

# IIT Madras

## ONLINE DEGREE

# **Managing Businesses Using Data**

**G Venkatesh, M Sureshbabu, Milind Gandhe**



**Cast Study Guests:**

**Omkar (Flipkart), Sivakumar (Astrazeneca), Varsha (Mercer), Venkat (Paypal)**

# Learning objectives

- Understand the business context:
  - consumption patterns
  - micro-economic concepts underlying demand and supply
- Analyse firm-level and industry-level data
- Discover how businesses operate, and how they are actively managed using data dashboards
- Get a handle on the data that originates from business processes
- Identify the techniques used to represent and structure this data
- Gain skills on the use of worksheets to organise, interpret and present data
- These are to be delivered through a mix of:
  - conceptual lectures
  - case study presentations
  - spread sheet working illustrations
  - mini assignments
  - course project

# Course contents integrate topics from many sources

Introduces business management through the lens of a data scientist

- Micro and macro economics
  - Finance and accounting
  - Marketing and Strategy
  - Production
  - Management Information Systems
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- No single text book reference for the course



# Weeks 1-2: Micro economics

- Week 0: Introduction to the course. Tutorial on spreadsheets: Excel & Google sheets
- Week 1: Consumption and demand
  - Micro & Macro economics: the role of data
  - production, consumption and exchange
  - consumption baskets
  - sources of consumer survey data
- Week 2: Micro-economic concepts:
  - Utility: cardinal vs ordinal, indifference curves
  - Demand and supply curves, changes in demand and elasticity
  - production cost, cost curves
  - Make vs buy decisions
  - production quantity decisions

# Weeks 3-4: Firm data analysis

- Week 3: Firm level strategies and performance data:
  - Pricing strategies
  - Analysis of firm performance - key ratios
- Analysis examples:
  - Ultratech
  - Page Industries
  - Nestle
  - TCS
- Week 4: Analysing industry level data:
  - Industry definition and classification codes, IIP and PMI
  - Market structure and concentration
  - Porter's five forces
  - Analysis examples:
    - Cement industry
    - Textile industry
    - FMCG industry
    - IT industry

**Assignment:** Prepare report on the sales and profit trends of a company (and its competitive position)  
Each student will be assigned a company for the purpose of this assignment



# Case study 1 - Fabmart (E-Commerce)

- Week 5:
  - Introduction to E-Commerce
  - Fabmart case introduction
  - explanation of data set & questions to be answered
  - revenue pareto, volume pareto
  - scatter plot of sales and revenue, revenue trend
- Week 6:
  - Sales analysis: organisation of distribution centre
  - analysis of sales trends
  - average days of inventory
  - ledger: avoiding stockouts
- **Assignment:** Prepare sales and inventory analysis report for a specific data set

# Case study 2 - Ace Gears (Manufacturing)

- Week 7:
  - introduction to the manufacturing sector
  - context of the automotive industry during the years 2019-2021
  - monthly information on sales, production, inventory and costing
  - revenue trend analysis
  - portfolio management
- Week 8:
  - regional sales analysis: sales agent planning
  - production scheduling
  - scrap analysis
  - unit level profitability analysis
  - raw material re-ordering and safety stock
- Assignment: Prepare report on revenue trends, unit level profitability and operational efficiency using a specific data set

# Case study 3 - Tech Enterprises (HR)

- Week 9:
  - introduction to HR as a function
  - introduction to the Tech Enterprises case
  - internal sourcing, ranking of internal candidates
  - job descriptions
  - sourcing channels and their analysis
  - recruitment process and onboarding

**Assignment:** Prepare report on ranking of candidates according to specified criterion given a specific candidate profile list

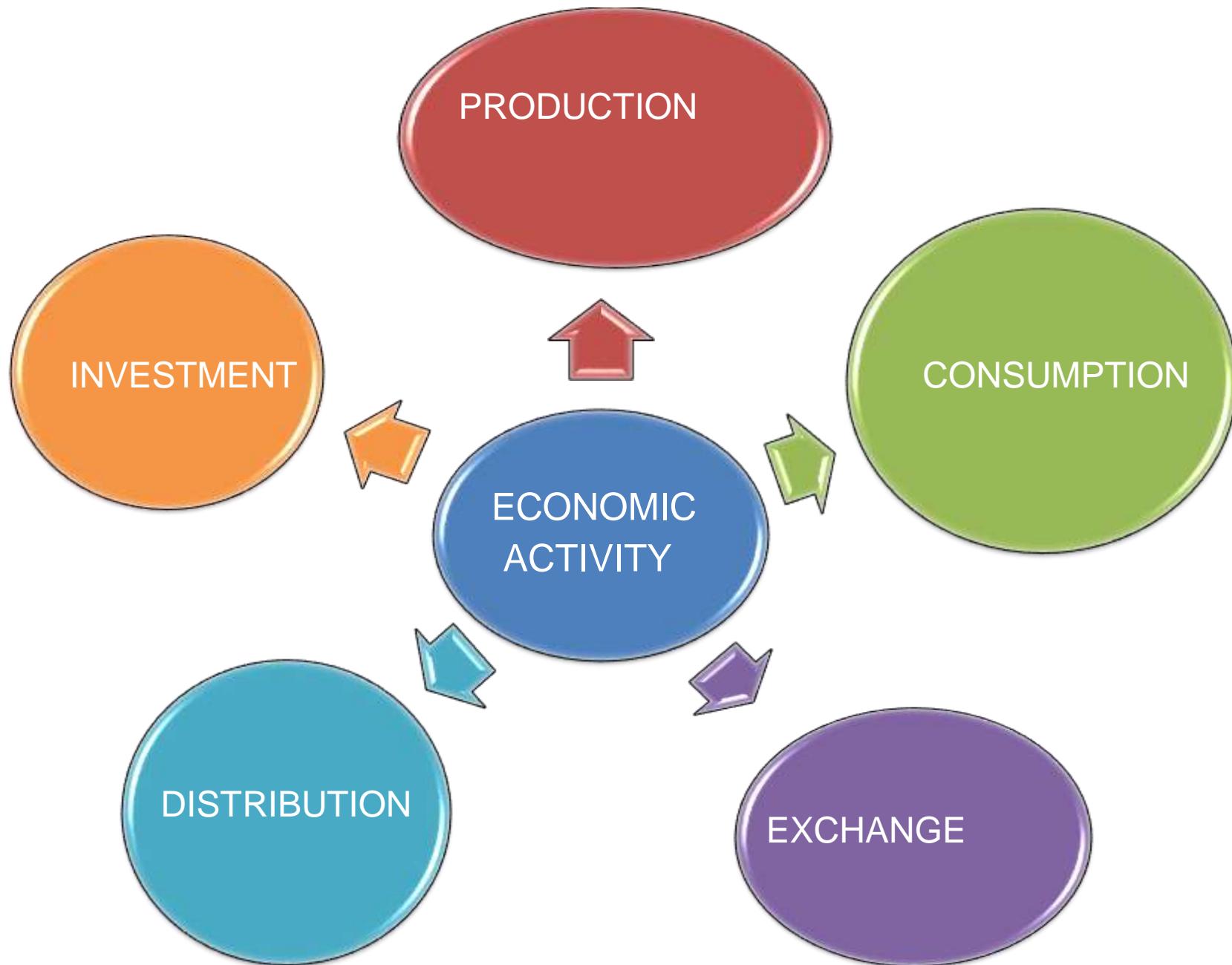


# Case study 4 - PayBuddy (FinTech)

- Week 10:
  - introduction to Finance Industry and Fintech
  - payment processing and money flow
  - new credit product introduction
  - nudge economics
  - payment transaction and customer data set
  - identifying rules to target the appropriate customers
- Week 11:
  - introduction to A/B testing
  - analysis of the A/B testing data
  - credit risk evaluation
  - risk-return tradeoffs
- **Assignment:** Prepare report on recommendation rules, A/B testing, credit risk evaluation using a specific data set

