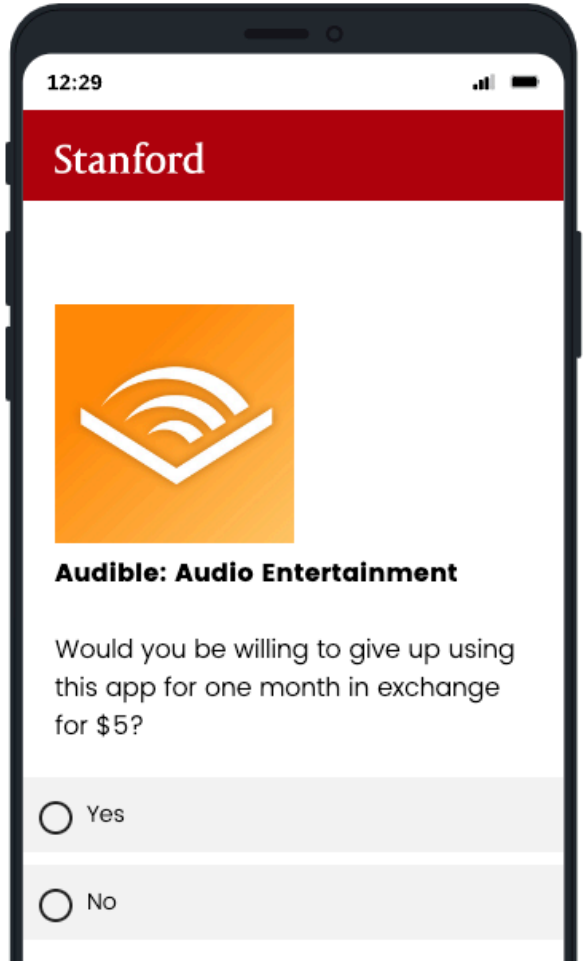
Open ended text



Cash offer



- Intuitive, no training needed.
- Works well on mobile.
- Flexible design, works for monetary and non-monetary offers.
- Easy to add logos and pictures.

Digital items without market prices

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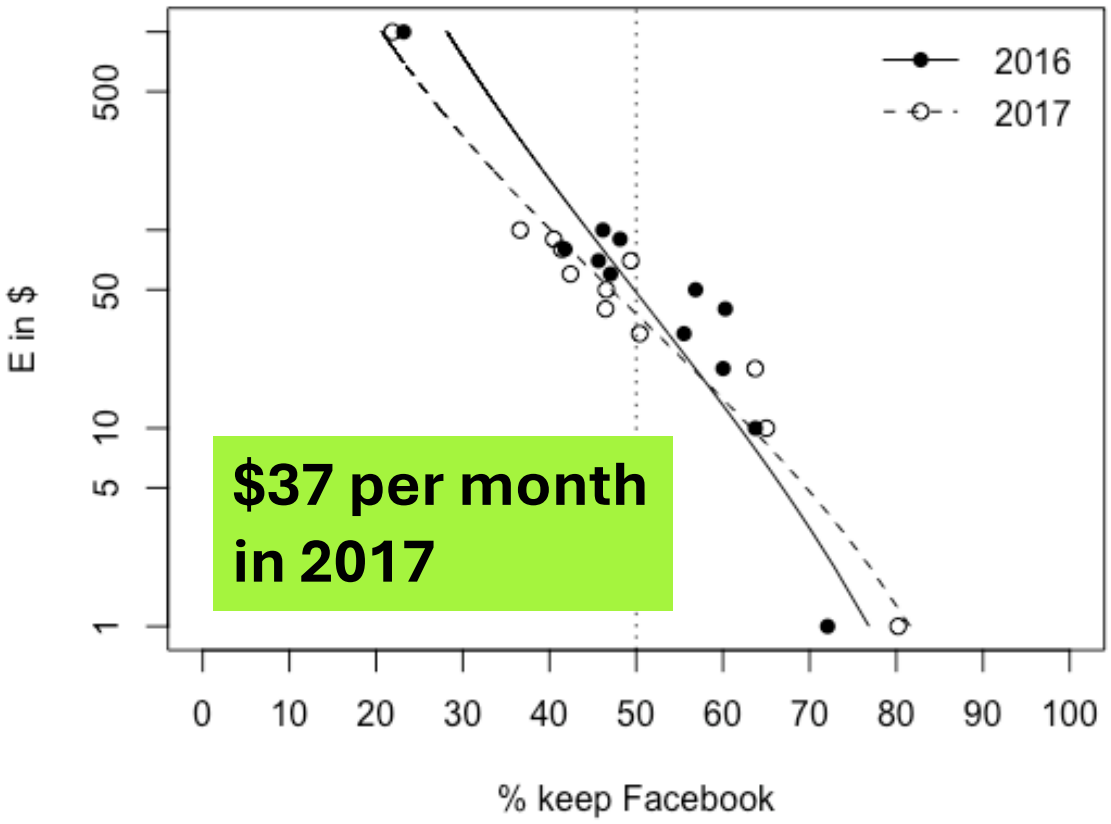
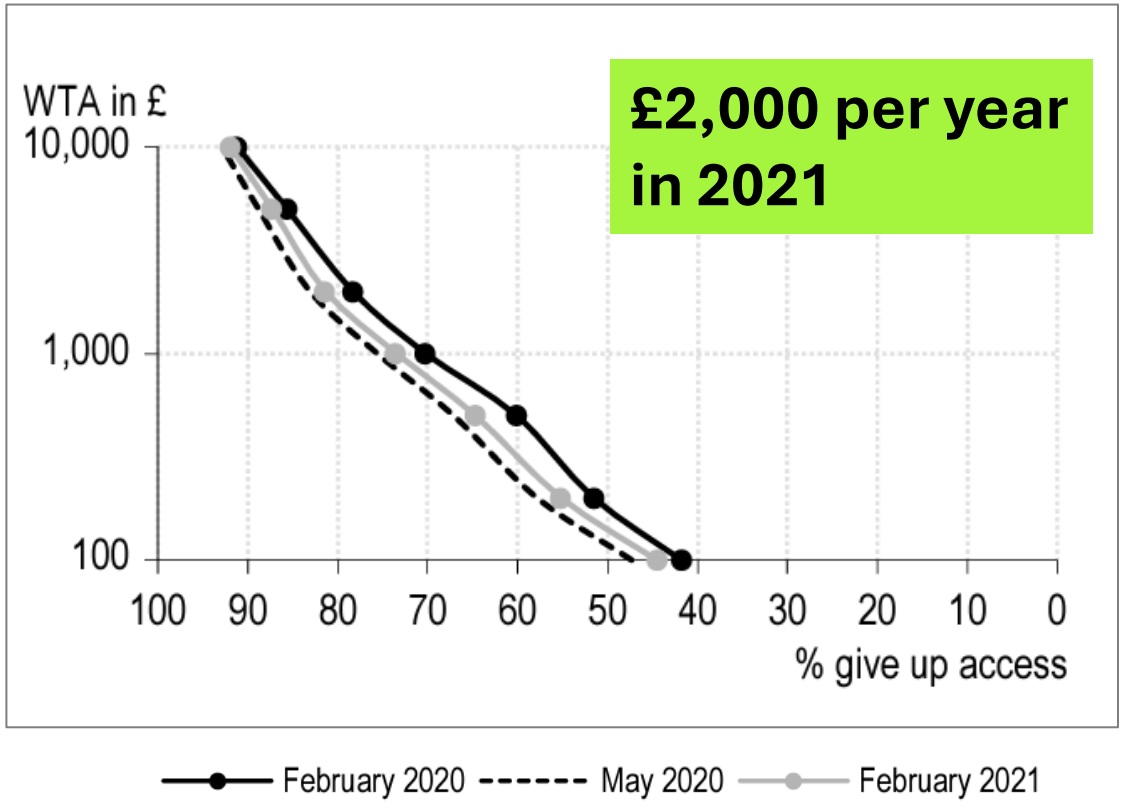
Facebook, US



Brynjolfsson, Collis, Eggers (2019), *PNAS*

Google Maps, UK



Coyle & Nguyen (2023), *Economie et Statistique*

GDP-B: Traditional consumption items

- The goal is to build a representative basket for the traditional and digital economy.
- For traditional items we rely on Consumer Expenditure Surveys (CE) from the Bureau of Labor Statistics (BLS).
- We choose 264 items covering most of the consumer spending (apart from housing).
- For example: eggs, apples, health insurance, sports equipment, private vehicles

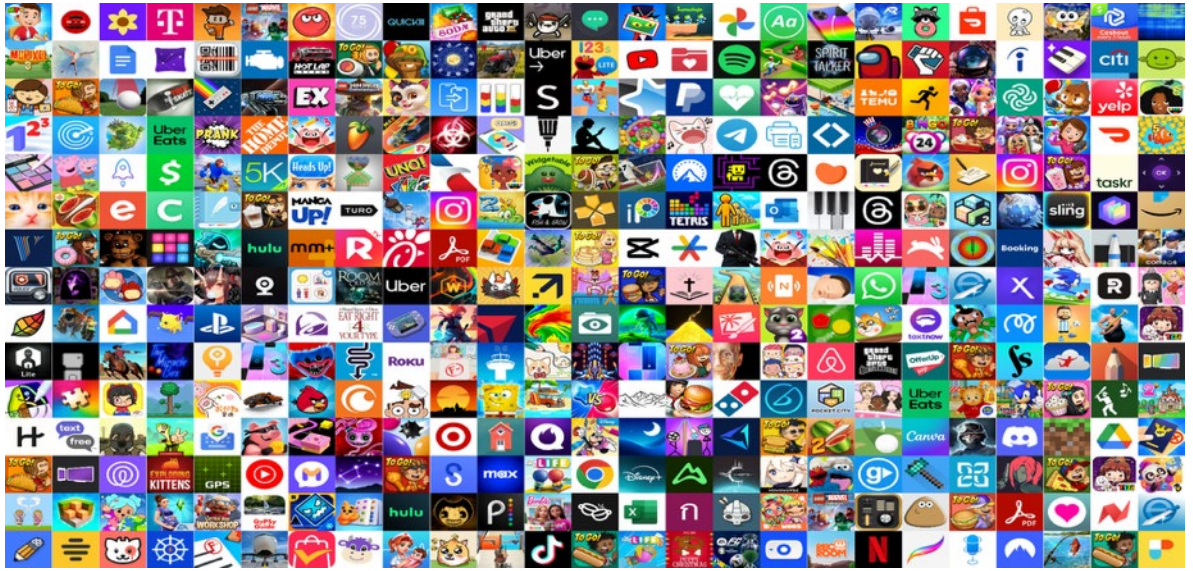
	All items		In GDP-B	
Level	Freq.	Percent	Freq.	Percent
1	14	1.98	4	1.52
2	84	11.90	34	12.88
3	188	26.63	66	25.00
4	215	30.45	78	29.55
5	150	21.25	71	26.89
6	38	5.38	11	4.17
7	17	2.41	-	-
Total	706	100.00	264	100.00

