

# ON THE LAWS OF ECONOMICS

by

Kenneth W Clements  
Department of Economics  
UWA Business School

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1

## PREFACE

Scientific knowledge can be distilled into a set of laws that are sufficiently general and robust to be useful in describing and predicting behavior – behavior of physical objects (the orbit of the planets, for example), invisible forces (electricity), economies (why some prosper and others languish) and people (education as investment in human capital).

This lecture on the laws of economics has four basic parts:

1. I start with some introductory remarks on laws in general and laws in economics in particular.
2. I then turn to the first of two examples treated in some detail, the law of one price. This law is an application of the “no arbitrage condition”, a unifying principle in much of financial economics.
3. The second example is a set of laws relating to consumption economics: Engel’s law; the law of demand; the dispersion of quantities exceeding that of prices; and Pigou’s law and the “law” of  $-\frac{1}{2}$  for price elasticities.
4. The last section discusses the general nature of the laws of economics, including how new laws might be created, as well as canvassing the credentials of several potential laws.

.2

## ACKNOWLEDGEMENTS

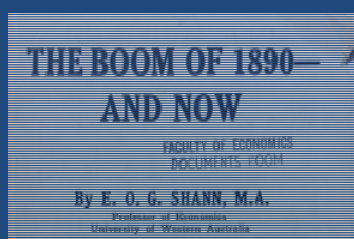
This presentation draws on research I have undertaken over a lengthy period in collaboration with PhD students and others, including Dongling Chen, Grace Gao, Yihui Lan, Haiyan Liu, Li Lian Ong, Antony Selvanathan, Saroja Selvanathan, Jiawei Si and Long Vo. I have benefitted greatly from this productive collaboration.

I wish to acknowledge helpful comments from and discussions with Peter Hartley, Izan, Michael McLure, Tom Simpson, Wayne Smith and Jill Trinh, as well as the research assistance of Long Vo, Jiawei Si and Tom Simpson. Some of this material was presented at Vietnam's Business and Economics Research Conference (VBER2018), Ho Chi Minh City, July 2018, and I appreciate the feedback from participants. Thanks also to the ARC and BHP for the generous financial support for much of the underlying research.

Whilst I was preparing this presentation, Jiawei Si, my long-time RA and co-author, sadly passed away. Though never complaining and with a cheerful disposition, life must not have been easy for Jiawei. I will miss him greatly.

3

## EDWARD SHANN



A call to Australia to put her house in order before the inevitable drought and fall in price of wool and wheat overtake us. The comparisons set out are so striking and the lesson they teach so startling that it behoves every one of us to take heed.

4

## I. WHAT IS A LAW?

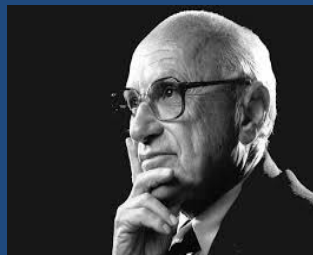
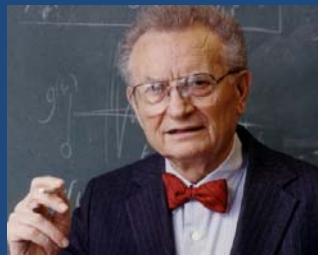
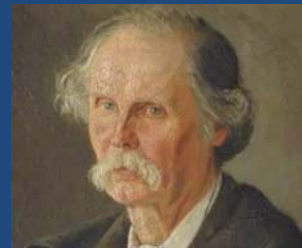
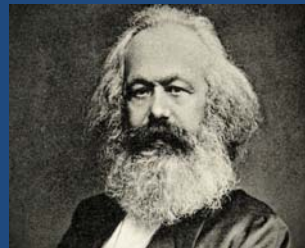
### Types of Laws

- Physical laws
- Law of the jungle
- Laws of good behavior
- Legislated law
- Theological law
- Parkinson's law
- Murphy's law
- Laws of economics

