



PESD Cookstove Research

Mark Thurber

Associate Director, Program on Energy and Sustainable Development

Energy@Stanford

September 14, 2011

Low-Income Energy Research Platform

Research Question

What kinds of institutional arrangements (enterprises, business models, markets, policies, and laws/regulations) can allow delivery of modern energy services to the poor at scale and in a durable way?

Methods

Structured case studies

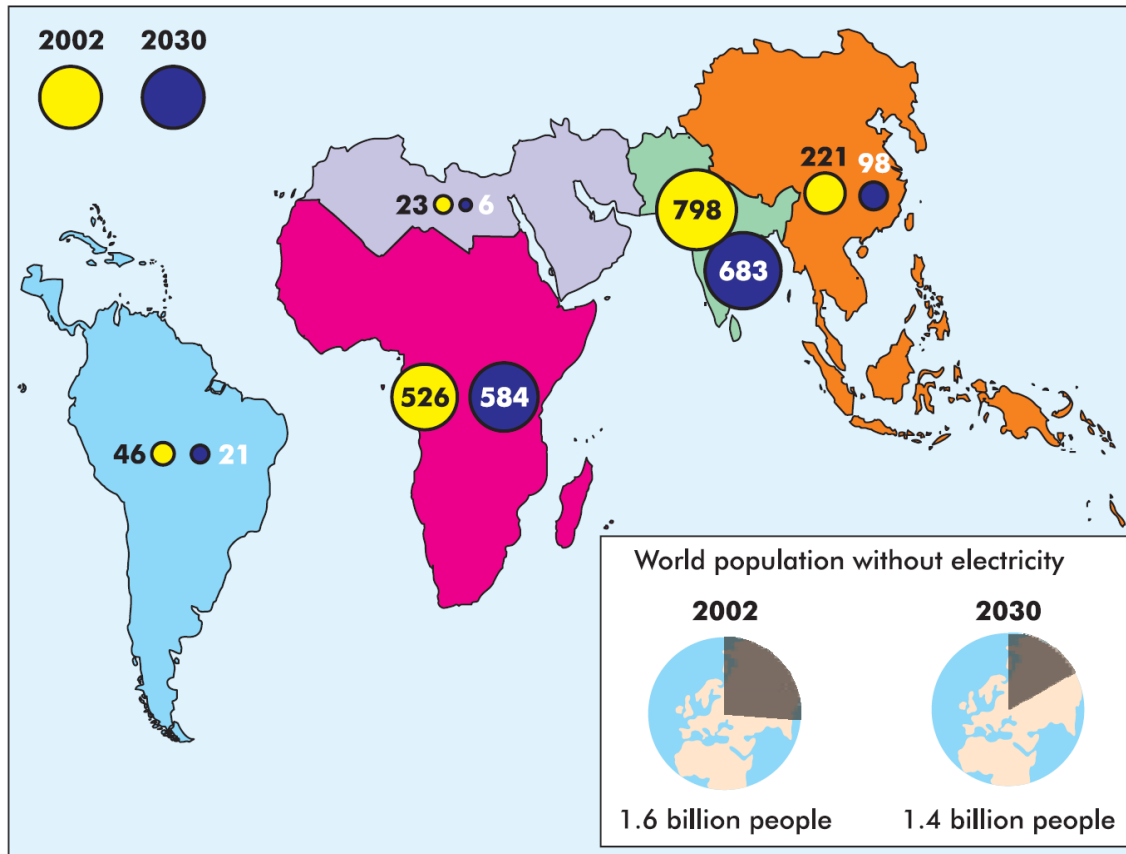
Qualitative surveys

Quantitative surveys

Econometric modeling

The Energy Transition

- 1.6 billion people without electricity



- 2.4 billion without “modern” fuels

Harms of Status Quo

- Lack of energy directly impedes development
 - No lighting for education
 - No electricity for productive activities
 - Time spent on biomass collection (esp. by women)