Table 2: Number of items in GDP-B by level

A “digital basket of goods”

Build long list of 1,000+ items:

- Number of downloads
- Number of website visits
- Number of active users
- Time spent



+ pre-installed apps (alarm, clock, calculator)

+ app categories (social media, navigation, etc)

+ top items in each category

Data collection process

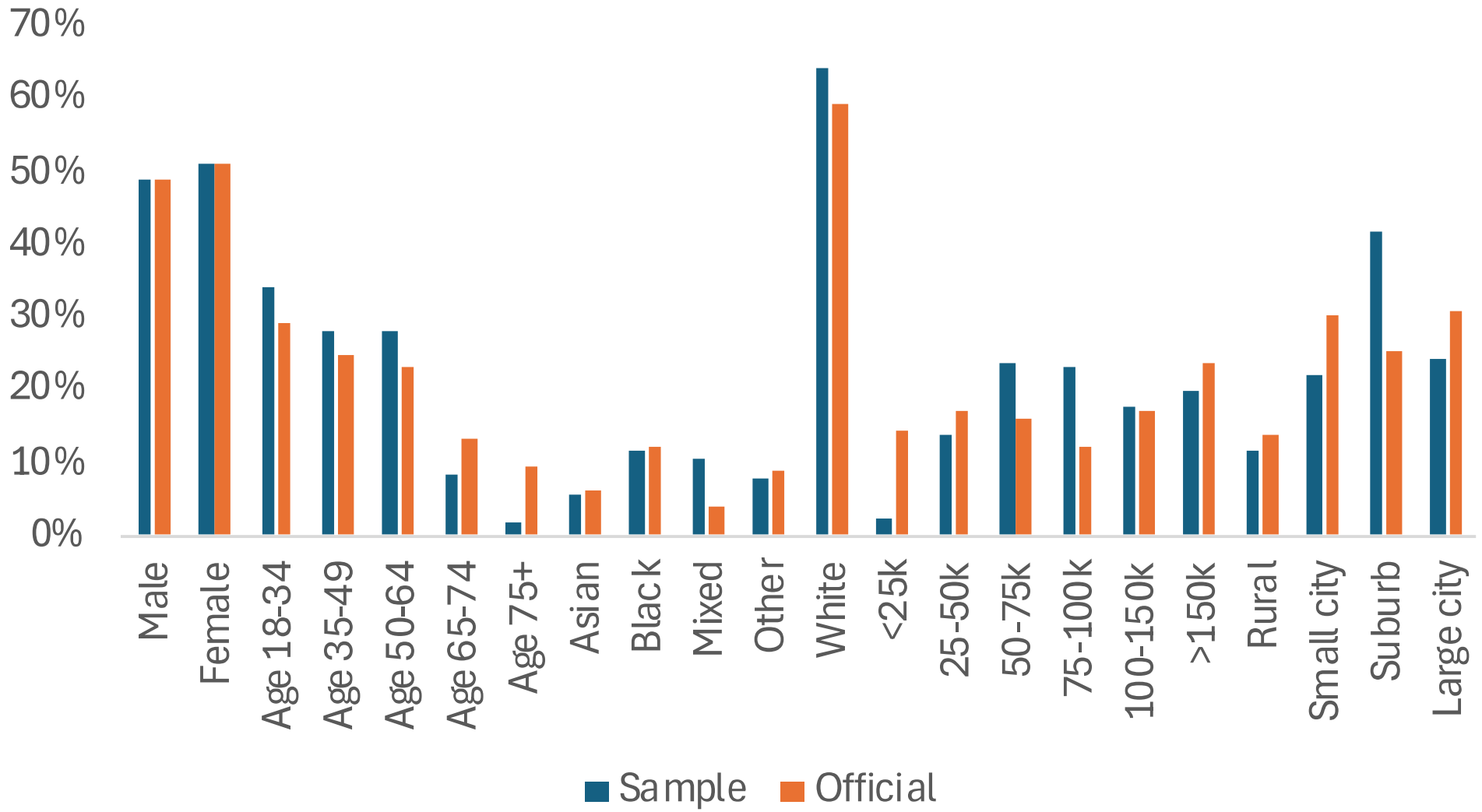
Run Single Binary Discrete Choice Surveys via Prolific, representative of US population (N=33,000) + open box survey (N=4,400).

Data collected in December 2024 and March 2025.

Average response time of 2:30 minutes for 15 questions.

Explicit and implicit attention checks (i.e. “fake apps”) passed by 97.3% of respondents.

Survey representativeness (unweighted)



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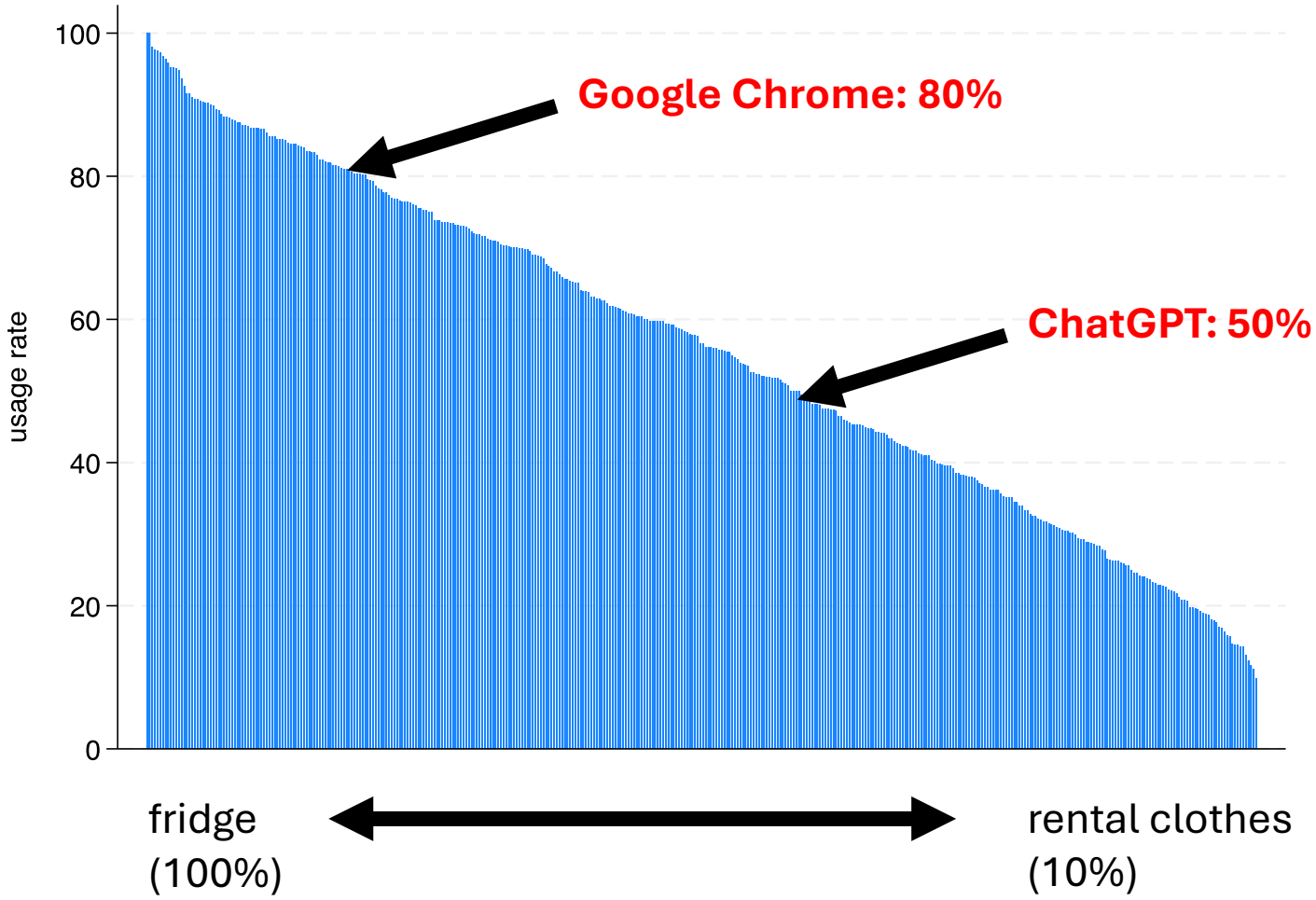
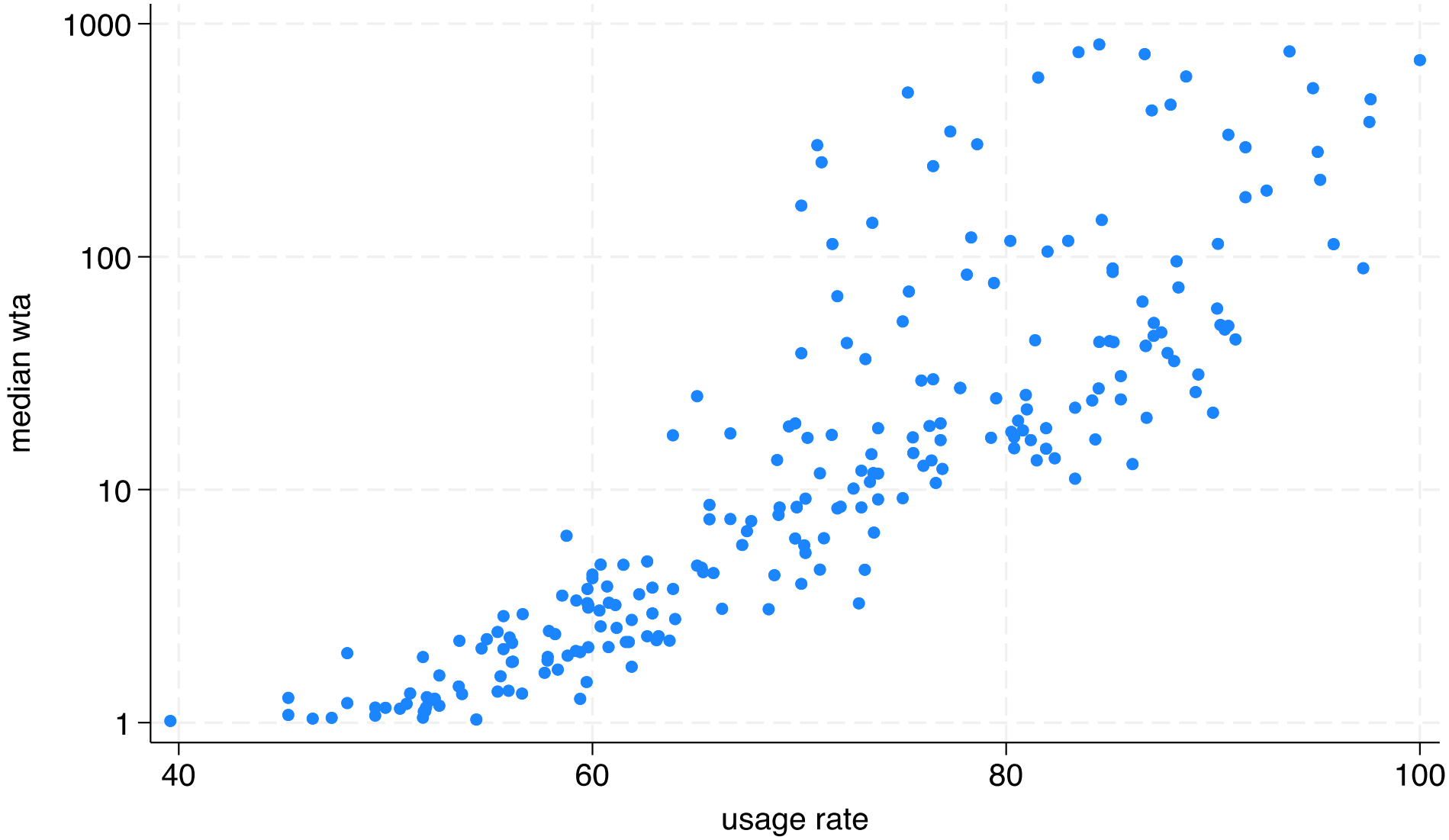
3. GDP-B: 2025 Results