5

## THE LUMINARIES

Smith, Marx, Marshall, Samuelson, Friedman



6

## CONFUSION, CONTROVERSY AND QUANTIFICATION

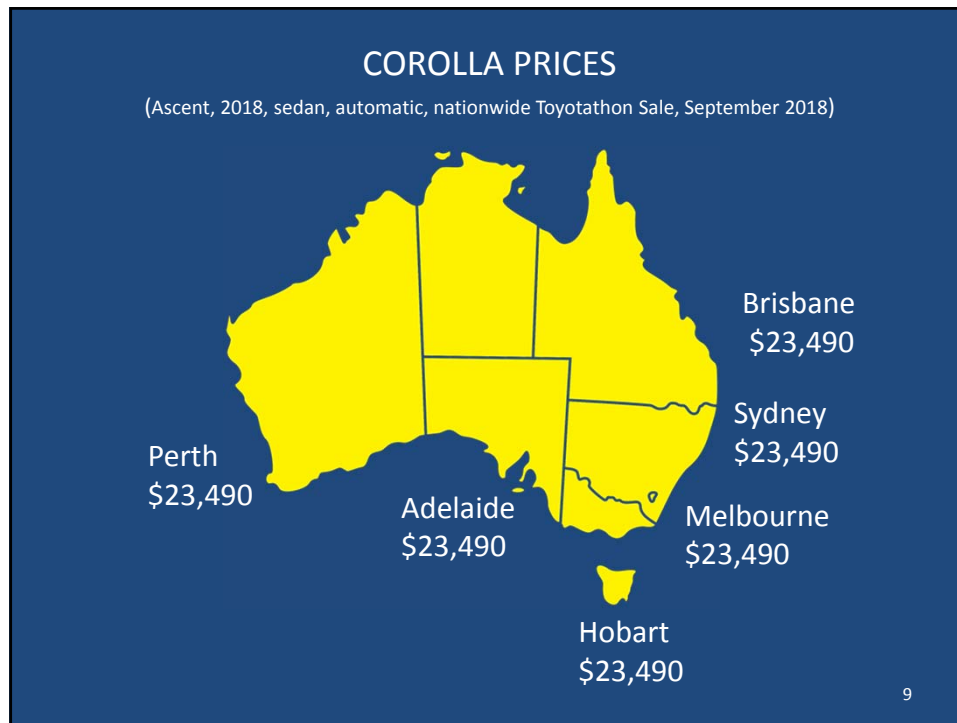
- Laws of economics deal with what is
- Theorems not laws
- Two examples:
  - The law of one price
  - Four laws of consumption

7

## MY CAR



8



## II. THE LAW OF ONE PRICE

The law of one price:

The price of an identical good sells for the same price everywhere

- Mechanism: Arbitrage
- Prices are equalised across countries:

$$p = p^*$$

## PREREQUISITES FOR THE LAW OF ONE PRICE

1. Identical commodities – only difference is location &/or currency
2. No barriers to trade
3. No transport costs
4. No nontraded components (wholesale/retail margins, for example)

A big ask!

11

## EXCHANGE RATES AND PRICES

- Law of one price (LOP) implies prices at home and abroad equalised:

$$p_c = S_c \cdot p^*, \text{ or } \log p_c = \log S_c + \log p^*$$

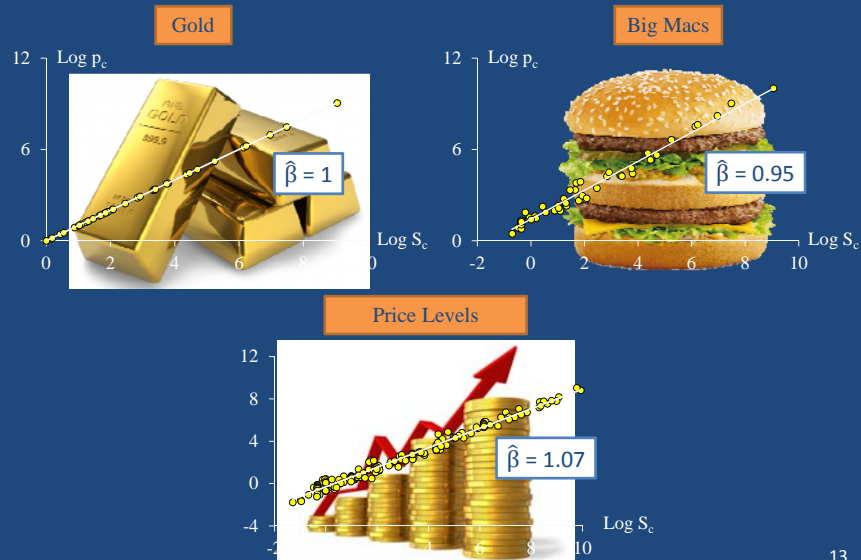
- LOP implies local price,  $p_c$ , proportional to the exchange rate,  $S_c$
- With a cross-section of countries and for a particular item, regress local prices on exchange rates:

$$\log p_c = \alpha + \beta \cdot \log S_c + \varepsilon_c, \quad c = 1, \dots, C \text{ countries}$$