- Serious climate impacts
- Negative health consequences of biomass burning

Energy for the Poor: Health Impact



Source: GVEP 2009

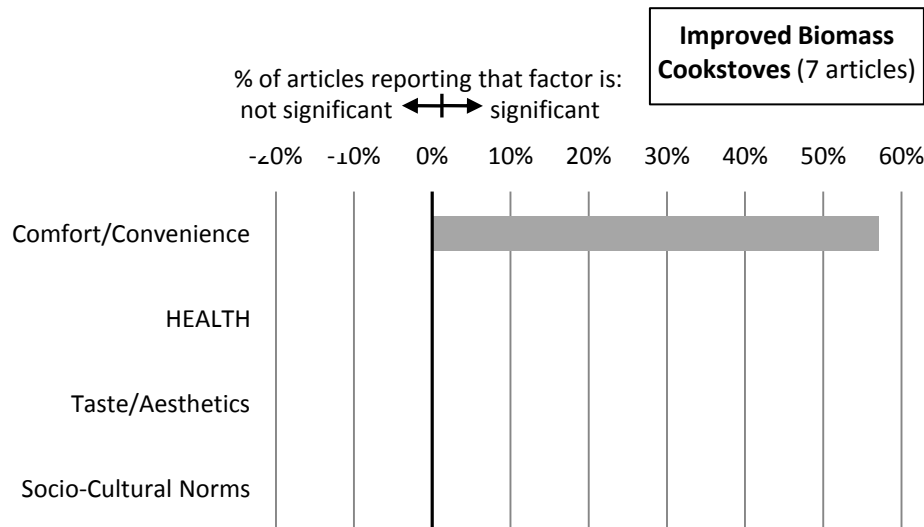
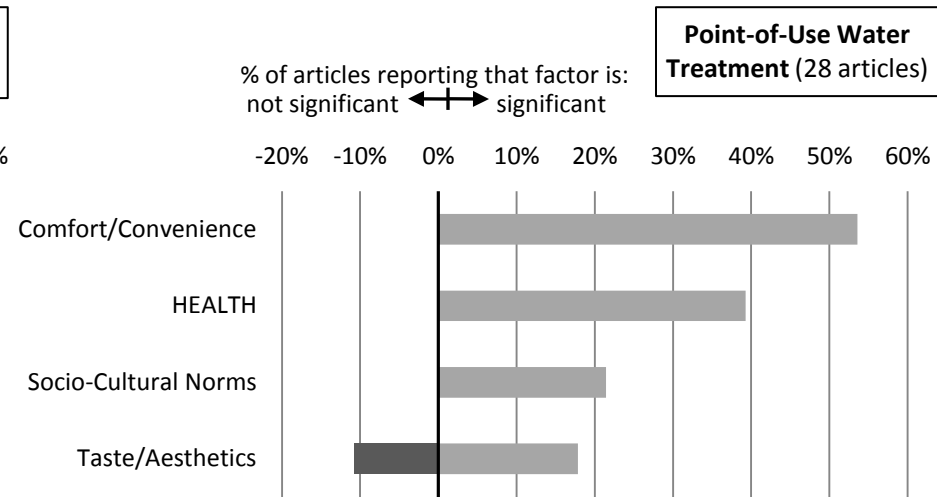
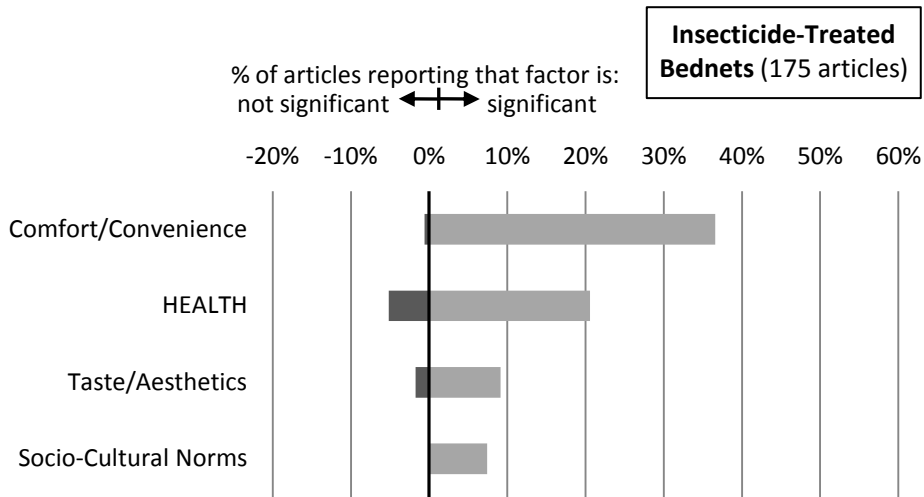


Photo: Mark Thurber 2009

Estimated deaths from cooking-related indoor air pollution:
1.6 million/year (> malaria)

Improved biomass cookstoves could significantly reduce

Are Health Benefits Valued?