Usage rates range from 10% to 100%

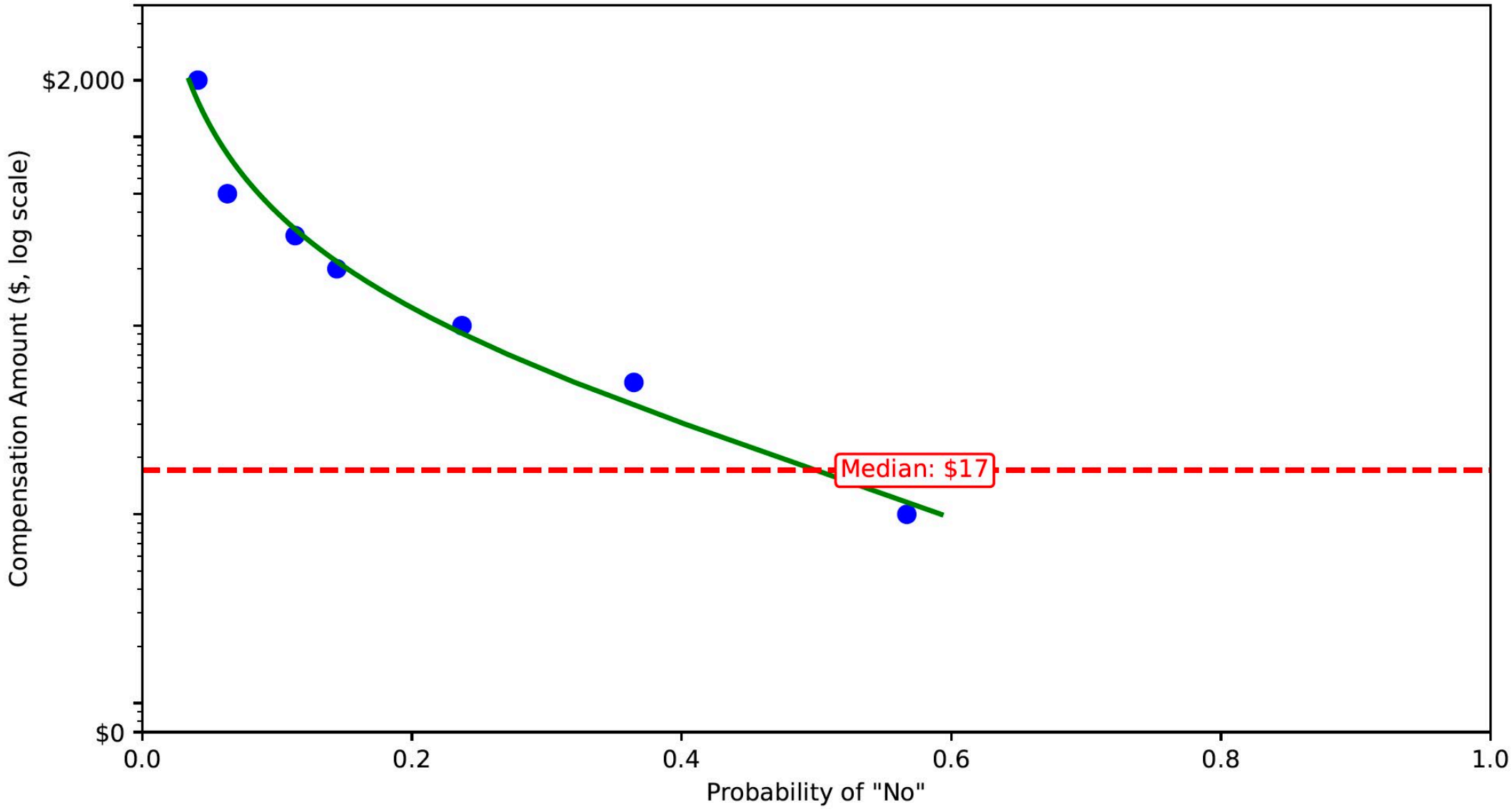
- Average usage rate is 44%, ranging from 10% (rental clothes) to 100% (fridge).
- High usage rates (80% or more) observed for one third of items.
- Low usage rates (30% or less) observed for 17% of items.