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# Consumption and Demand



# Production

- Production is the process of converting raw materials into useful good/service. Goods/services become useful as they acquire utility value in the process of production.
- Producers have limited capital resources while they have a wide range of goods and services to choose from for their firms and factories to produce .
- With the given prices of inputs they choose such combinations which minimise cost of production so that they earn maximum profit.

# Consumption

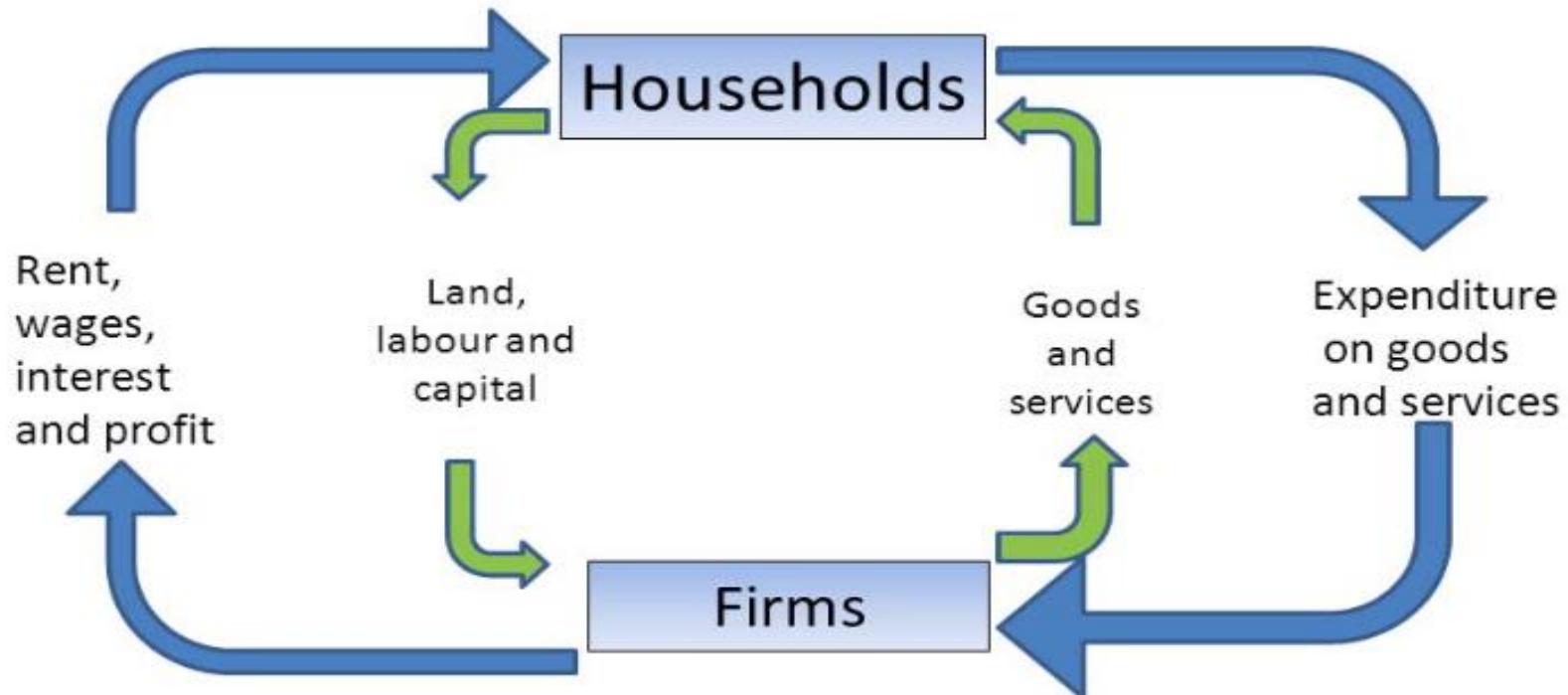
- **Consumption** is that economic activity which is concerned with the use of goods and services for the direct satisfaction of individuals and collective wants.
- A **consumer** is a person who consumes goods and services for the satisfaction of his/her wants.
- Consumption activity is the base of all production activities.
- **There would not be production if there was no consumption**

- As a consumer people have limited means (income ) while their wants are unlimited.
- Study of consumption behaviour is concerned with the question “How people use their given /limited means for the purchase of different goods and services, so that their satisfaction is maximised?
- In Consumption Theory we formulate a set of standard relationships explaining how consumers tend to behave.