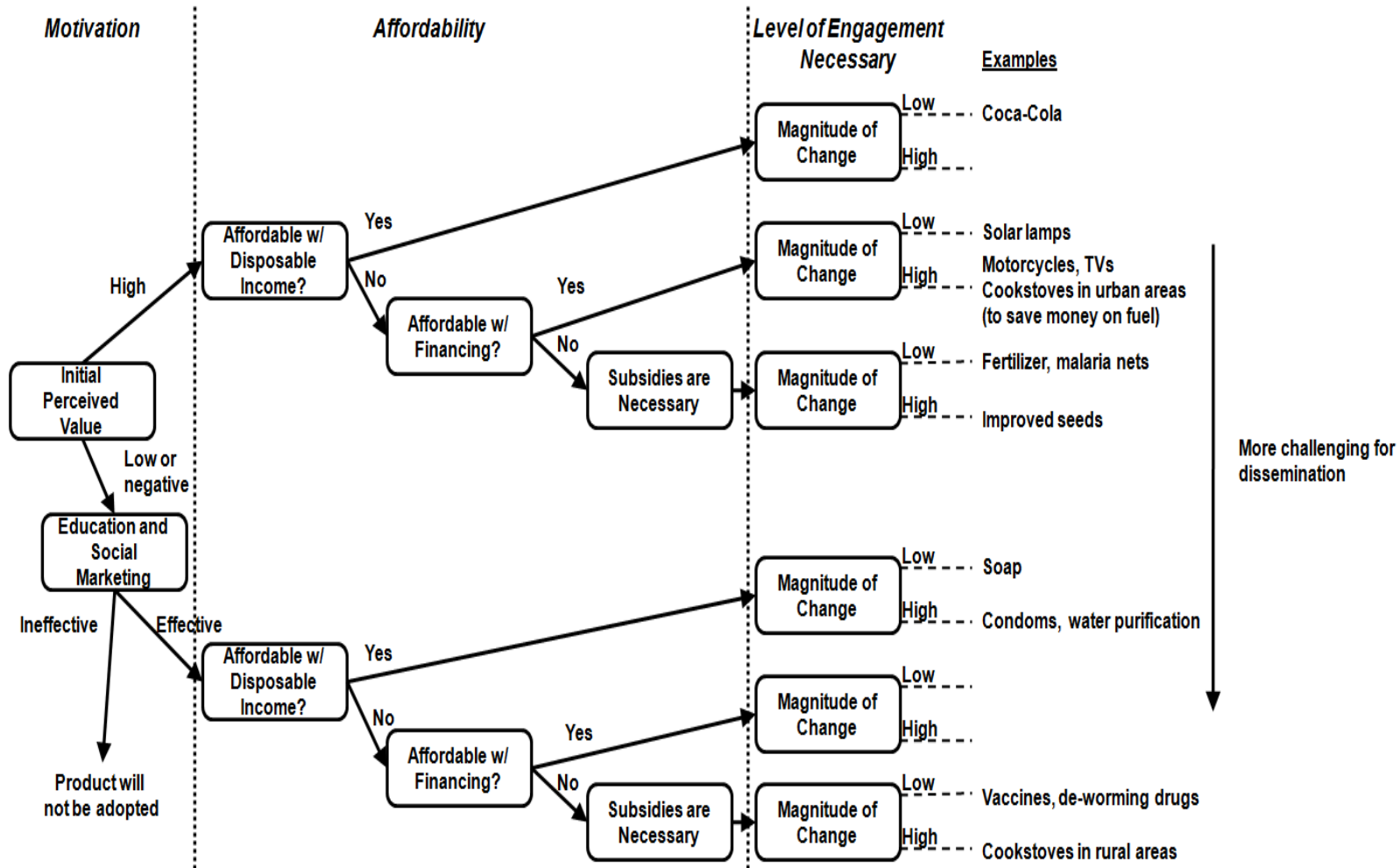


Systematic review of factors affecting adoption of health-improving technologies

Thurber, Warner, Platt, Slaski, and Miller

Differentiated Barriers to Technology Diffusion

- Influences:**
- Observability of benefit
 - Economic vs. non-economic
 - Immediate vs. long-term
 - Tastes and preferences



Cookstove Dissemination Research

Top-down: “Business models” for distribution

Bottom-up: Factors affecting household cooking choices

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Survey of Cookstove Sellers in India

Organization	Years in stoves business	Approx. # of direct employees in stoves	Est. total # of stoves sold in India (as of June 2010)
A	1	3	0
B	40	300	0 (sold 150,000 in Africa)
C	2	60	120,000
D	4	21	450,000
E	11	2	450
F	1	Unknown	1000
G	2	5	5000
H	5	10	25,000
I	1	5	40
J	10	20–50	7000

How have business model factors affected ability to scale and to sustain business?

Two Stove Companies That Have Scaled

First Energy



- ~450,000 stoves sold
- Retrenchment period following detachment from BP in 2009
- Major challenge due to price increases in raw materials for biomass pellet fuel
- Increased pellet price in 2009

Envirofit



- ~150,000 stoves sold
- Business appears to be growing

Business Model Factor #1: Technology/Design

First Energy



Source: Wall Street Journal / First Energy

**Radical Innovation /
Complex**

Envirofit



Source: Envirofit

**Incremental Innovation /
Simple**

Business Model Factor #2: Customer Targeting



	First Energy	Envirofit
Household Location	Rural/Urban	Rural
Household Income	\$2-8/day	>\$7/day
Stove Price	\$20-35	\$20-30
Competing Fuels	Biomass / LPG	Biomass