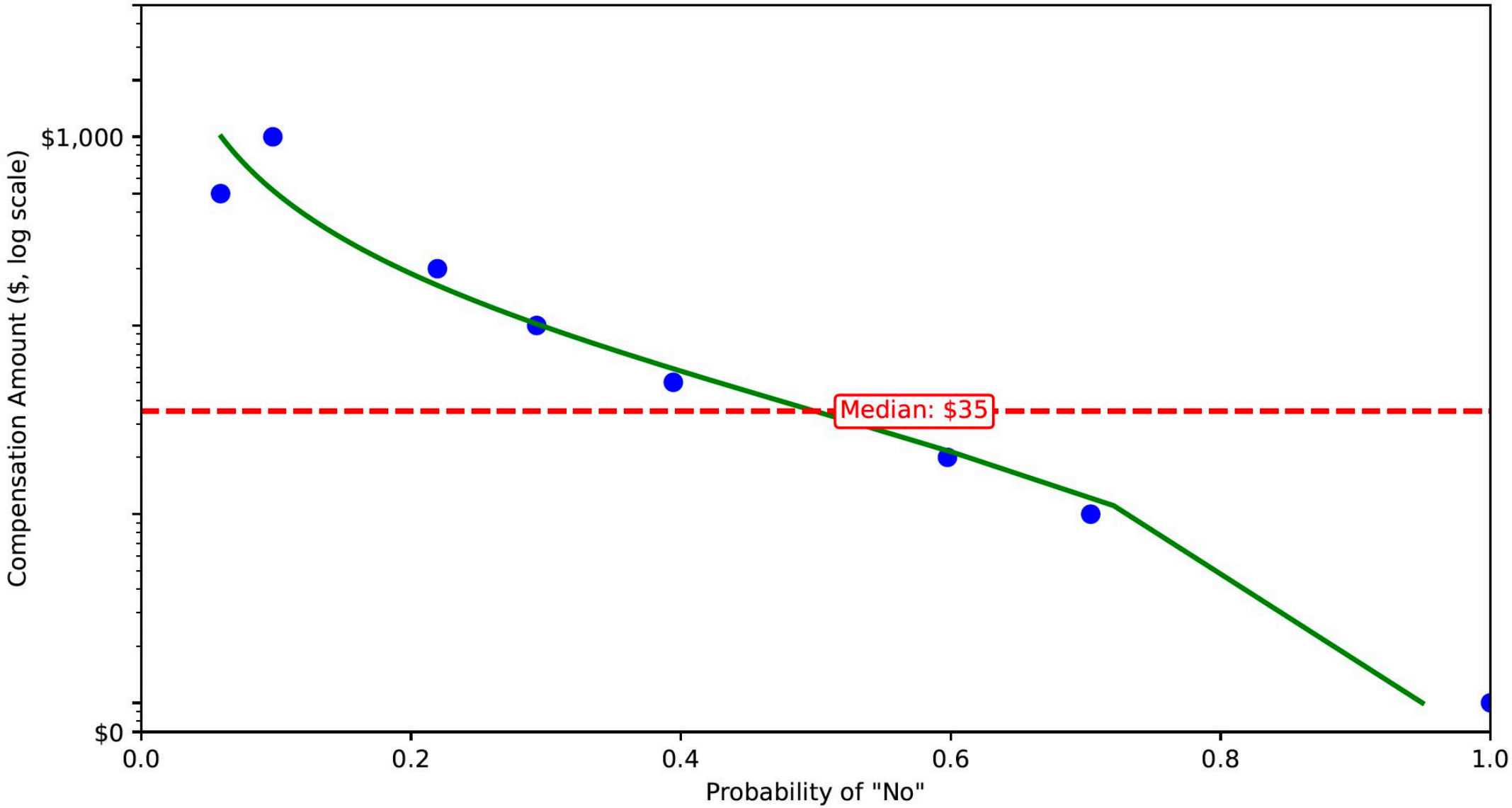
Usage correlated with WTA



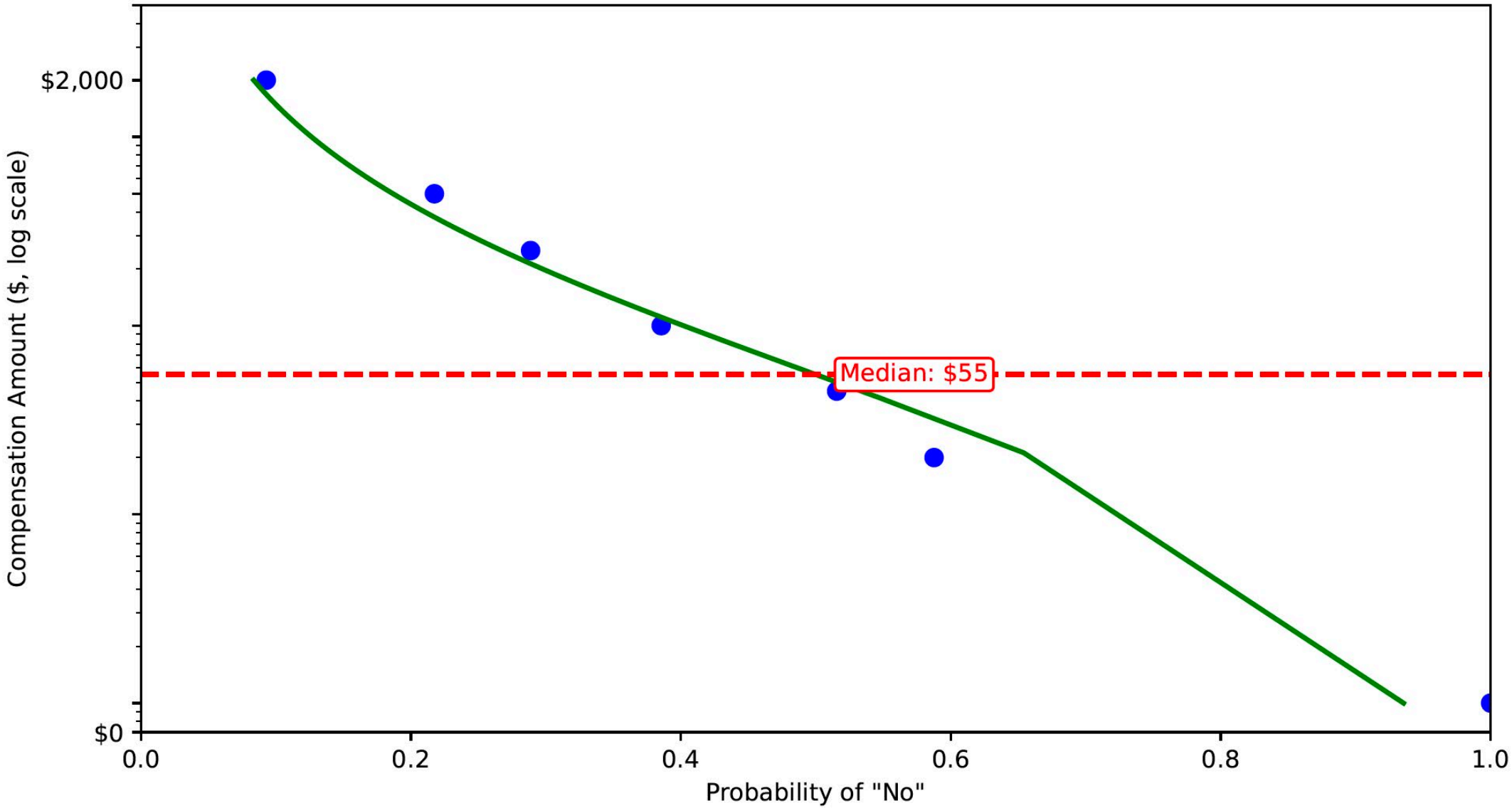
Traditional item example: Beef



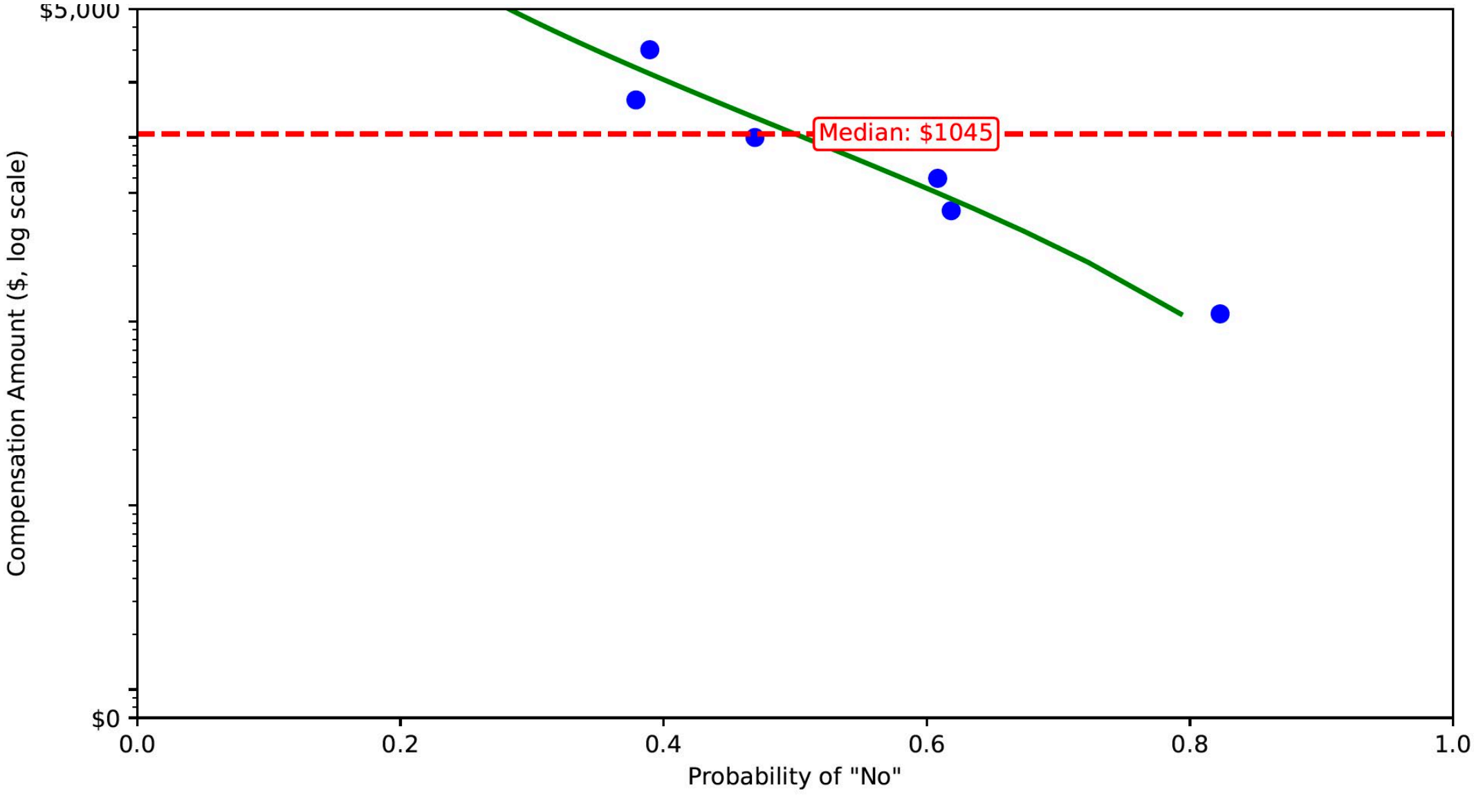
Digital item example: Google Chrome



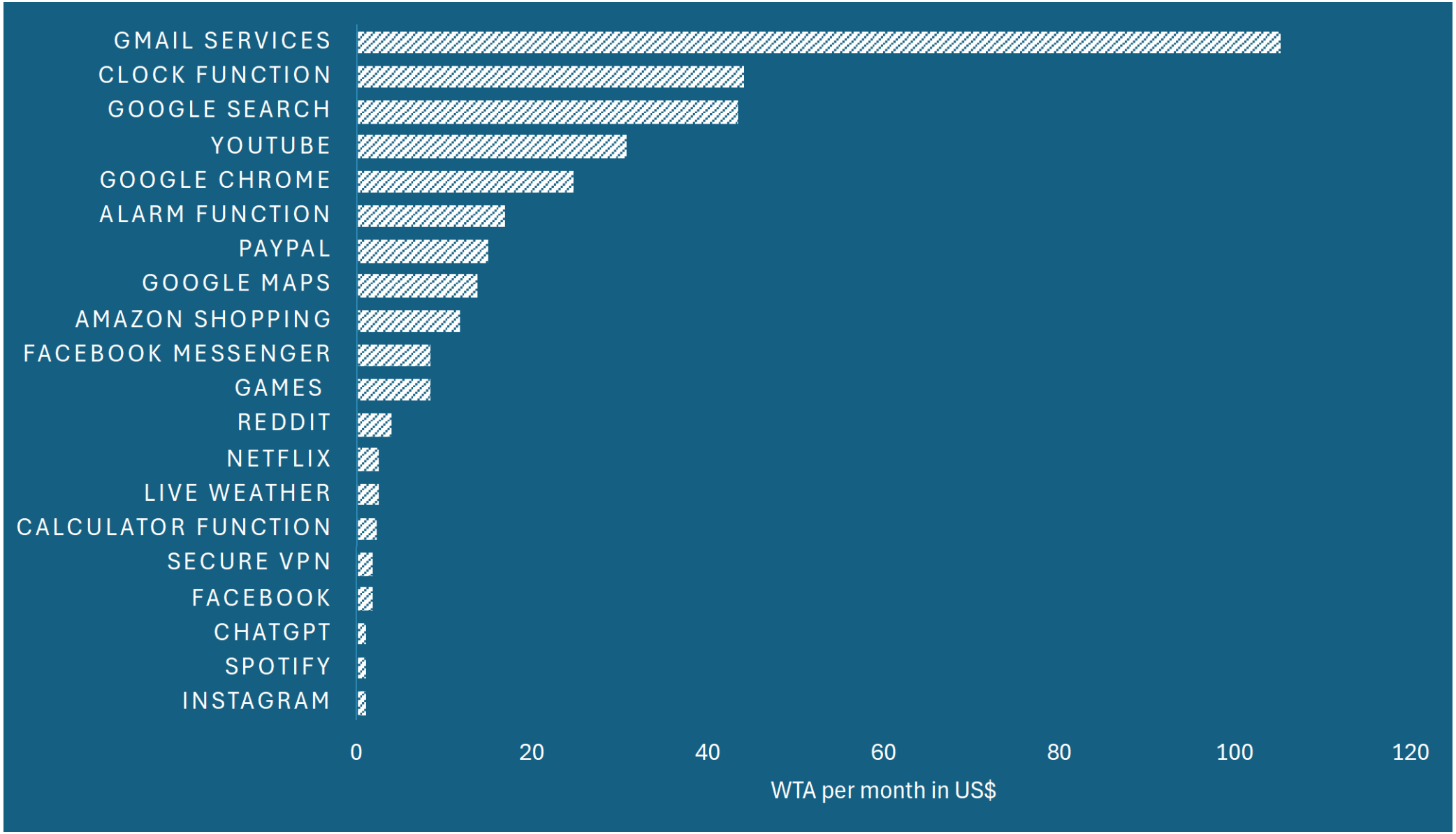
Seasonal item example: Air conditioning



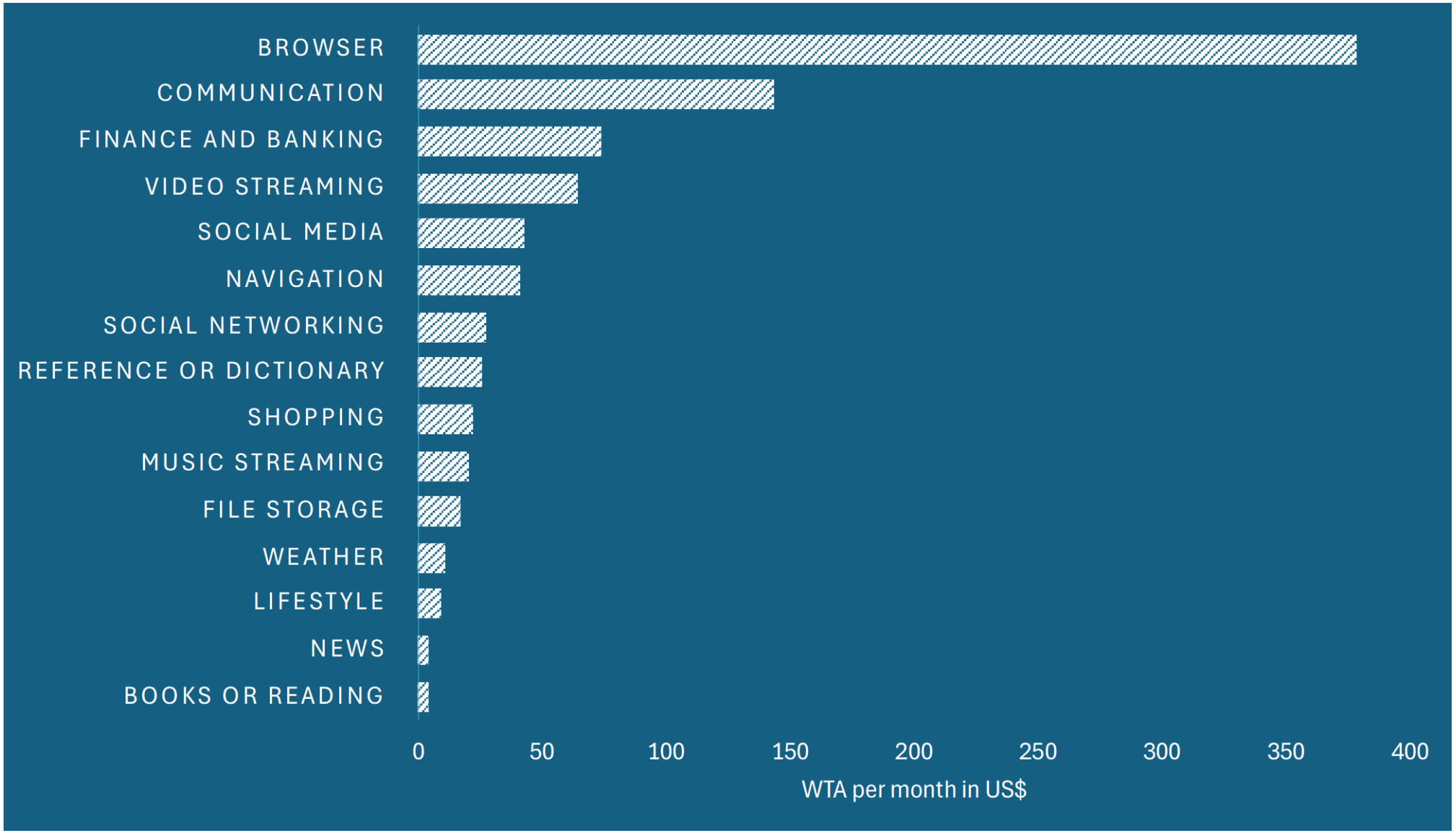
Durable item example: vehicles



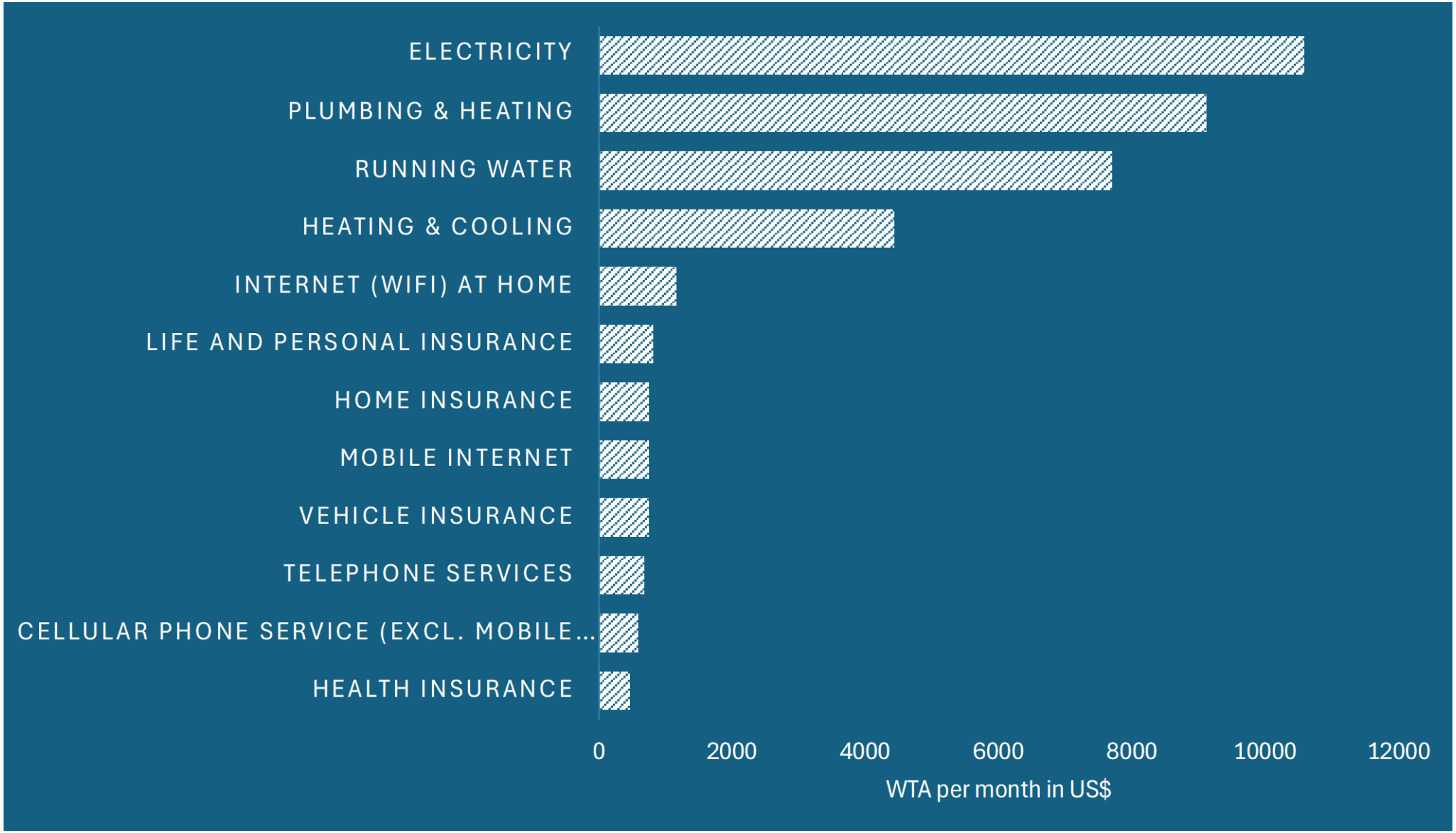
GDP-B: Digital items



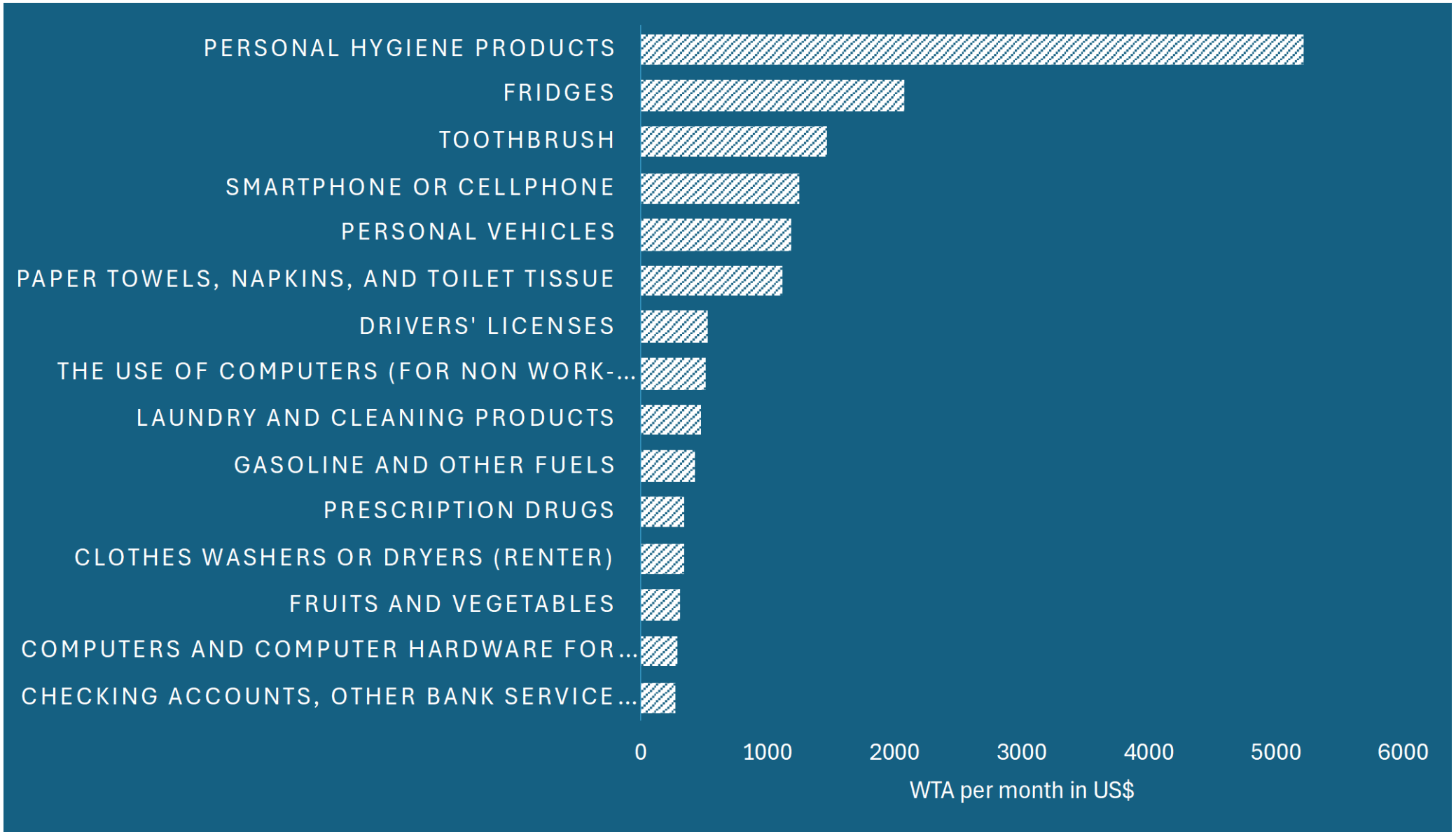
GDP-B: Digital categories



GDP-B: Basic utilities and insurance items



GDP-B: Other traditional items



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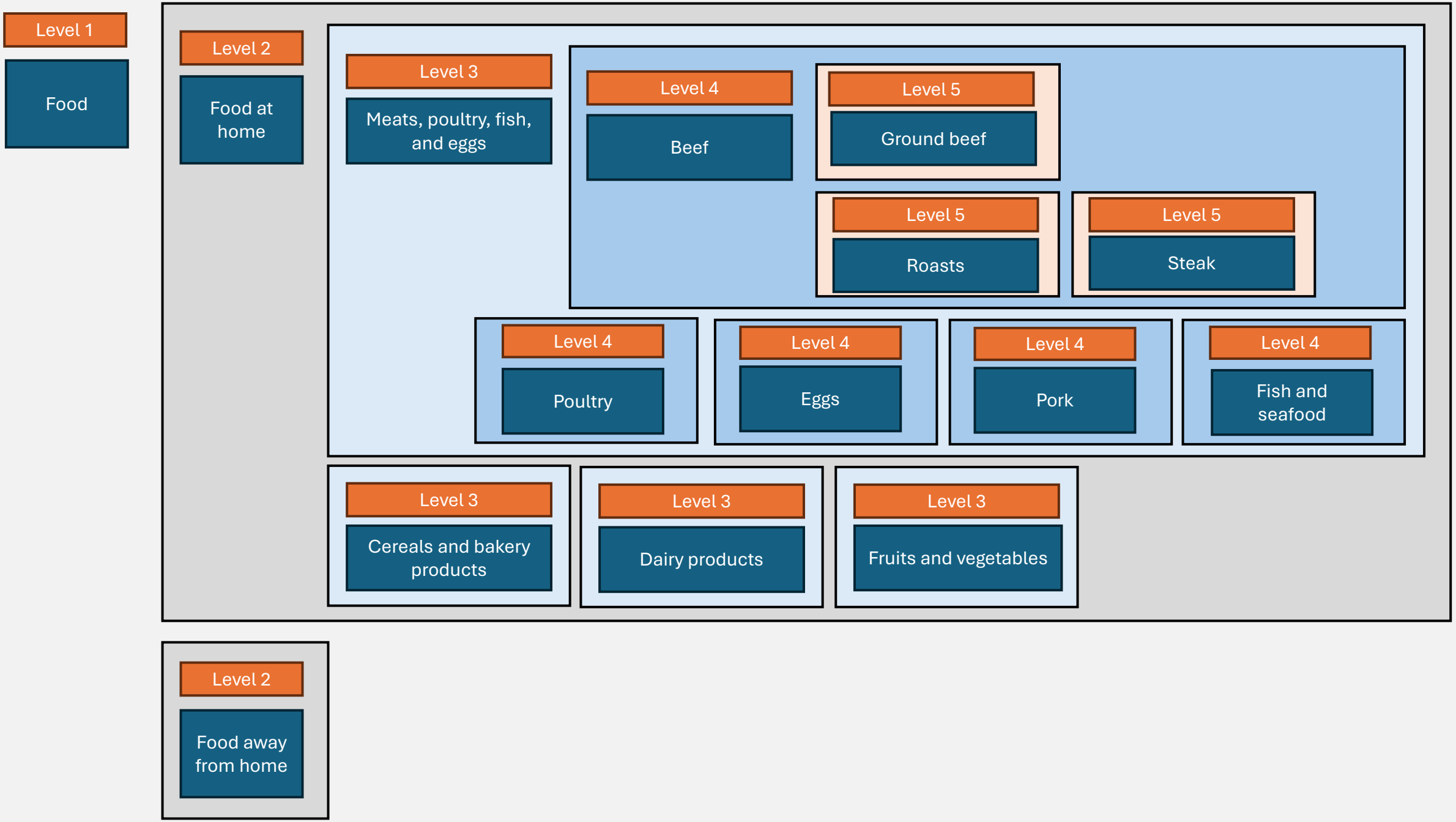
4. Aggregation problem


Level 1
Food
Level 2
Food at home
Level 3
Meats, poultry, fish, and eggs
Level 4
Beef
Level 5
Ground beef
Level 5
Roasts
Level 5
Steak
Level 4
Poultry
Level 4
Eggs
Level 4
Pork
Level 4
Fish and seafood
Level 3
Cereals and bakery products
Level 3
Dairy products
Level 3
Fruits and vegetables
Level 2
Food away from home