- LOP implies:  $\beta = 1$

12

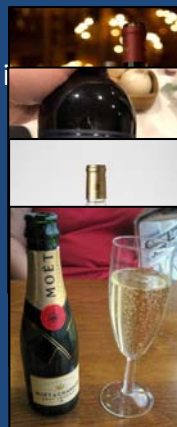
## THREE ILLUSTRATIONS OF THE LOP



13

PRICES OF  
198 FOOD ITEMS

- Data from International Program, 2011 version
- 198 finely defined food items:



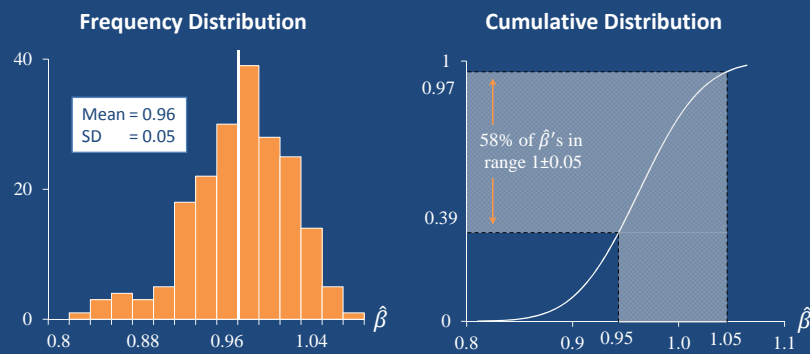
- Cross-section of almost 200 countries
- Consumer prices – contain substantial nontraded elements

14

## FIRST TEST OF LOP

Slope Coefficients, 198 Food Items

$$\log p_c = \alpha + \beta \cdot \log S_c + \varepsilon_c$$



Not perfect, but not bad for consumer prices

15

## SECOND TEST OF LOP: TIME-SERIES ACROSS COUNTRIES

Panel of **producer prices** from Food and Agricultural Organisation:

- 158 countries
- Annual data for 23 years, 1991–2013
- 133 agricultural commodities, such as

16



## DO LOP DEVIATIONS DIE OUT?

- Deviation:  $k_{ict} = \log p_{ict} - \log S_{ct} - \log p_{it}^*$
- Roughly speaking, deviation dies out when the change ( $\Delta k_{ict}$ ) falls with previous level ( $k_{ic,t-1}$ )
- Use regression equation
 

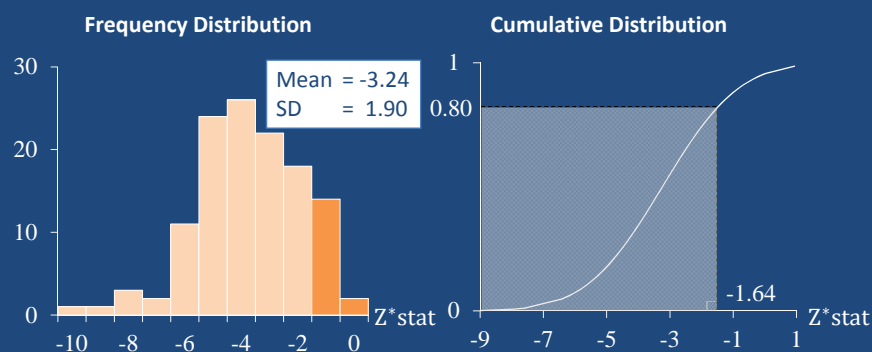
$$\Delta k_{ict} = \gamma_c + \lambda_c k_{ic,t-1} + \text{lagged } \Delta k_{ict} + \varepsilon_{ict}$$

 to test  $\lambda_c = 0$
- Use Choi and Hartung's approach to testing

17

## TESTS OF LOP DEVIATIONS, 133 COMMODITIES

$Z^* \text{stat} \sim N(0,1)$  when coefficient  $\lambda_c = 0$



For 80% of commodities, reject nonstationary deviations

18

## WHAT HAS BEEN LEARNT?

### Summary

1. Prices not equalised
2. Considerable price dispersion, but slope coefficients  $\approx 1$  and deviations eliminated over time
3. Currency changes flow more or less fully into prices
4. LOP not perfect, but suitable as a benchmark approach