Business Model Factor #3: Enterprise Financing

First Energy

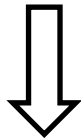


Envirofit



2006-2009

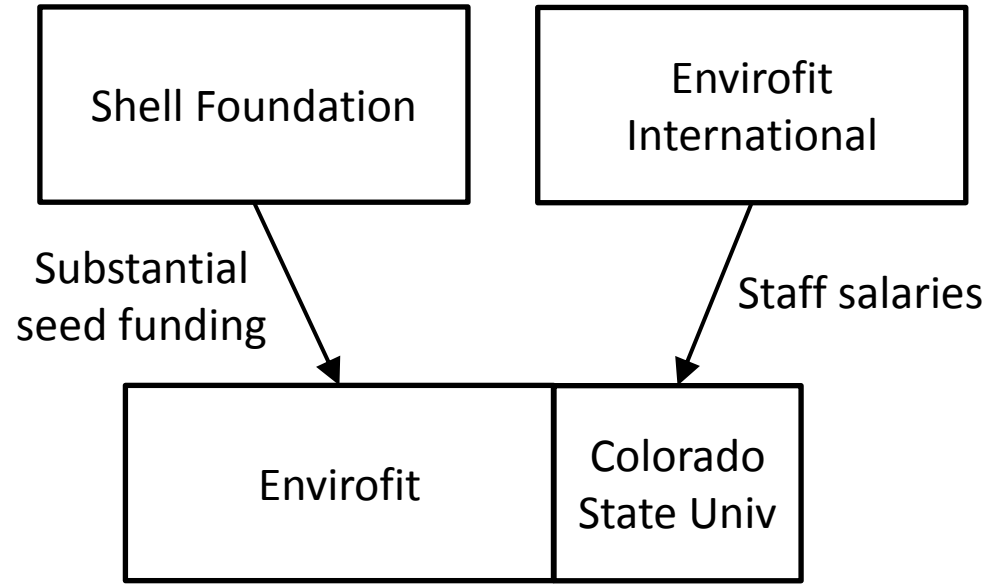
BP Emerging
Consumer Markets



2009-

First Energy

Substantial
seed funding



Shell Foundation

Envirofit
International

Envirofit

Colorado
State Univ

Staff salaries

Business Model Factor #4: Sales Channel – Women Entrepreneurs

First Energy



Envirofit



Photo by Mark Thurber



Source: Envirofit

Business Model Factor #4: Sales Channel – Store Fronts

First Energy



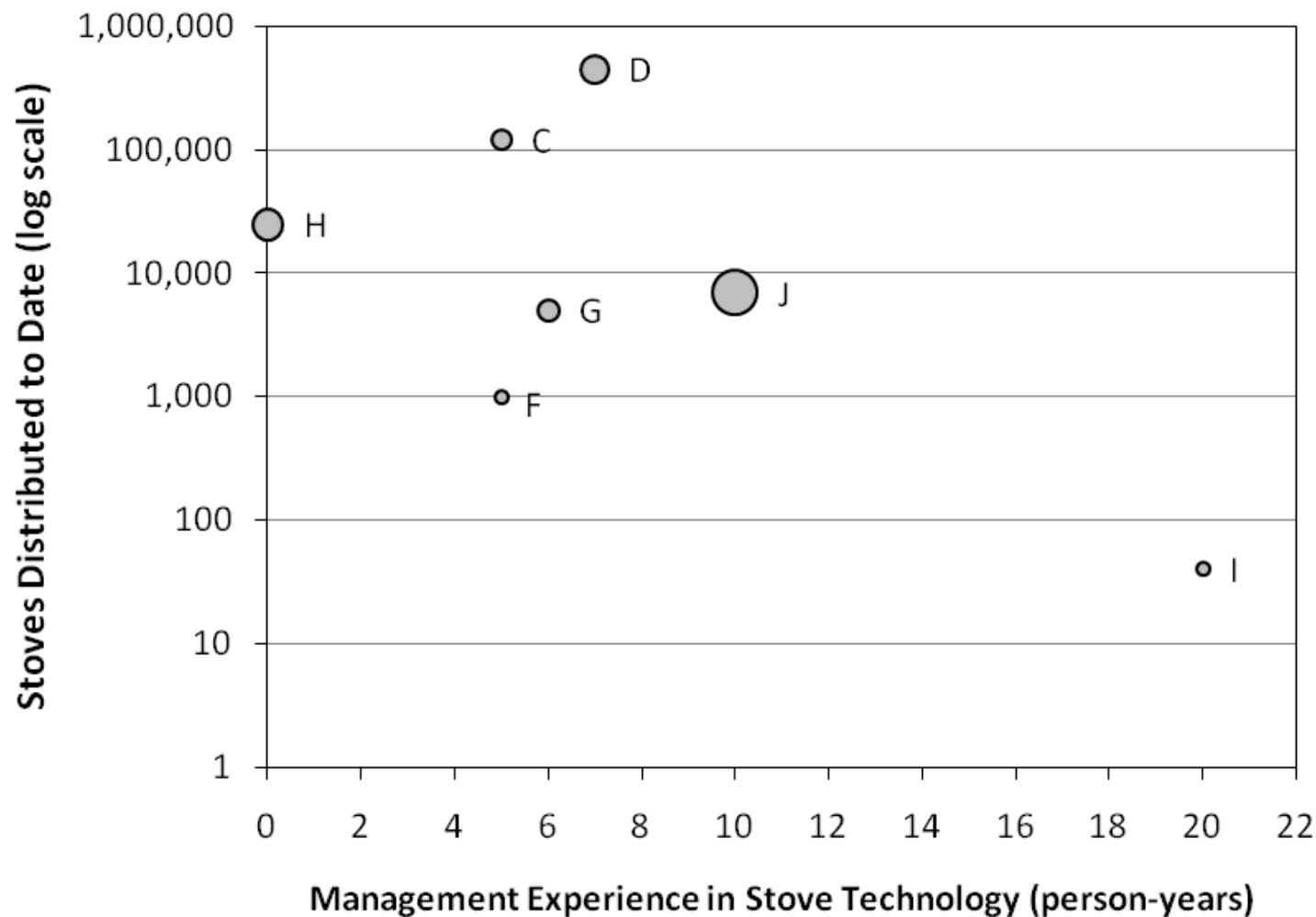
Photo by Mark Thurber

Envirofit



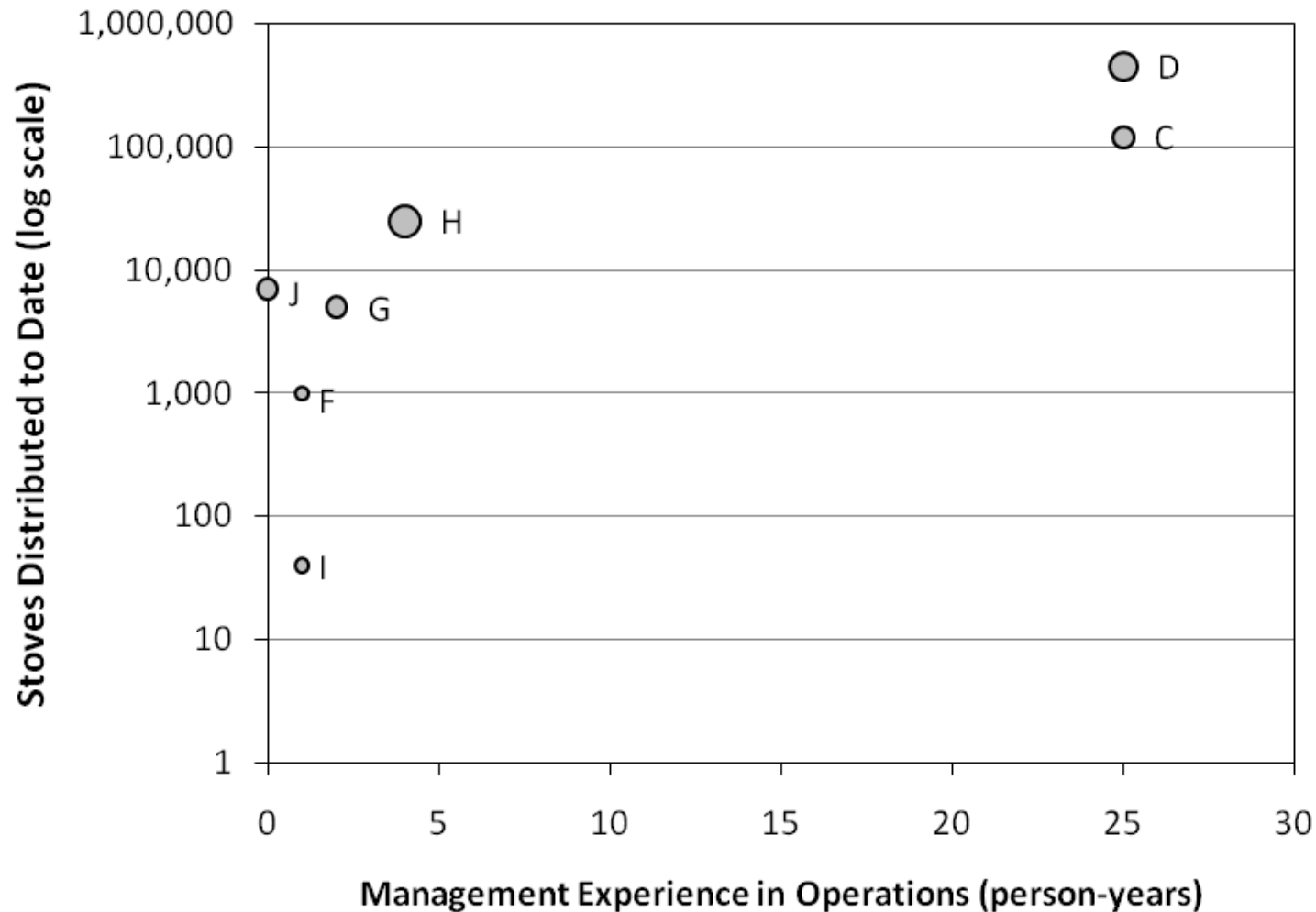
Source: Envirofit

Business Model Factor #5: Management Experience – Technology

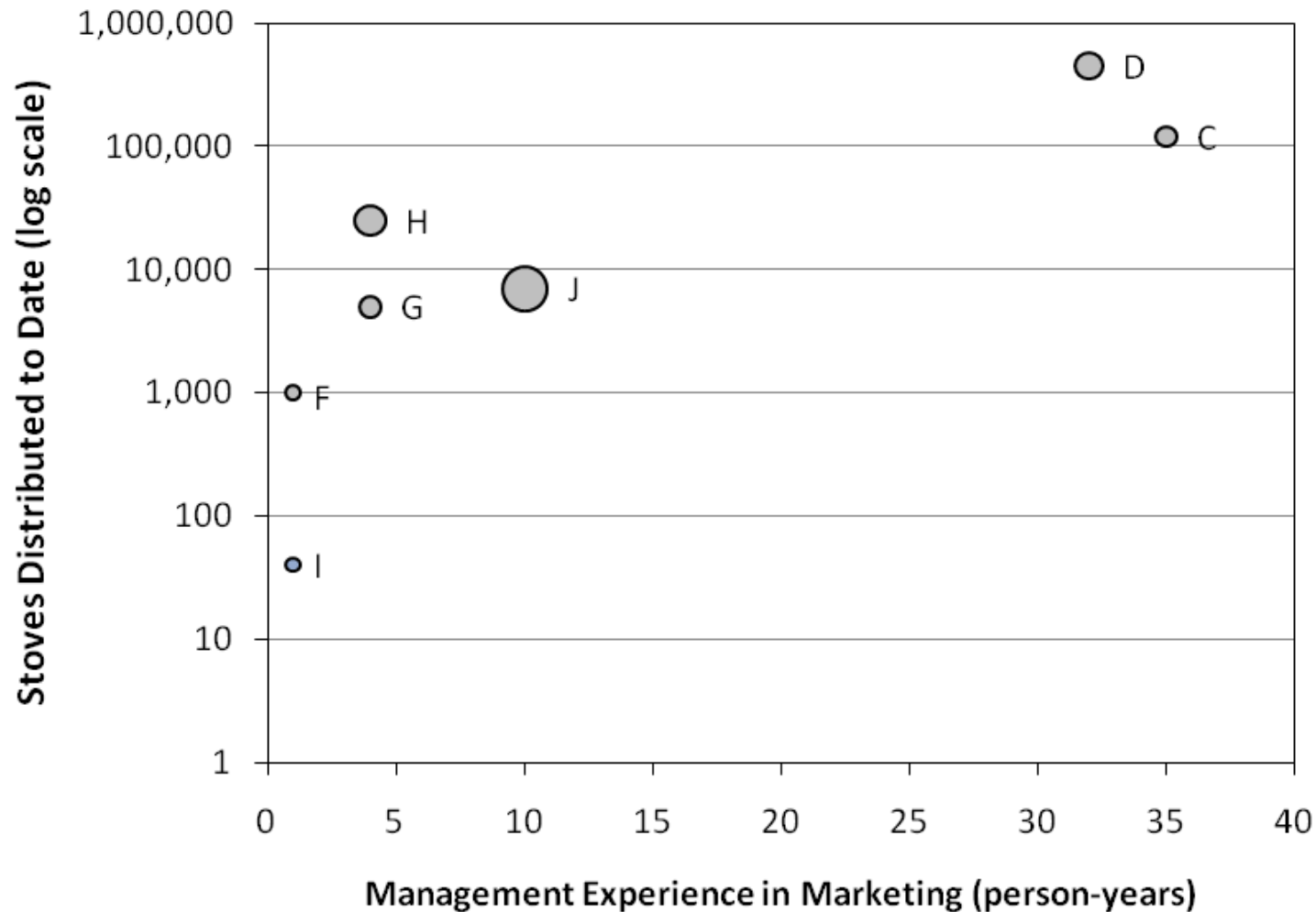