Meats, poultry, fish, and eggs
$179.9
$38.8
4.6
$16.8
Beef
1.6
$10.3
$2.2
Pork
0.3
$7.2
$22.1
Poultry
3.1
$7.1
$3.3
Fish and seafood
0.6
$6.1
$14.4
Eggs
4.4
$3.3
$4.3
Other meats
0.9
$5.0
$63.1
$38.8
1.6
$8.3
Ground beef
2.1
$4.7
$1.2
Roasts
0.9
$1.3
$1.2
Steak
0.4
$3.0
Other beef
$0.9
Bacon, breakfast sausage, and...
0.3
$2.6
$0.3
Pork chops
0.3
$1.2
$0.8
Ham
0.7
$1.2
Other pork
$21.4
Chicken
4.0
$5.3
Other poultry
$1.7
Fresh fish and shellfish
0.5
$3.5
$0.9
Processed fish and seafood
0.3
$2.6
$0.1
Frankfurters
0.07
$1.4
$3.5
Lunchmeats
1.2
$2.9
$0.3
Lamb, organ meat, and game
0.75
$0.4
$40.6
$30.1
1.3

Total surplus from traditional items

- Anywhere between **infinity** and **almost zero**?
  - CS from not being able to spend or do anything
  - CS from this apple versus that apple

- 135 million consumer units in the US in 2023.
  - Average income (after tax): $7,300 / month
  - Average spending: $6,450 / month
  - Average surplus: $???

Total surplus from traditional items

Category	Surplus	Expenditure	Ratio
Housing	44,694	2,120	21.1
Personal care products and services	6,857	79	86.6
Transportation	3,498	1,098	3.2
Healthcare	2,243	513	4.4
Food	1,904	832	2.3
Personal insurance and pensions	814	796	1.0
Entertainment	474	303	1.6
Miscellaneous	379	99	3.8
Apparel and services	217	170	1.3
Reading	65	10	6.6
Education	34	138	0.2
Alcoholic beverages	3	53	0.1
Cash contributions	2	198	0.0
Tobacco products and smoking supplies	0	31	0.0

GDP-B for the digital economy

- The surplus from all 24 digital categories adds up to $900 per month, around 18% of average monthly income in the US.
  - Accounts for substitutability within categories (e.g. Google v Apple Maps) but not across categories (e.g. Social media v news).
  - Upper bound: smartphone $1,245 + computer $506

- Not all digital items are free (Netflix, Spotify, ChatGPT), so GDP-B measures surplus on top of savings.
  - For example, surplus from video and audio streaming is $166, needs to be added to the $31 the average person spends on these per month.
  - Google Maps is free so it's 100% surplus.