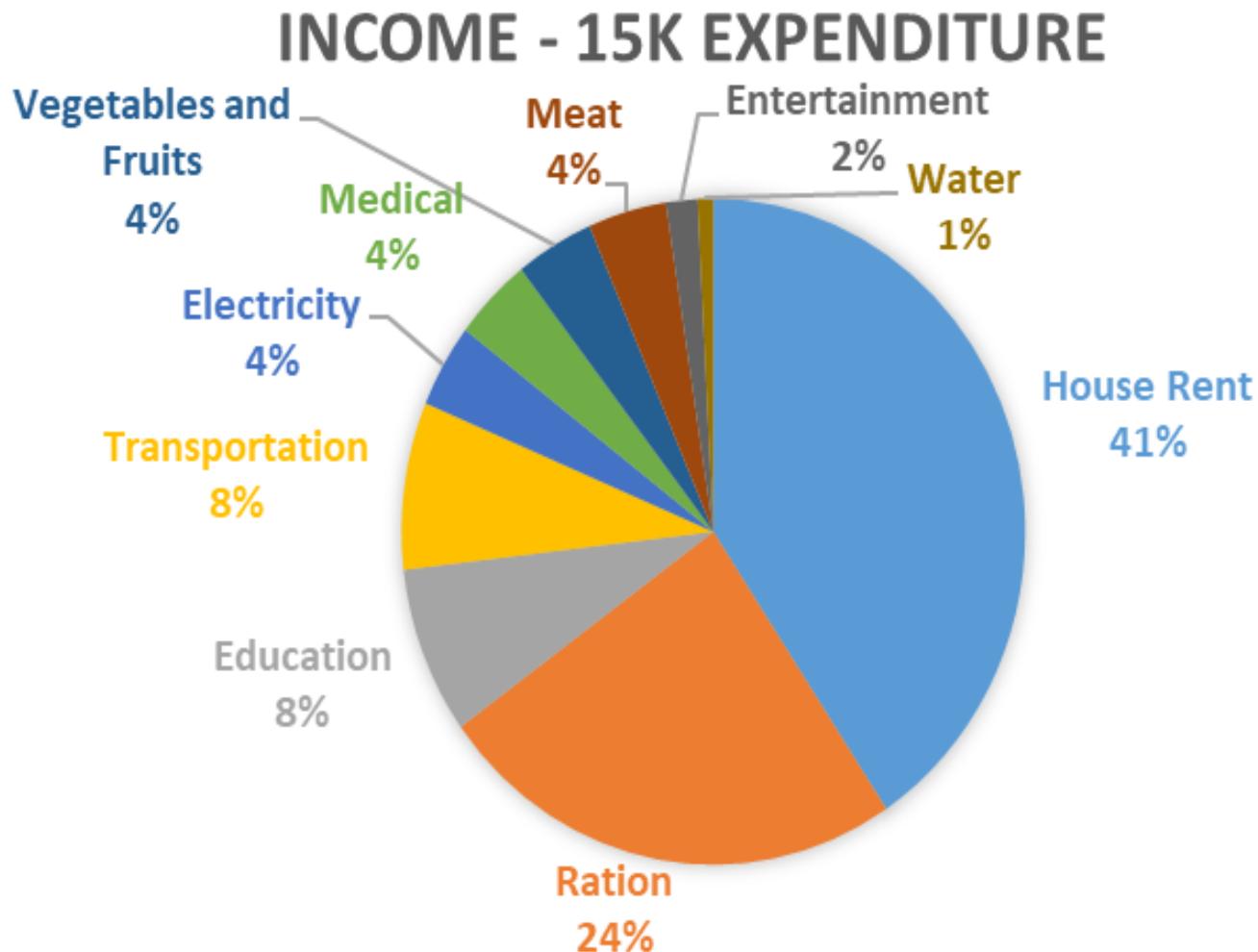
# Exchange

- Exchange is that economic activity which is concerned with sale and purchase of commodities.
- In simple terms barter or buying and selling