### Uses of LOP

1. Policies attempting to divorce domestic prices from the exchange rate and world prices will fail
2. PPP: Is the currency over- or under-valued?
3. Distinction between real and nominal sides of the economy

19

## ARBITRAGE IN FINANCIAL MARKETS

Gold as financial asset

### Market for Financial Assets

- Lower transaction/transport costs for financial assets
- Lower “nontraded components”
- LOP tends to hold more closely

### Example

Equalisation of hedged returns on identical securities denominated in different currencies -- covered interest arbitrage

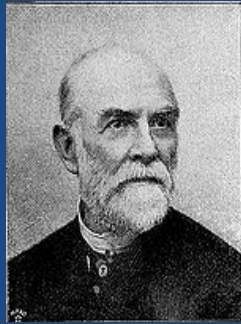
### No Arbitrage Condition

- Modigliani-Miller irrelevance of capital structure
- Dividend policy
- Options pricing
- Ricardian equivalence of government debt and taxes

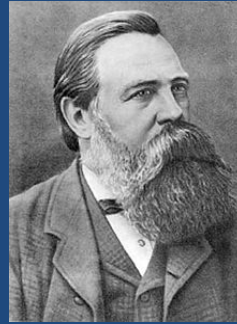
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### III. FOUR LAWS OF CONSUMPTION

- Engel's law – proportion of income spent on food declines with income



Ernst Engel  
1821 – 1896



Friedrich Engels  
1820 – 1895

21

### A WEEK'S FOOD

Chad



2011 GDP p. c. = \$2,000  
Food share = 51%

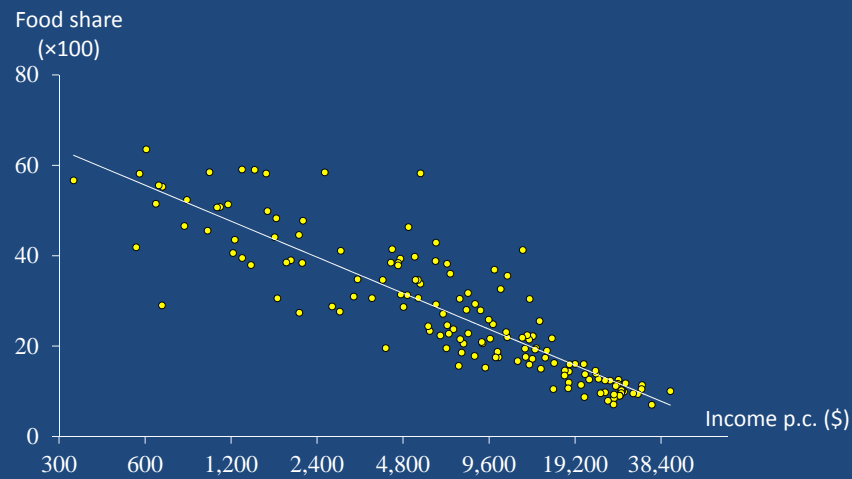
Norway



2011 GDP p. c. = \$61,900  
Food share = 11%

22

LAW 1: ENGEL'S LAW,  
FOOD SHARE FALLS AS INCOME RISES  
(155 countries in 2011)