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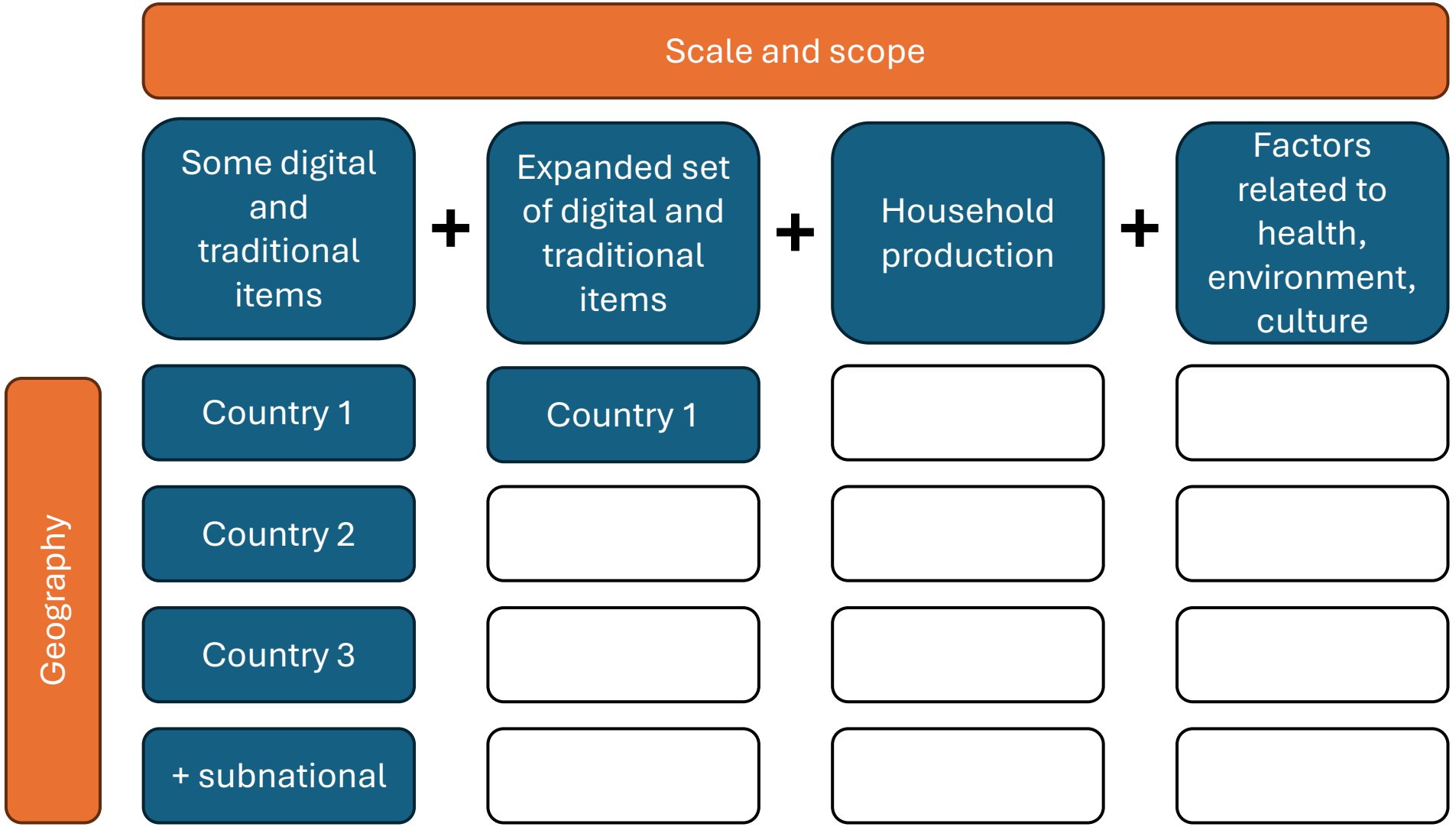
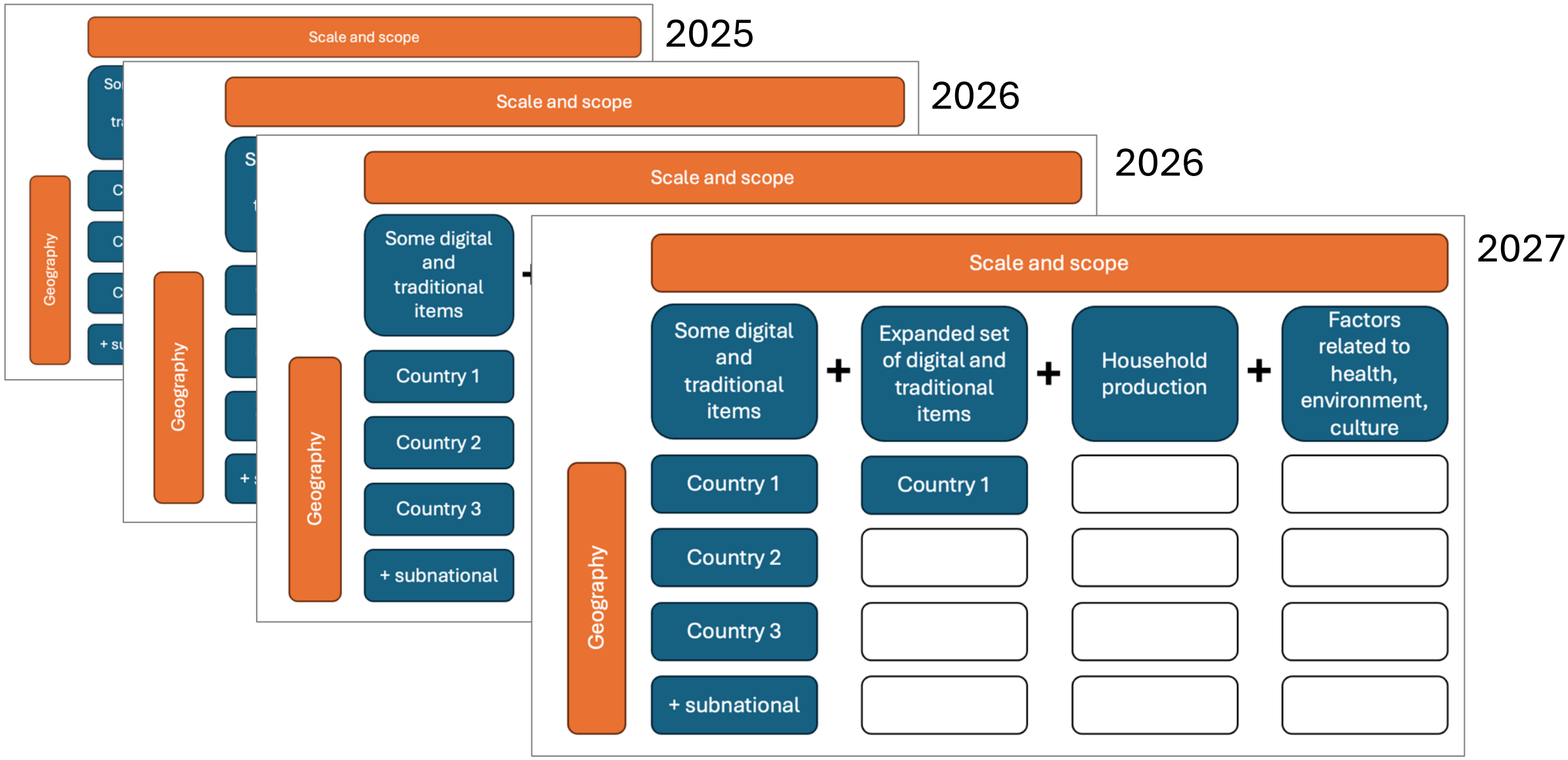
5. Next steps for GDP-B

GDP-B next steps: Expanding geography and scale and scope of basket



GDP-B next steps: Expanding geography and scale and scope of basket



Next steps for GDP-B

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1. Producing and publishing regular GDP-B numbers. We aim to match the official quarterly GDP release schedule.
2. Expanding the number of items (traditional, digital) + quality of life factors health, environmental assets, household production, culture and social connection.
3. Exploit variation across groups and geography. Quantify types of survey biases.
4. Augment surveys with LLM agents from complementary projects at the lab. This should enhance efficiency, speed, and lower costs of surveying.
   - Sophia Kazinnik presenting more on this tomorrow, Thursday, in Contributed session K: New methods/data

Where to find more

- Brynjolfsson, Erik, Avinash Collis, and Felix Eggers. "**Using massive online choice experiments to measure changes in well-being**". *Proceedings of the National Academy of Sciences* 116.15: 7250-7255, 2019.
- Brynjolfsson, Erik, Avinash Collis, W. Erwin Diewert, Felix Eggers, and Kevin J. Fox. "**GDP-B: Accounting for the value of new and free goods in the digital economy**". Forthcoming in *American Economic Journal: Macroeconomics*.
- Brynjolfsson, Erik, et al. "**The digital welfare of nations: New measures of welfare gains and inequality**". NBER Working Paper No. w31670, 2025.
- Brynjolfsson, Erik, Avinash Collis, Sophia Kazinnik, David Nguyen. "**Measuring Consumer Surplus at Scale**". Working Paper, 2025.
- Brynjolfsson, Erik, Sophia Kazinnik, José Ramón Enríquez, and David Nguyen. "**Augmenting Human Survey Responses with Generative AI: An Application to Economic Research**". Working Paper, 2025.
- Brynjolfsson, Erik, Avinash Collis, and Felix Eggers. "**LLM Time Machines: Valuing digital goods over time**". Working Paper, 2025