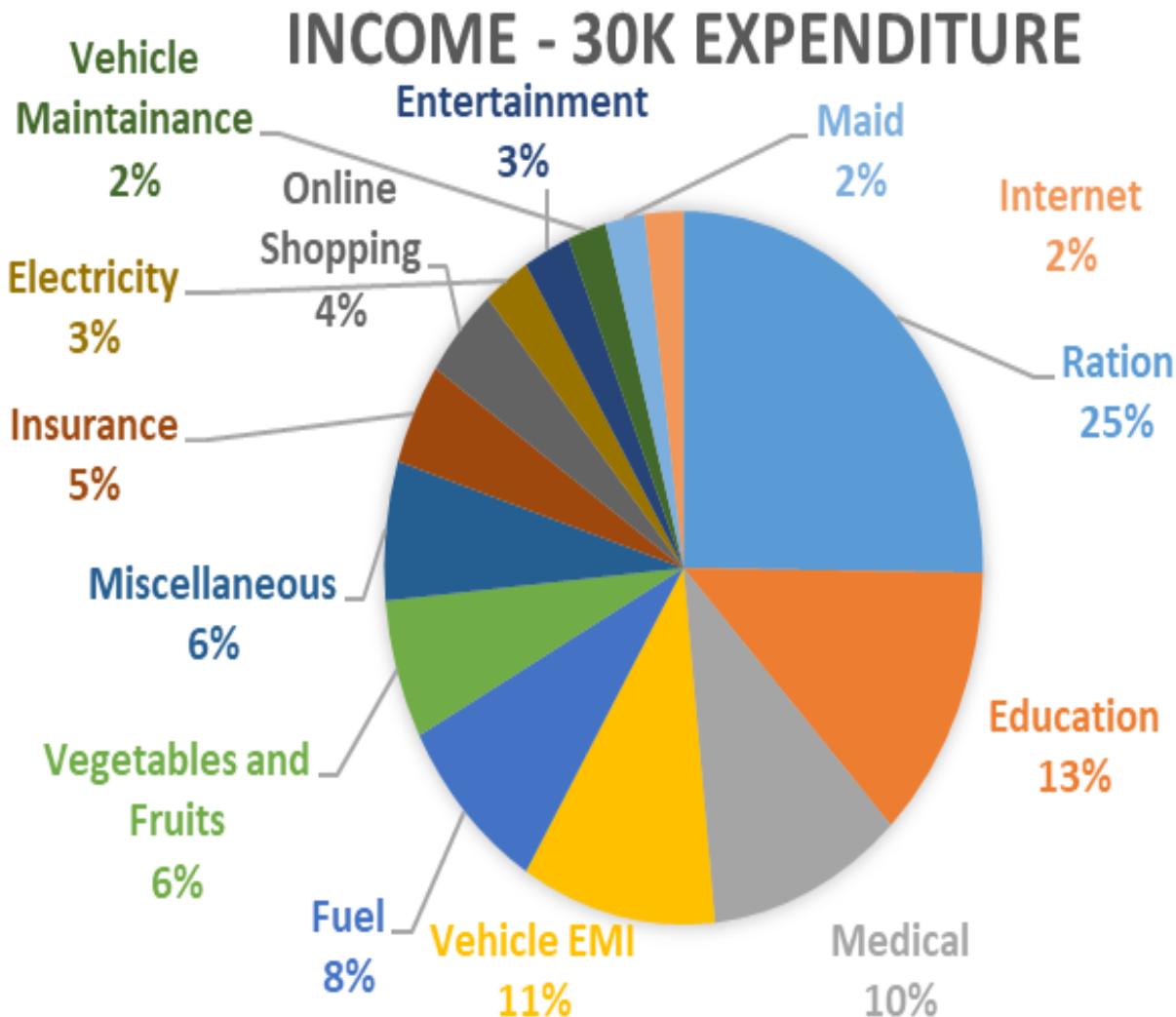
## The circular flow of income



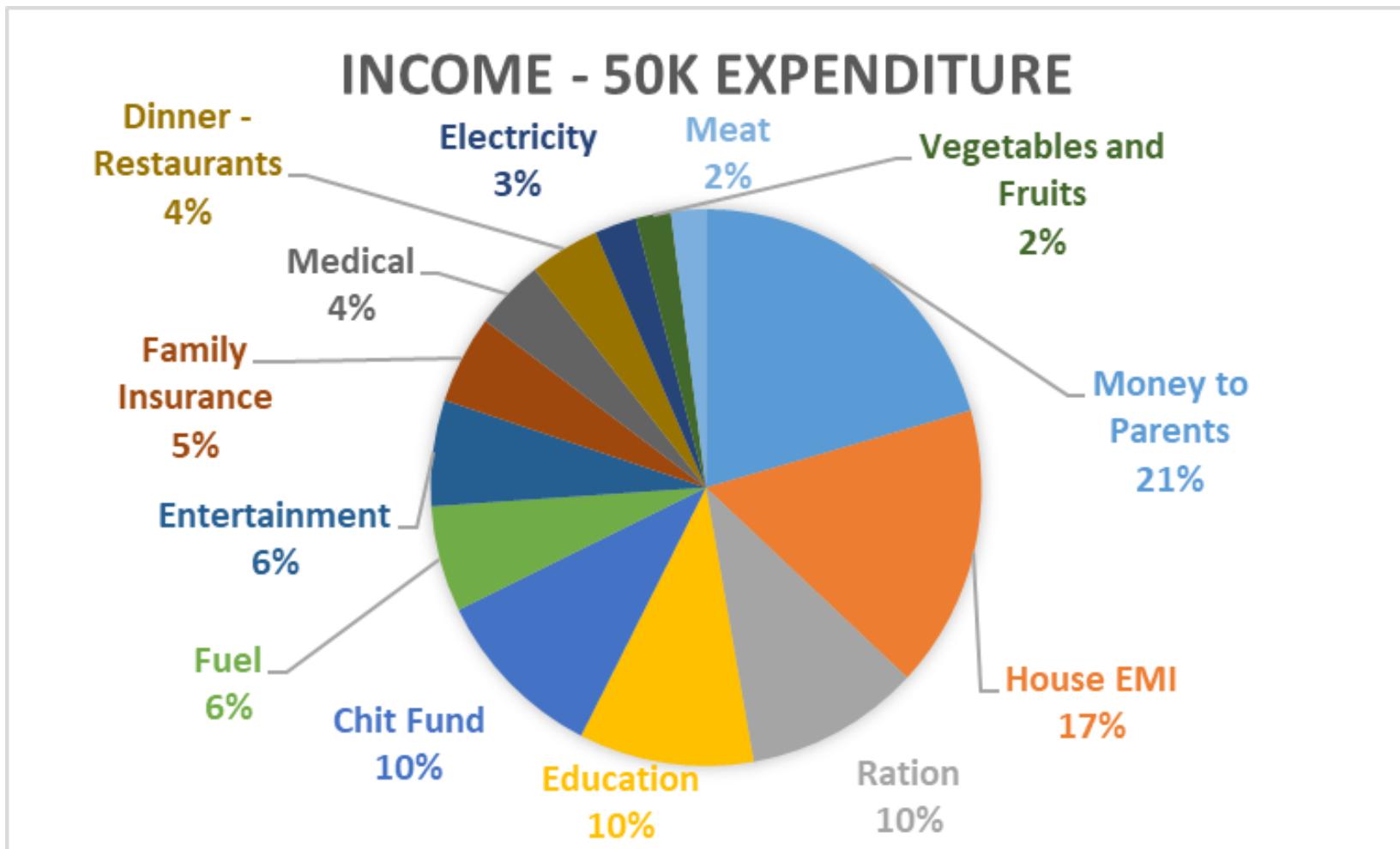
Representing consumption:  
A typical consumption basket (income Rs. 15000)



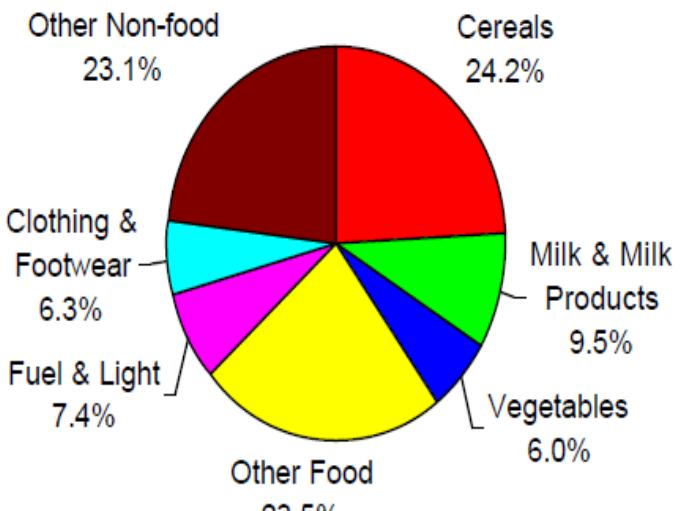
## Representing consumption: A typical consumption basket (income Rs. 30000)



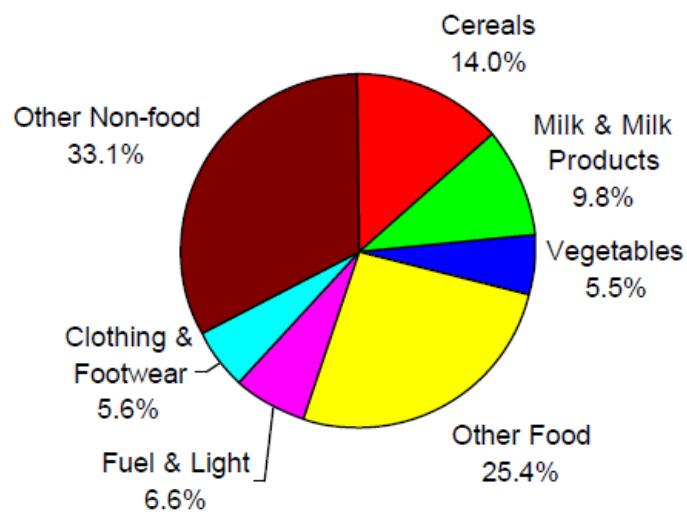
Representing consumption:  
A typical consumption basket (income Rs. 50000)



# Data on consumption: Composition of consumer expenditure, 1993-1994



Rural



Urban

Source: NSS 50<sup>th</sup> round, Key results on household consumer expenditure, 1993-1994