Source: Shrimali, Slaski, Thurber, and Zerriffi (2011), *Energy Policy*

Business Model Factor #5: Management Experience – Operations



Business Model Factor #5: Management Experience – Marketing



Cookstove Dissemination Research

Top-down: “Business models” for distribution

Bottom-up: Factors affecting household cooking choices

1000-Household Survey of Cooking Habits in Maharashtra and Karnataka

Villages in Maharashtra			Villages in Karnataka		
Pune	Thopatewadi	1	Belgaum	Hanabar Hatti	1
	Dhamani	2		Tarihal	2
	Rajgurunagar (Khed) (CT)	3		Raybag (TP)	3
Satara	Hol	4		Bail Hongal (TMC)	4
	Pande	5	Dharwad	Betadur	5
Jalna	Sukhapuri	6		Bhandiwad	6
	Ambad (M CI)	7		Hubli	7
Latur	Patharwadi	8	Bagalkot	Kakanur	8
	Dhamangaon	9		Kerur (TP)	9
Nashik	Bramhan Wade	10	Haveri	Hulgur	10
	Nilgavhan	11			
	Satana (M CI)	12			
Sangli	Bhilwadi	13			
	Takali	14			
	Madhavnagar (CT)	15			

Information Collected by Survey

Usage of different kinds of stoves

Perceived attributes of different kinds of stoves

Stove costs

Fuel costs

Ease of fuel procurement

Perceived health impacts of indoor smoke from stoves

Awareness of improved biomass stoves

Purchase/use of improved biomass stoves

Research Questions to Address

- How do perceived health effects of smoke affect choice of cooking mode?
- Which attributes of a stove are most valued?
- What demographic factors drive uptake and ongoing use of different types of stoves?
- What is the diffusion process for a particular improved biomass stove (Oorja)?
- How do fuel availability factors affect choice of cooking mode?