Stanford team behind GDP-B

Core research team

Erik Brynjolfsson

David Nguyen

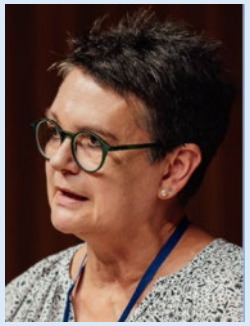
Sophia Kazinnik

Key collaborators

Avi Collis

Xiupeng Wang

GDP-B Advisory Committee



Diane Coyle

Jason Liu

Paul Schreyer

Leonard Nakamura

Rachel Soloveichik

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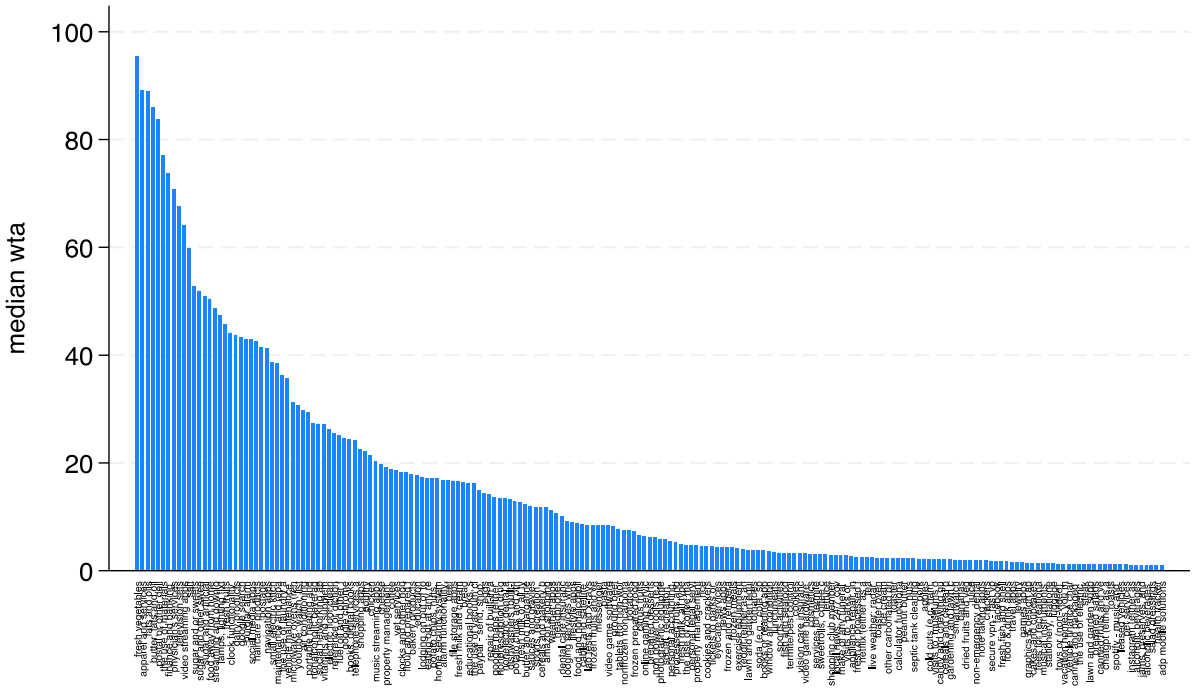
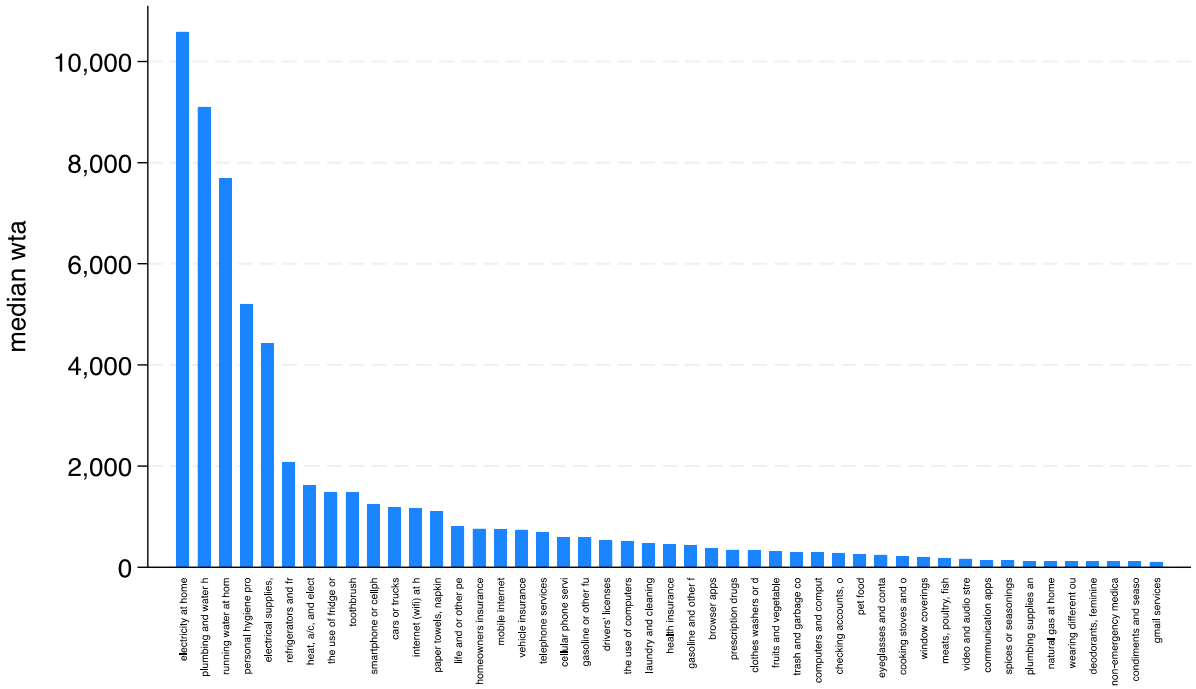
Additional slides

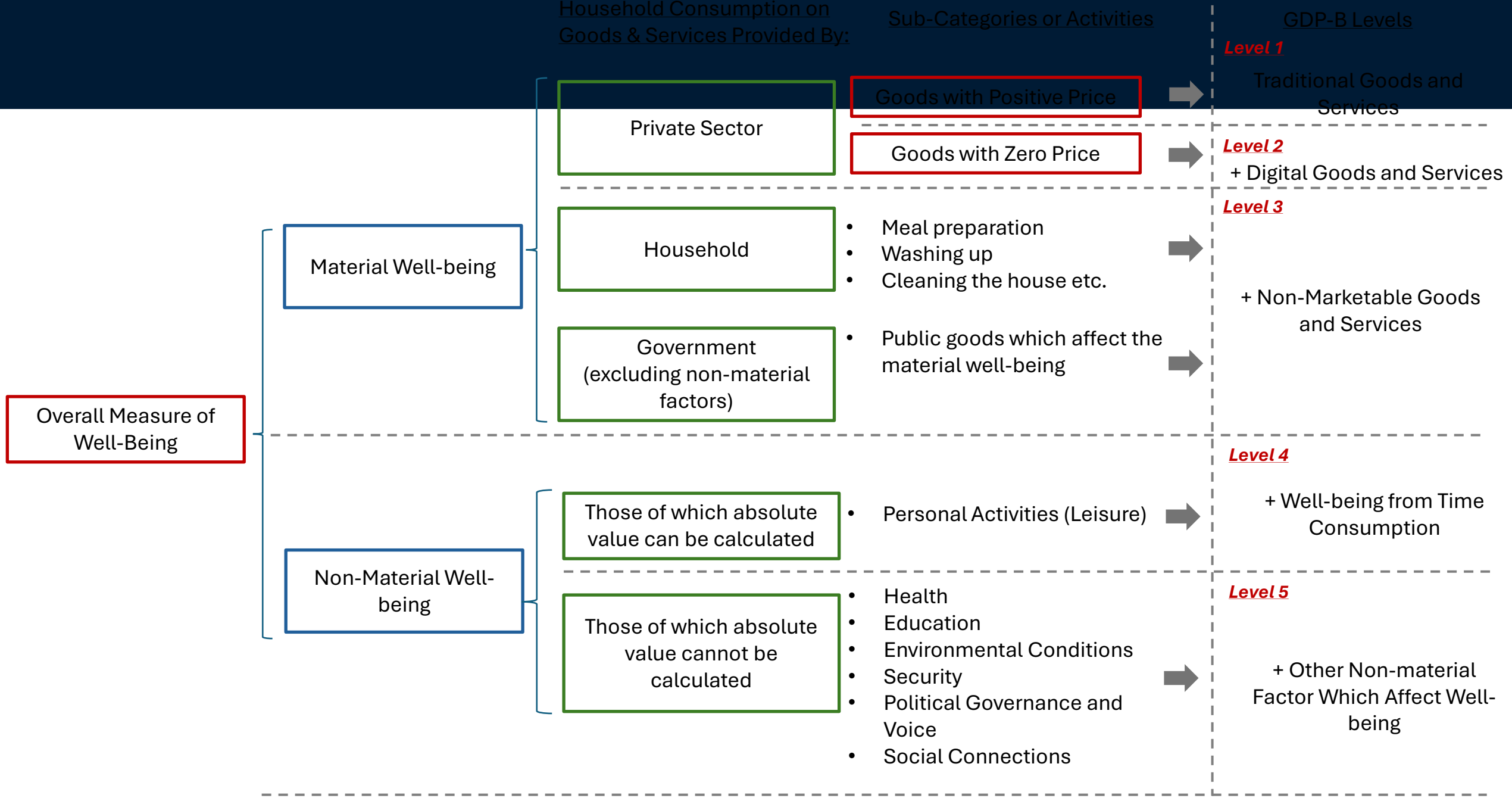
GDP-B results: summary

Median WTA = $1-100
(203 items)



Median WTA = $100+
(47 items)




Household Consumption on Goods & Services Provided By:
Sub-Categories or Activities
GDP-B Levels
Level 1
Traditional Goods and Services
Overall Measure of Well-Being
Material Well-being
Private Sector
Goods with Positive Price
Goods with Zero Price
Level 2
+ Digital Goods and Services
Household
Meal preparation
Washing up
Cleaning the house etc.
Level 3
Government (excluding non-material factors)
Public goods which affect the material well-being
+ Non-Marketable Goods and Services
Non-Material Well-being
Those of which absolute value can be calculated
Personal Activities (Leisure)
Level 4
+ Well-being from Time Consumption
Those of which absolute value cannot be calculated
Health
Education
Environmental Conditions
Security
Political Governance and Voice
Social Connections
Level 5
+ Other Non-material Factor Which Affect Well-being