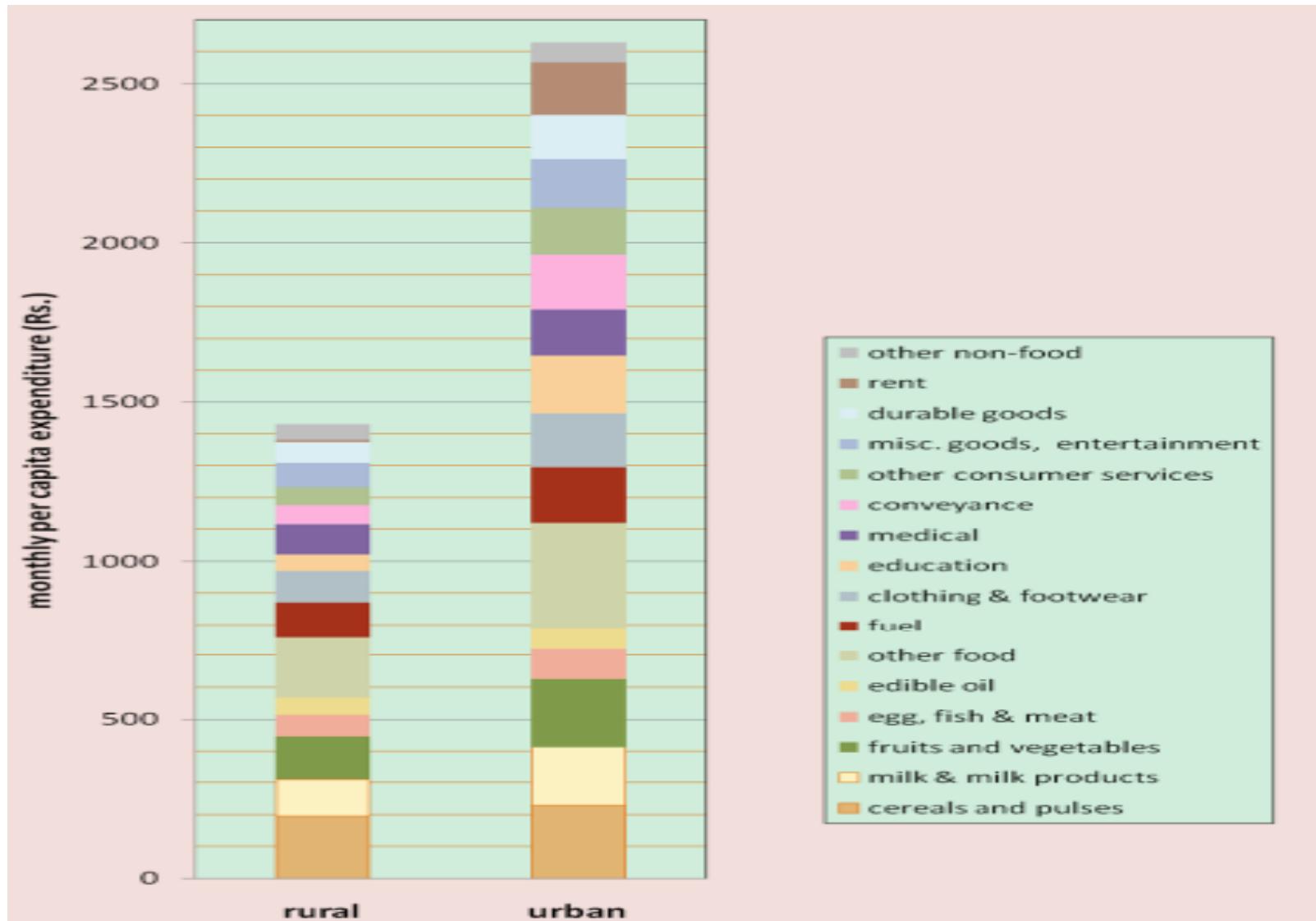
**Table T9: Trends in percentage composition of consumer expenditure since 1993-94**

item group	rural					urban				
	share in total consumer expenditure in									
	1993-94	1999-2000	2004-05	2009-10	2011-12	1993-94	1999-2000	2004-05	2009-10	2011-12
(1)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
cereals	24.2	22.2	18.0	15.6	12.0	14.0	12.4	10.1	9.1	7.3
gram	0.2	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1
cereal substitutes	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1
pulses & products	3.8	3.8	3.1	3.7	3.1	3.0	2.8	2.1	2.7	2.1
milk & products	9.5	8.8	8.5	8.6	9.1	9.8	8.7	7.9	7.8	7.8
edible oil	4.4	3.7	4.6	3.7	3.8	4.4	3.1	3.5	2.6	2.7
egg, fish & meat	3.3	3.3	3.3	3.5	3.6	3.4	3.1	2.7	2.7	2.8
vegetables	6.0	6.2	6.1	6.2	4.8	5.5	5.1	4.5	4.3	3.4
fruits & nuts	1.7	1.7	1.9	1.6	1.9	2.7	2.4	2.2	2.1	2.3
sugar	3.1	2.4	2.4	2.4	1.8	2.4	1.6	1.5	1.5	1.2
salt & spices	2.7	3.0	2.5	2.4	2.4	2.0	2.2	1.7	1.5	1.7
beverages, etc.	4.2	4.2	4.5	5.6	5.8	7.2	6.4	6.2	6.3	7.1
<b>food total</b>	<b>63.2</b>	<b>59.4</b>	<b>55.0</b>	<b>53.6</b>	<b>48.6</b>	<b>54.7</b>	<b>48.1</b>	<b>42.5</b>	<b>40.7</b>	<b>38.5</b>
pan, tobacco, intox.	3.2	2.9	2.7	2.2	2.4	2.3	1.9	1.6	1.2	1.4
fuel & light	7.4	7.5	10.2	9.5	9.2	6.6	7.8	9.9	8.0	7.6
clothing & bedding	5.4	6.9	4.5	4.9	6.3	4.7	6.1	4.0	4.7	5.3
footwear	0.9	1.1	0.8	1.0	1.3	0.9	1.2	0.7	0.9	1.2
misc. g. & services	17.3	19.6	23.4	24.0	26.1	27.5	31.3	37.2	37.8	39.7
durable goods	2.7	2.6	3.4	4.8	6.1	3.3	3.6	4.1	6.7	6.3
<b>non-food total</b>	<b>36.8</b>	<b>40.6</b>	<b>45.0</b>	<b>46.4</b>	<b>51.4</b>	<b>45.3</b>	<b>51.9</b>	<b>57.5</b>	<b>59.3</b>	<b>61.5</b>
<b>total expenditure</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