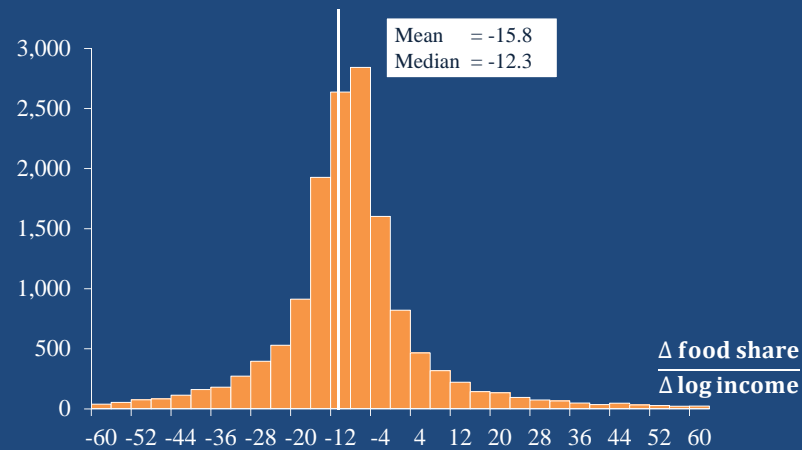


CHAD AND NORWAY AGAIN

Chad	Norway
2011 GDP p. c. = \$2,000 Food share = 51%	2011 GDP p. c. = \$61,900 Food share = 11%

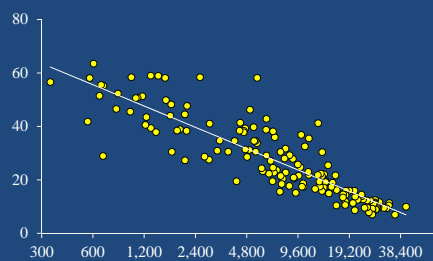
	Food share
Chad	51%
Norway	11%
Difference	-40 p. p.

## DIFFERENCES IN FOOD SHARES, (Relative to income differences, 15,400 country pairs)



25

## STRONG FORM OF ENGEL'S LAW



Food share falls arithmetically as  
income rises geometrically, or

$$w = \alpha + \beta \cdot \log M, \quad \beta < 0$$

When  $\beta = -15$ , this implies

Food share falls by  
10 percentage pts when income doubles

26

## USING ENGEL'S LAW: HOW RICH IS NORWAY?

	Food share change (Percentage points)	Rich country's income as multiple of poor's	Description
Engel's law	-10	2	<ul style="list-style-type: none"> <li>Share falls 10 points</li> <li>Income doubles</li> </ul>

16

- Norway's income is double 4 times over – a multiple  $2^4 = 16$
- Measured income multiple based on market exchange rates is

$$\frac{\$62,000}{\$2,000} = 31$$

- Warning!

27

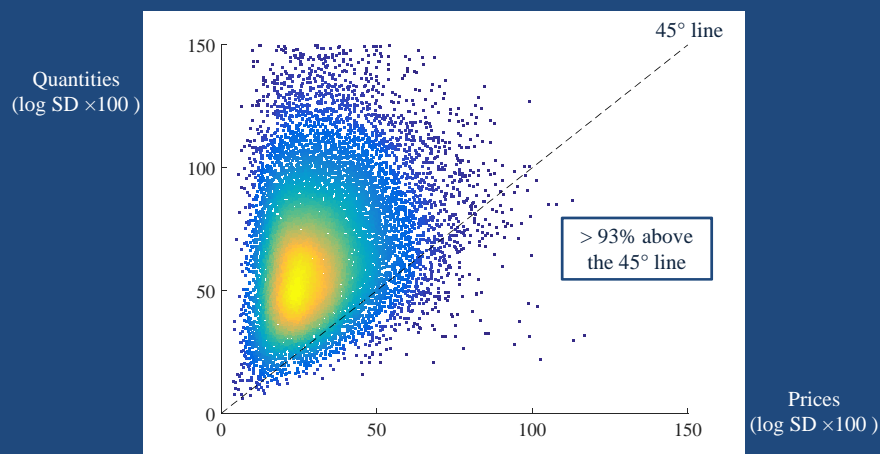
## LAW 2: QUANTITIES MORE VOLATILE THAN PRICES

- Prices more stable than quantities consumed
- Prices “sticky” over time – “contracts”, “menu costs”
- Quantities more flexible – driven by both prices and incomes
- Empirical regularity:

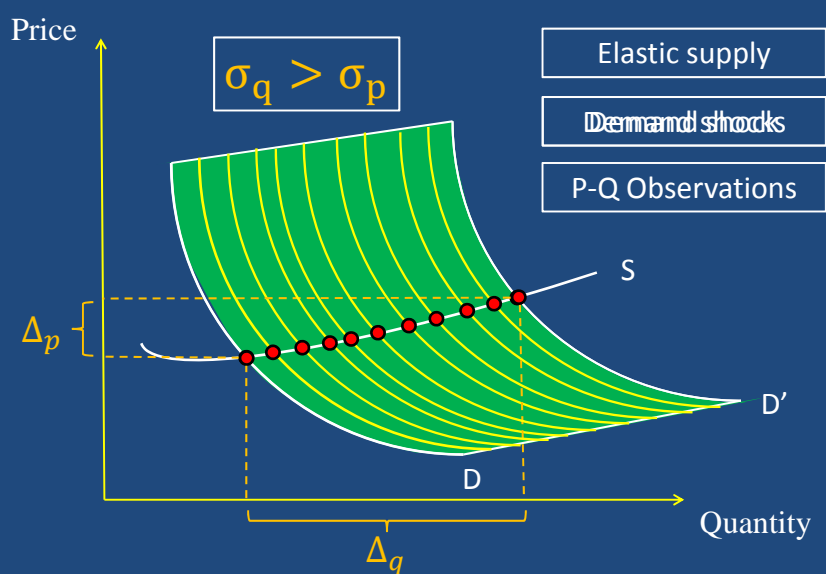
Quantity dispersion > price dispersion

28

## DISPERSION OF QUANTITIES AND PRICES (15,400 country pairs)

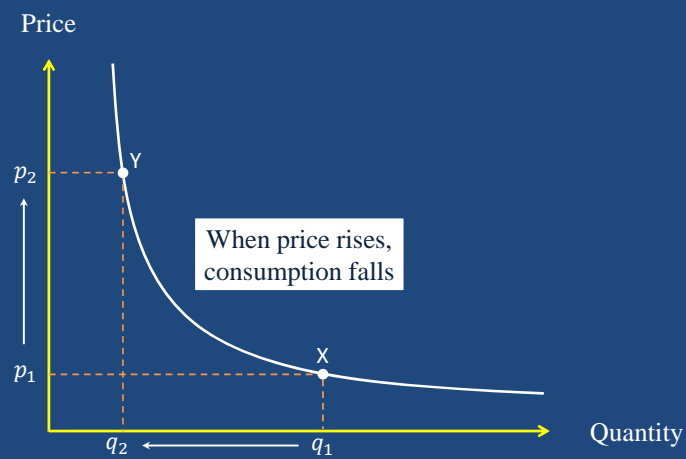


## WHY THE VOLATILITY OF QUANTITIES?

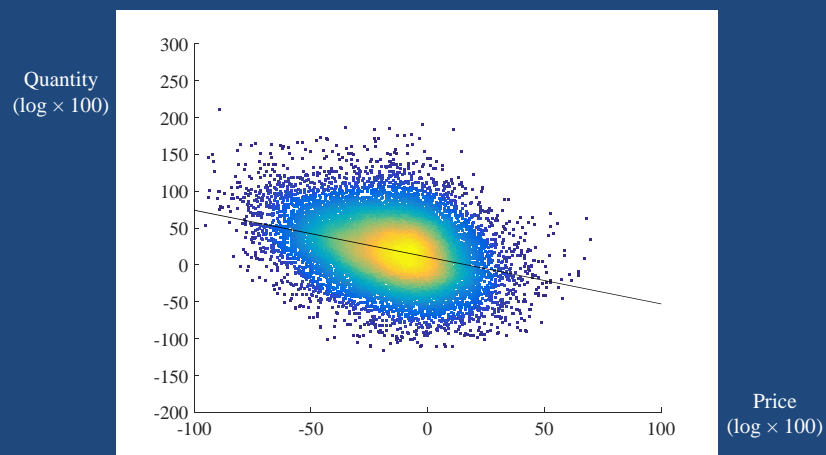


30

### LAW 3: DEMAND CURVES SLOPE DOWN (Aka the law of demand)



### DEMAND CURVE FOR FOOD (15,400 country pairs)





## BEER, WINE AND SPIRITS



- Food and alcohol very different commodities
- Alcohol a narrower commodity
- More idiosyncratic consumption
- Food a necessity; what about alcohol?