Survey Conducted March-May 2011

Traditional stove

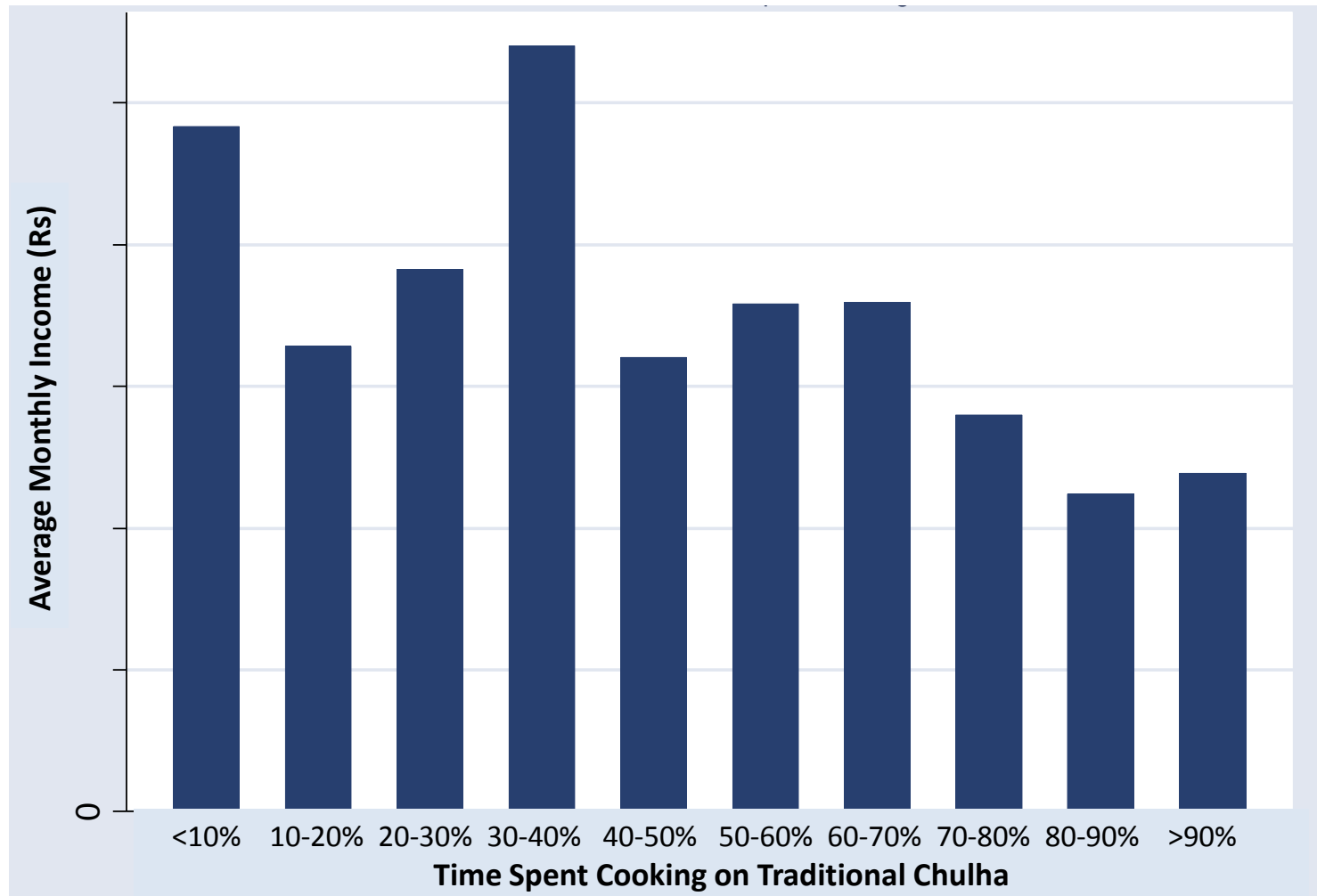


Oorja

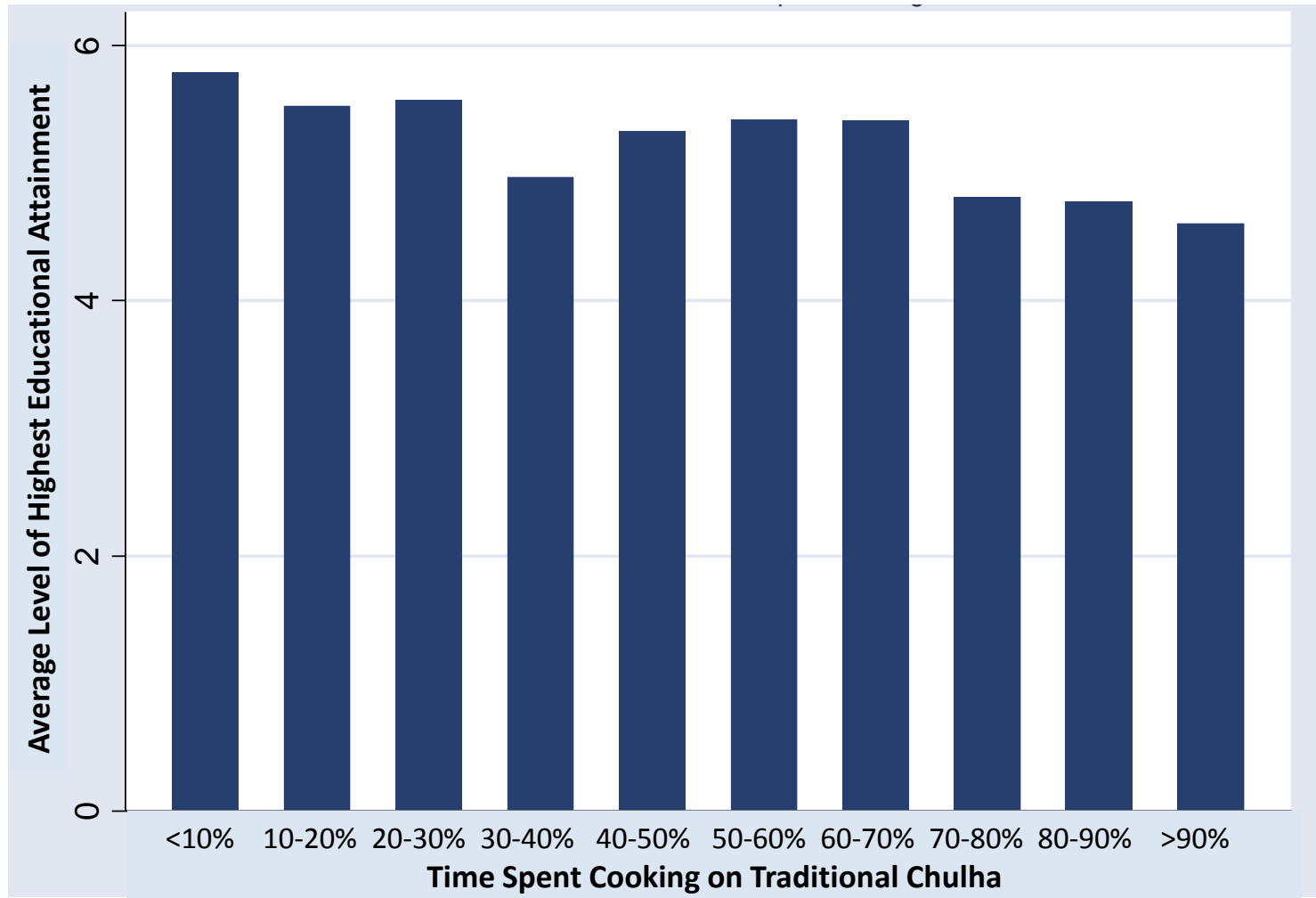


Photos by Himani Phadke

Initial Data Analysis: Income and Use of Traditional Chulha



Initial Data Analysis: Education and Use of Traditional Chulha



Thank you.

Questions?

Mark Thurber

mthurber@stanford.edu

Business Model Factors

Organization	Selected independent variables					Dependent variables	
	Technology and design	Target customers	External enterprise funding	Channel involvement	Management experience (operations and marketing)	Scale	Sustainability (if current trends continue)
A	Incremental	Household	Private	Unknown	Limited	TBD	Unknown
C	Incremental	Household (> \$7/day)	Donor	Significant	Significant	High	Likely
D ^h	Radical	Household (\$2-8/day)	Private	Significant	Significant	High	Unlikely
D ^{hc}	Radical	Household (\$2-8/day); commercial	Private	Significant	Significant	High	Likely
E	Radical	Commercial	Limited	Limited	Limited	Low	Proven
F	Unknown	Household (\$3-7/day)	Private	Unknown	Limited	TBD	Unknown
G	Incremental	Household; commercial	Limited	Limited	Limited	Moderate	Possible
H	Incremental	Household (> \$3/day)	Limited	Limited	Limited	Moderate	Possible
I	Incremental	Commercial	Limited	Unknown	Limited	TBD	Unknown
J	Incremental	Household	Donor	Limited	Limited	Moderate	Unlikely

Source: Shrimali, Slaski, Thurber, and Zerriffi (2011), *Energy Policy*

Manufacturing: Mass Production

First Energy



Photo by Mark Thurber

Envirofit



Source: Envirofit

Marketing: Attractive Packaging

First Energy



Photo by Mark Thurber

Envirofit



Source: Envirofit

Marketing: Product Demonstrations

First Energy



Source: First Energy

Envirofit



Source: Envirofit

Marketing: Advertisements

First Energy



Source: First Energy

Envirofit



Source: Envirofit