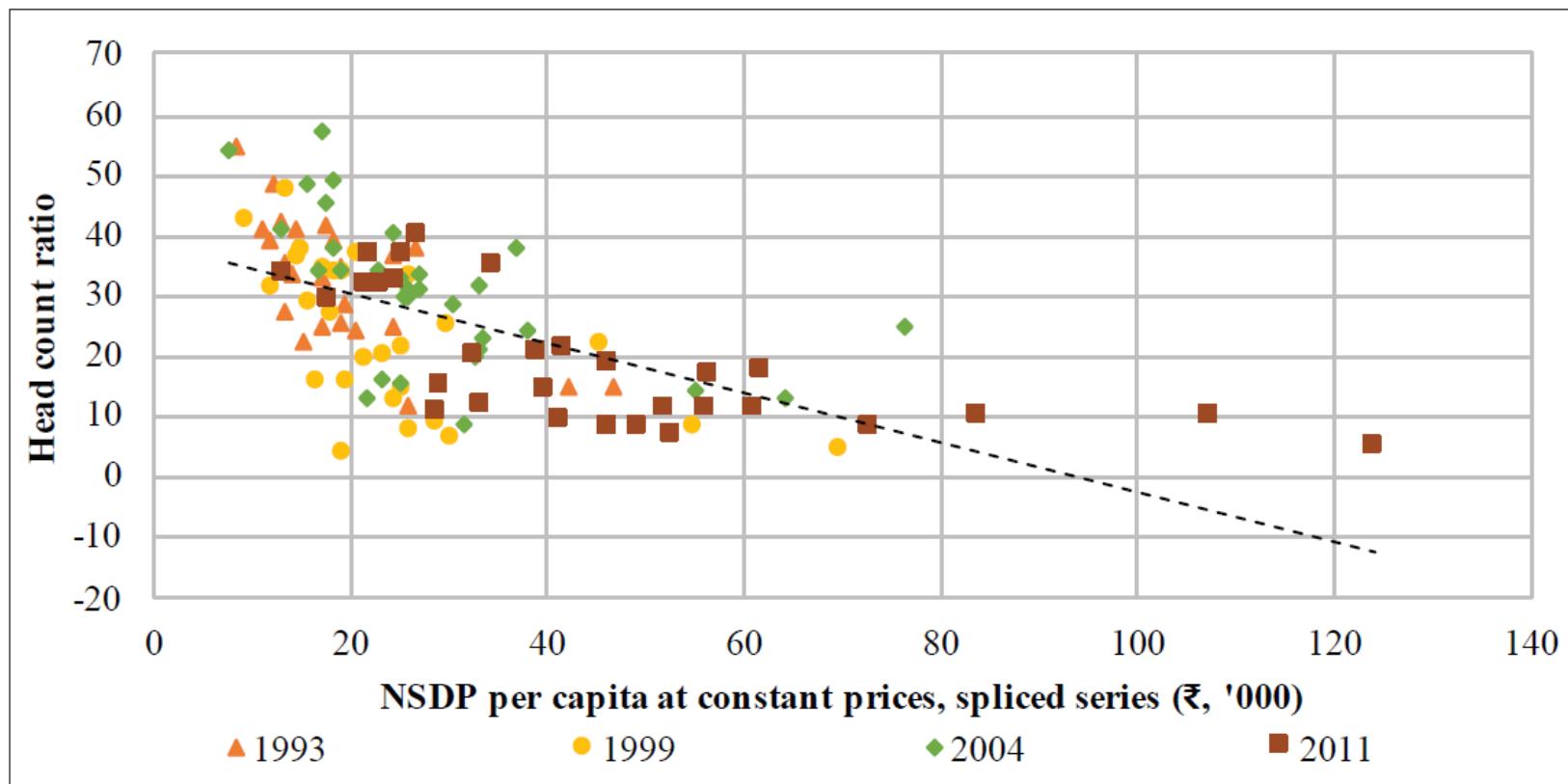
URP estimates shown except for 1999-2000, for which only MRP estimates are available.

Source: NSS 68<sup>th</sup> round, Key indicators of household consumer expenditure in India, 2011-2012

# Breakup of average rural and urban Monthly Per-capita Consumption Expenditure, 2011-2012



# Relationship between income (NSDP per capita at constant prices) and poverty (Head count ratio) in Indian states



Source: Survey calculations based on MoSPI data on NSDP and official poverty estimates of erstwhile Planning Commission.

Reference: Economic Survey, 2020-21

# What drives consumers' choice? Utility

- When economists talk about consumer choice, what they are referring to is the combination of goods and services a consumer purchases.
- To understand how a household will make its choices, economists look at what consumers can afford, as shown in a **budget constraint** and the **total utility** or satisfaction derived from those choices.
- **Utility** is the term economists use to describe the satisfaction or happiness a person gets from consuming a good or service.
- For example: Mr. Raj obtains utility from consuming T-shirts and consuming movies. Like all consumers, we assume Raj wishes to choose the combination of T-shirts and movies that will provide him with the greatest total utility,

# Prices

- The fact that goods have value can be ascribed ultimately to the limitations in the world's material endowment.
- That is why goods have prices; if they were available in unlimited supply they would be free.
- Price usually serves as the rationing device whereby their use is kept down to the available supply.
- In a market economy the relationship between the price of a good and the quantity supplied depends on the cost of making it, and that cost, ultimately, is the cost of *not* making other goods. The market mechanism enforces this relationship.

Surveyed over  
234,000  
households

## Consumer Pyramids Household Survey

A continuous survey to measure household well-being in India

### A longitudinal survey

large panel of sample households surveyed repeatedly over time

### A fast-frequency survey

survey conducted comprehensively thrice every year

Wave in progress

23rd

May-Aug  
2021

Response rate (%)

53.57

3-wave avg.  
62.67

Updated on: Jul 1 2021 6:00AM

## A fast-frequency portrayal of living standards of Indian households

### People of India<sub>dx</sub>

The People of India database provides a moving kaleidoscope of the attributes and peculiarities of the Indian people.

### Aspirational India<sub>dx</sub>

Explore household assets and amenities, household sentiments, their perceptions and decisions regarding purchase of assets or to make investments.

### Income Pyramids<sub>dx</sub>

Enables the study of seasonality of household incomes, volatility of incomes, growth in incomes, changing composition of household incomes and a lot more.

### Consumption Pyramids<sub>dx</sub>

Consumption Pyramids fills a serious gap in the official Indian statistical system. It delivers fast-frequency data on consumption expenditure of households.

Kaushik Krishnan 28 Jun 2021

The uneven expansion of electricity in India: Summary

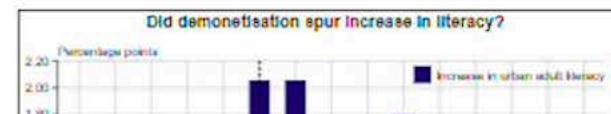
Mahesh Vyas 24 Jun 2021

Limitations? Sure. But Bias?  
Nope.

Kaushik Krishnan 17 Jun 2021

Stories from Wave 22: Data Availability

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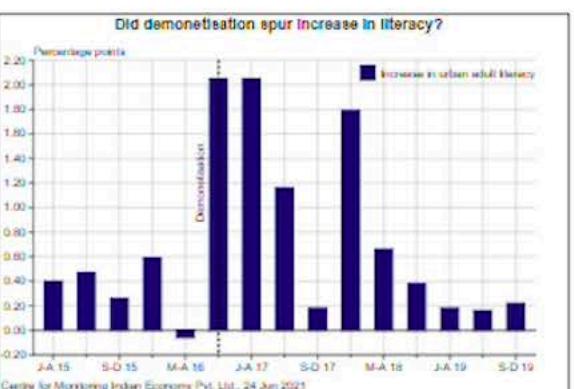
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[Stories from Wave 22: Data Availability](#)

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[Understanding CMIE's CPHS Employment Data](#)

Kaushik Krishnan 16 Jun 2021

[Stories From Wave 22:](#)

The video is now available on YouTube for anyone to watch.

## What was presented?

Wave 22 of the Consumer Pyramids Household Survey was conducted from January 1, 2021 to April 30, 2021. Record-level data from Wave 22 was made available to subscribers on May 1, 2021. We discussed 3 stories about the data and 3 stories from the data of Wave 22.