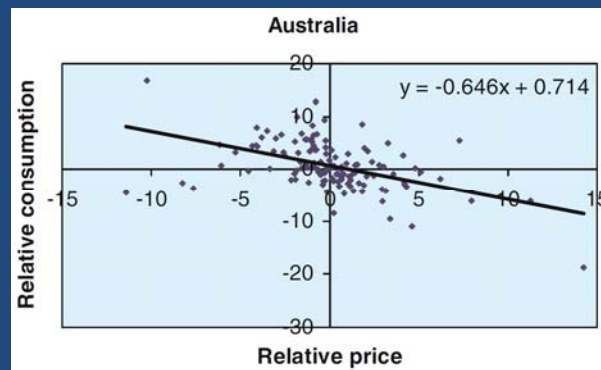
33

## ALCOHOL DEMAND

- Does the law of demand still hold?
- Saroja Selvanathan and Antony Selvanathan studied demand for alcoholic beverages
- Consumption of beer, wine and spirits in 10 countries over time, annual data
- Next 3 slides from Selvanathan and Selvanathan (2007)

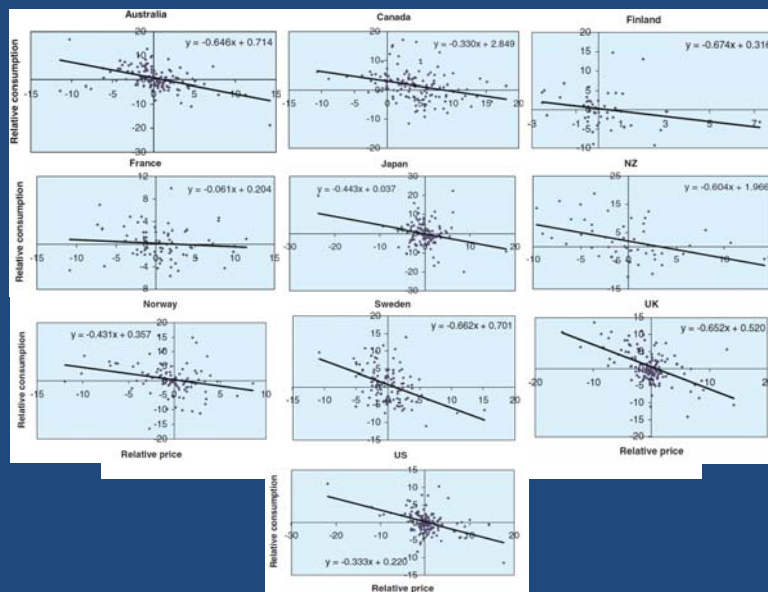
34

## DEMAND FOR ALCOHOL AS A WHOLE, AUSTRALIA



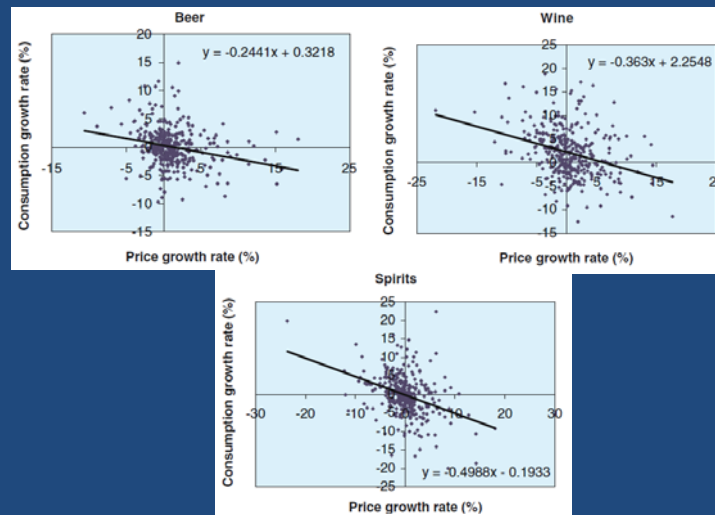
35

## AUSTRALIA + NINE



36

## BEER, WINE AND SPIRITS INDIVIDUALLY



37

## “LAW” 4: DEMAND ELASTICITIES ARE $-\frac{1}{2}$

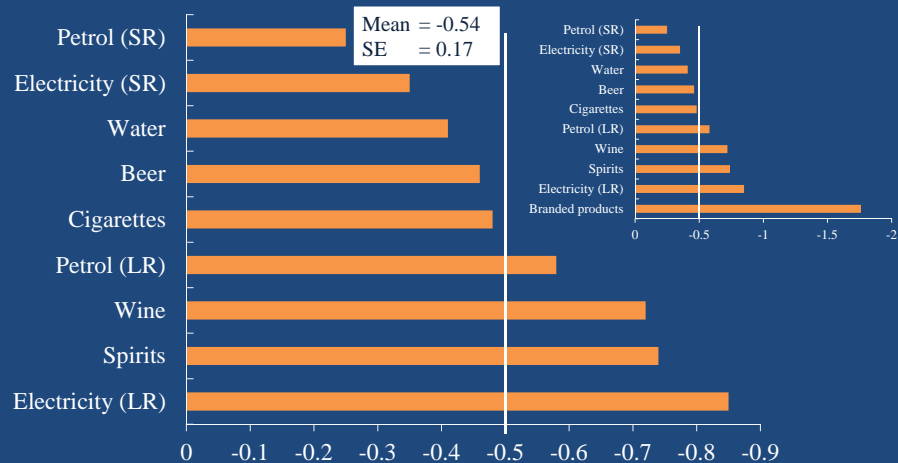
- Price elasticity is the price sensitivity of demand
- Are there good substitutes?
- If nothing is known, use

$$\text{Price elasticity} = -\frac{1}{2}$$

- Useful for “interesting” goods with limited substitutes

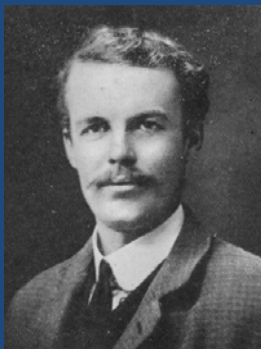
38

## DEMAND ELASTICITIES FOR INTERESTING PRODUCTS



39

## ARTHUR PIGOU



- Arthur Pigou (1877-1959)
- The “elusive professor” (Knight and McLure, 2012)

### Pigou's Law

- Luxuries more price elastic than necessities:

$$\text{Price elasticity} = -\frac{1}{2} \times \text{Income elasticity}$$

- Holds when utility is additive -- no cross effects:

$$u(q_1, \dots, q_n) = \sum_{i=1}^n u_i(q_i)$$

40

## USES OF LAWS OF CONSUMPTION

### 1. Engel's law

- Shortcut estimate of income
- Feeding the world

### 2. Volatility of quantities > prices

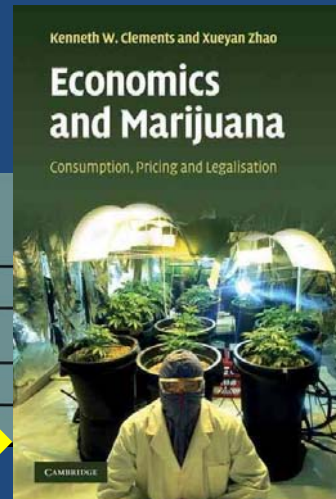
- Source of shocks to a market
- Workings of markets

### 3. Higher prices leads to lower consumption

- Pricing strategies of firms