### 1. Stories about the data of Wave 22

1. **A larger sample:** CPHS now has a household sample of over 176,000 households across the country. This is over 2,000 households higher than the sample size in Wave 21. We plan to continue to expand the CPHS sample in the ongoing Wave 23.
2. **A higher response rate:** The response rate in Wave 22 was 73.44 percent. This is the highest it has been since the Covid-19 pandemic began. This also coincides with an increase in face-to-face interviews. 97.59 percent of all interviews in Wave 22 were conducted in person. Of the 26.66 percent of households that did not respond in Wave 22, the majority of them were not visited due to logistical and operational constraints. Household refusal to participate continues to remain low at just 1.46 percent.
3. **Well balanced survey execution:** Accompanying the increased response rate, Wave 22 was a well balanced survey. We maintained our desired rural-urban balance and did well against the state-wise balance dictated by the survey. We have also checked for balance in terms of covering various income-, occupation- and education-groups in the survey. Though the survey design does not explicitly require balance among these groups, a well executed survey that claims to be representative of India should do so. Comfortingly we find that CPHS has

groups, a well executed survey that claims to be representative of India, should do so. Comfortingly, we find that CPHS has maintained balance on all these groups in Wave 22.

## 2. Stories from the data of Wave 22

1. **Depressed incomes:** We showed evidence that while incomes have risen since the pandemic, the average monthly income for January 2021 for India households was still lower in nominal terms than its equivalent amount in January 2019.
2. **Weak consumer demand:** We demonstrated that the increase in consumer demand that was seen shortly after the first lockdowns were lifted was short-lived. Consumer demand for durables has fallen across the board and continues to remain weak.
3. **Where you work matters:** Looking at those people employed in companies, we show that the group that actually worked in an office was shielded from the lockdowns whereas the group that worked in non-office settings like factories or warehouses, suffered a decline in employment. Equally, agricultural employment increased to record levels and stays high despite the fact that the Jan-Apr wave of CPHS usually records lower levels of employment for farm-work.



# The uneven expansion of electricity in India: Summary

by Kaushik Krishnan

We conducted the 10th Consumer Pyramids Household Survey Research Seminar on **June 24 2021** at 4.30 PM IST. You can view a recording of the webinar [here](#).



Alfonso Martinez Arranz from the [University of Melbourne](#) and Robert Thomson from [Monash University](#) presented:

## The uneven expansion of electricity supply in India

Their paper is coauthored with Steven Zech (Monash University), Ganesh Hegde (IIT Bombay), Dharmalingam Arunachalam (Monash University) and Anand B. Rao (IIT Bombay). It has recently been published in [Energy Research & Social Science](#).

Their work was discussed by Santosh Harish from the [Centre for Policy Research](#).

about the data and 3 stories from the data of Wave 22.

## 1. Stories about the data of Wave 22

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## Summary

This paper is the first in a series of investigations into access to public goods in India. It concerns access to electricity. The authors use data from CPHS in conjunction with electoral data to try and explain patterns of access to electricity.

The primary variable of interest from CPHS is [POWER\\_AVAILABILITY\\_IN\\_HOURS\\_PER\\_DAY](#), which measures the number of hours in a day for which electricity is available in the household.

The authors postulate three hypotheses that could explain changes to electricity access over time:

1. Clientelism: Locations with small electoral margins of support for parties that control state-level governments experience the largest increases in electricity supply.
2. Incrementalism: Locations surrounded by areas with relatively high-quality energy infrastructure experience the largest increases in electricity supply.
3. Maximin: Locations with the poorest previous electricity supply experience the largest increases in electricity supply

The authors find very strong evidence for the Maximin hypothesis as well as reasonably strong evidence to support the Incrementalism hypothesis. They find very little evidence in support of the Clientelism hypothesis.

### Future work

The authors are keen to expand on their work in two directions:

1. Study data further back in time: The authors are considering exploring data sources before CPHS such as NSS data and the IHDS to investigate changes that took place before they could be captured in CPHS.
2. Study access to other public goods in India such as access to drinking water, sanitation and education: The authors plan to explore other

# Stories From Wave 22: Research Ideas

by [Kaushik Krishnan](#)

CMIE presented [Stories from Wave 22](#) on June 10, 2021. The presentation was followed by a live question and answer session. Over 150 questions were asked by the audience, with the bulk of them being answered during the session.

Many of the questions asked were whether particular research ideas were feasible. Almost all of the questions from the audience are possible to explore with the unit-level data that is available in CPdx! We summarise those ideas below for you to investigate:



## Labour Force Participation

1. Did Covid19 and the lockdowns cause a significant change in occupational structures?
2. Can the pattern of jobs destruction among those people employed by companies, but did not have office jobs be attributed to differences between blue-collar and white-collar workers?
3. Are non-office based company workers largely contract workers?
4. Did people with jobs in the IT sector or those that work on digital

- 3. Are non-office based company workers largely contract workers?
- 4. Did people with jobs in the IT sector, or those that work on digital services, see the same job loss as people working in other sectors?
- 5. Did those people working in companies, who managed to retain their jobs during the pandemic experience salary cuts?
- 6. What explains the rise in agricultural employment since 2020?

## Incomes

- 1. What is the evolution of average household income in real terms?
- 2. How have incomes changed for agricultural households?

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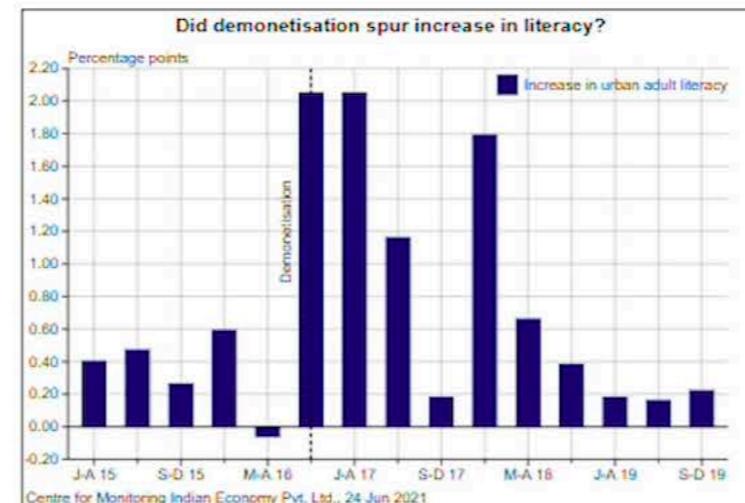
## Stories From Wave 22: Research Ideas

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## Stories From Wave 22: Survey Execution Q&A

Mahesh Vyas 24 Jun 2021

## Limitations? Sure. But Bias? Nope.



Kaushik Krishnan 11 Jun 2021

Kaushik Krishnan 17 Jun 2021

## Stories from Wave 22: Data Availability

Kaushik Krishnan 16 Jun 2021

## Understanding CMIE's CPHS Employment Data

Kaushik Krishnan 16 Jun 2021

## Stories From Wave 22: Survey Design Q&A

1. What is the evolution of average household income in real terms?
2. How have incomes changed for agricultural households?
3. Did the increase in agricultural employment in 2020 and 2021 cause agricultural wage rates to fall?
4. How is the marginal rupee of income allocated by the household between savings and consumption expenditure?

### Consumption Expenditure

1. Do government incentives to spend money result in increased consumption expenditure?
2. Does consumption expenditure on non-durables have any relationship to consumption expenditure on durables?
3. How has food consumption changed due to Covid-19 and the lockdowns?