- Tax policy

### 4. Rule of $-\frac{1}{2}$

- Use when little or nothing known
- Marijuana economics



## IV. THE NATURE OF LAWS OF ECONOMICS

### Laws of Economics DO NOT:

- Come from single breakthrough
- Stem from the work of individual nor particular location
- Derive from theory or introspection alone
- Constitute black letter law

### Laws of Economics ARE:

- Empirical regularities from a large body of research
- Robust, having stood the test of time
- Quantitative
- Useful

## SUMMARY

Laws of economics are robust  
quantitative relationships useful in  
understanding many different  
circumstances

43

## THREE QUESTIONS

1. What if the laws of economics are broken?

2. Who polices the laws?



3. How do general laws work?  
Trump's general law: "China cut its  
US trade deficit by \$200 billion  
defies the laws of economics"

23 May 2018



44

## OTHER POSSIBLE LAWS

### Monetary Economics

1. Fisher's law: Nominal interest rates rise with expected inflation
2. Gresham's law: Bad money drives out good
3. Friedman's law: Inflation is wholly and solely a monetary phenomenon

### Consumer Demand

1. Law of diminishing marginal utility: Really?
2. Symmetry of the substitution effects: Effect of change in beer price on wine consumption = wine price change on beer
3. Bennett's law: Share of calories derived from staples declines as income rises

45

My time must be up  
Thank you

46

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48



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