### Ownership and Intentions to Purchase Assets

1. Can the time series in intention to purchase be studied to find out exactly when consumer demand dropped?
2. Some households already own certain assets. Can one analyse just those households that don't currently own that asset, and then study



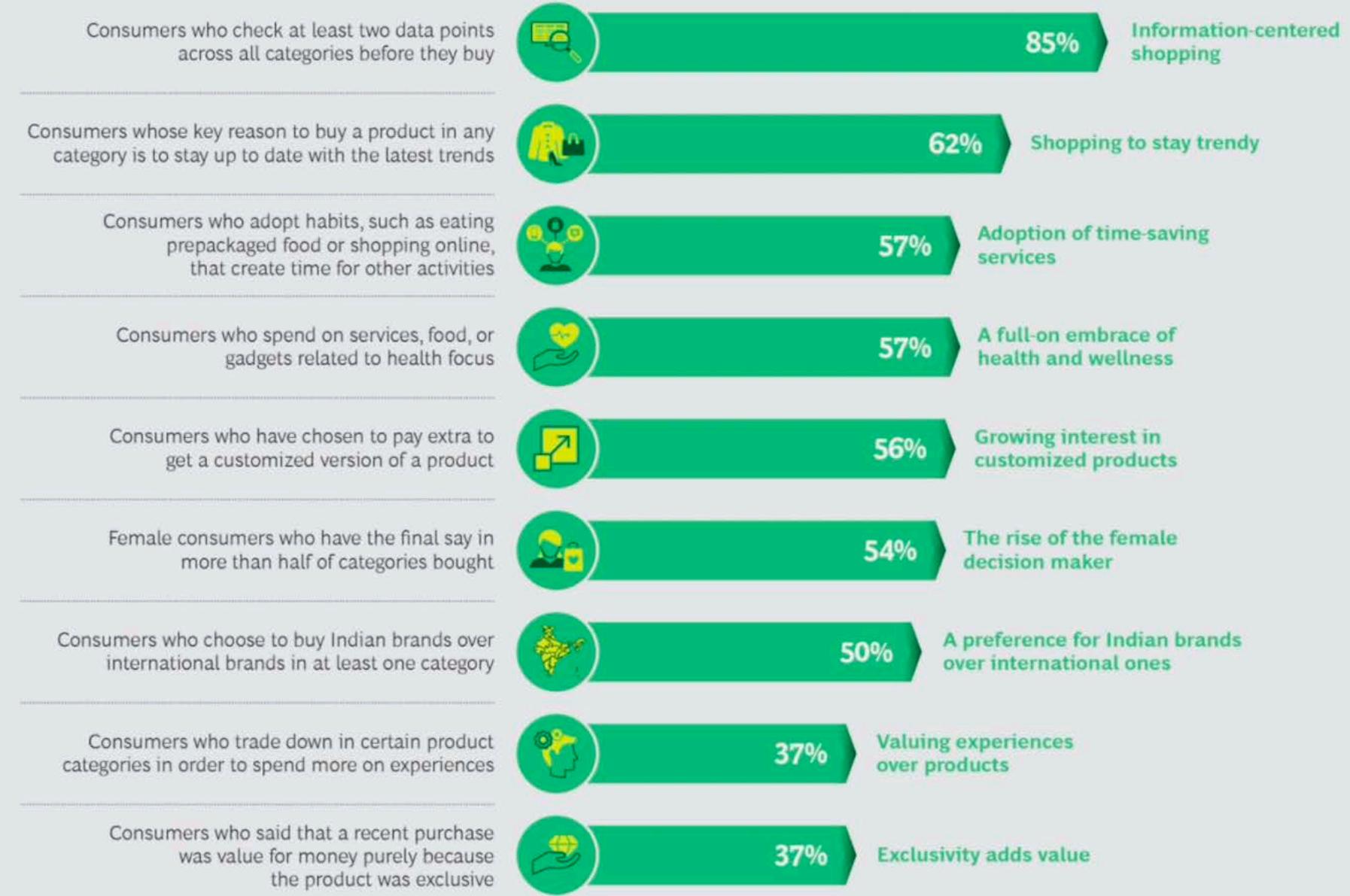
Trisha and Samir, a married couple in their early 30s, grew up in typical middle-class Indian households.<sup>1</sup> Their circumstances as children were modest, and their families were extremely cautious with spending: the adults' biggest dream was to move out of the rentals they were living in and buy their own homes. Trisha remembers her mother going to *mandi* (a fresh-vegetable market) every other day to get the best produce at the cheapest price. Both families' major indulgence was the occasional getaway to hill stations—higher-elevation towns with cooler temperatures that are popular vacation spots in India.

But attitudes in India are changing as a **consequence of rising incomes** and of exposure to new ideas and technologies. For Trisha and Samir—and the tens of millions of Indians like them—the interest in spending on traditional things, such as the purchase of a home, has fallen. Increasingly, people are spending more on experiences, customized products, and time-saving

# Ten Trends That Are Altering Consumer Behavior in India



## EXHIBIT 4 | TEN EMERGING BEHAVIORS OF INDIAN CONSUMERS





**Source:** BCG analysis.

**Note:** Percentages reflect the average adoption of all ten trends.

<sup>1</sup>Annual household income: elite = greater than \$30,800; affluent = \$15,400 to \$30,800; aspirers = \$7,700 to \$15,400; next billion = \$2,300 to \$7,700. The income bands reflect a conversion rate of \$1 = ₹65.

<sup>2</sup>City population: metro = greater than 4 million; tier 1 = 1 million to 4 million; tier 2 = 500,000 to 1 million; tier 3 = 100,000 to 500,000.

<sup>3</sup>The “rise in the female decision maker” trend was omitted for gender analysis.

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<sup>2</sup>City population: metro = greater than 4 million; tier 1 = 1 million to 4 million; tier 2 = 500,000 to 1 million; tier 3 = 100,000 to 500,000.

<sup>3</sup>The “rise in the female decision maker” trend was omitted for gender analysis.

**Information-Centered Shopping.** People in Indian cities now treat information gathering as an integral part of the shopping experience. Eighty-five percent of consumers check at least two data points (beyond prices and discounts) when they’re buying something, and roughly 50% do some sort of online research. Among the sorts of information that people look for are product reviews, manufacturing and expiration dates, and how a product compares with alternatives in terms of features. “I need to read the pack before buying,” said a 38-year-old housewife from Gurugram. This is true even for a simple product, such as yogurt, which she noted can come in many varieties. “You need to know what you’re buying.”

available in Jamnagar, the tier 1 city where she lives. There are numerous social occasions in “cities like ours,” she said, and “people really talk about what the other person was wearing. No one likes to repeat their clothes.”

### THE TRENDS THROUGH A DIFFERENT LENS

Because the survey questions covered 30 categories, it was possible to do a detailed analysis of the trends across product segments. (See Exhibit 3.)

While each of these trends is gaining steam, their current penetration across categories varies. For instance, nascent trends, such as the more favorable views of renting and

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There’s a belief that what one buys should reflect one’s individual preferences and needs—even if one has to pay

## EXHIBIT 3 | How the Trends Are Affecting Product Categories

