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COBB-DOUGLAS UTILITY – EVENTUALLY!

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The Centre of Policy Studies (COPS) is a research centre at Monash University devoted to quantitative analysis of issues relevant to Australian economic policy.

Cobb-Douglas-Eventually!

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TOPICS COVERED IN PAPER

- *historical review of directly additive preferences (LES)*
- *Engel flexibility, [Engel] regularity, convergence to Cobb-Douglas —differing opinions about desirability of the latter*
- *implicit indirect additivity — AIDADS*

An Implicitly Directly Additive Demand System

TOPICS [2]

- *problems in CGE sims where there are v. large changes in income*
- *insertion of AIDADS into a CGE model & its calibration — ORANI-G → ORANAIDAD*
- *demonstration of ORANAIDAD's ability to maintain regularity throughout a large (esp. negative) change in per capita incomes*

TOPICS [3]

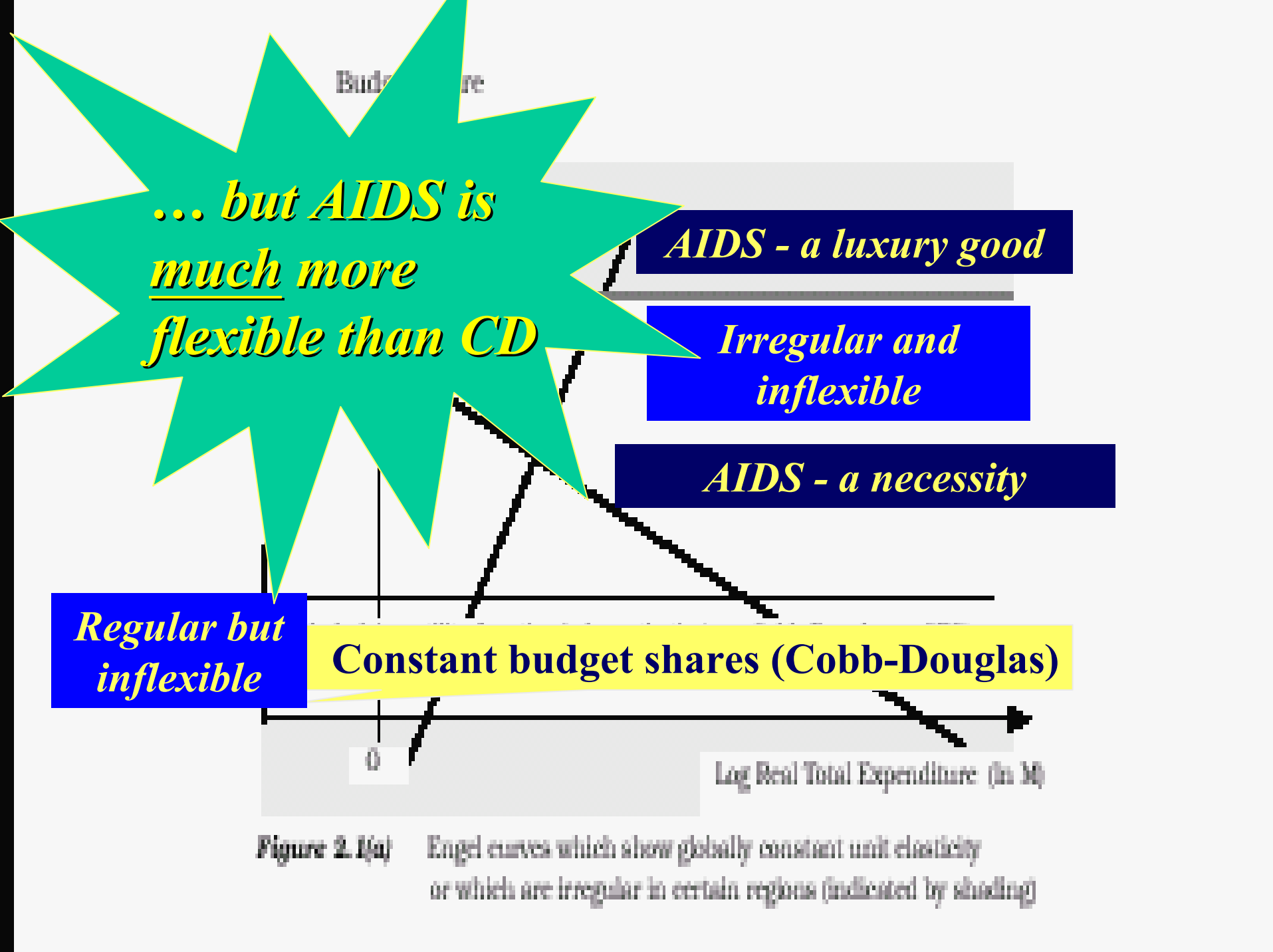
- ***effectively global regularity of AIDADS [in the Appendix]***

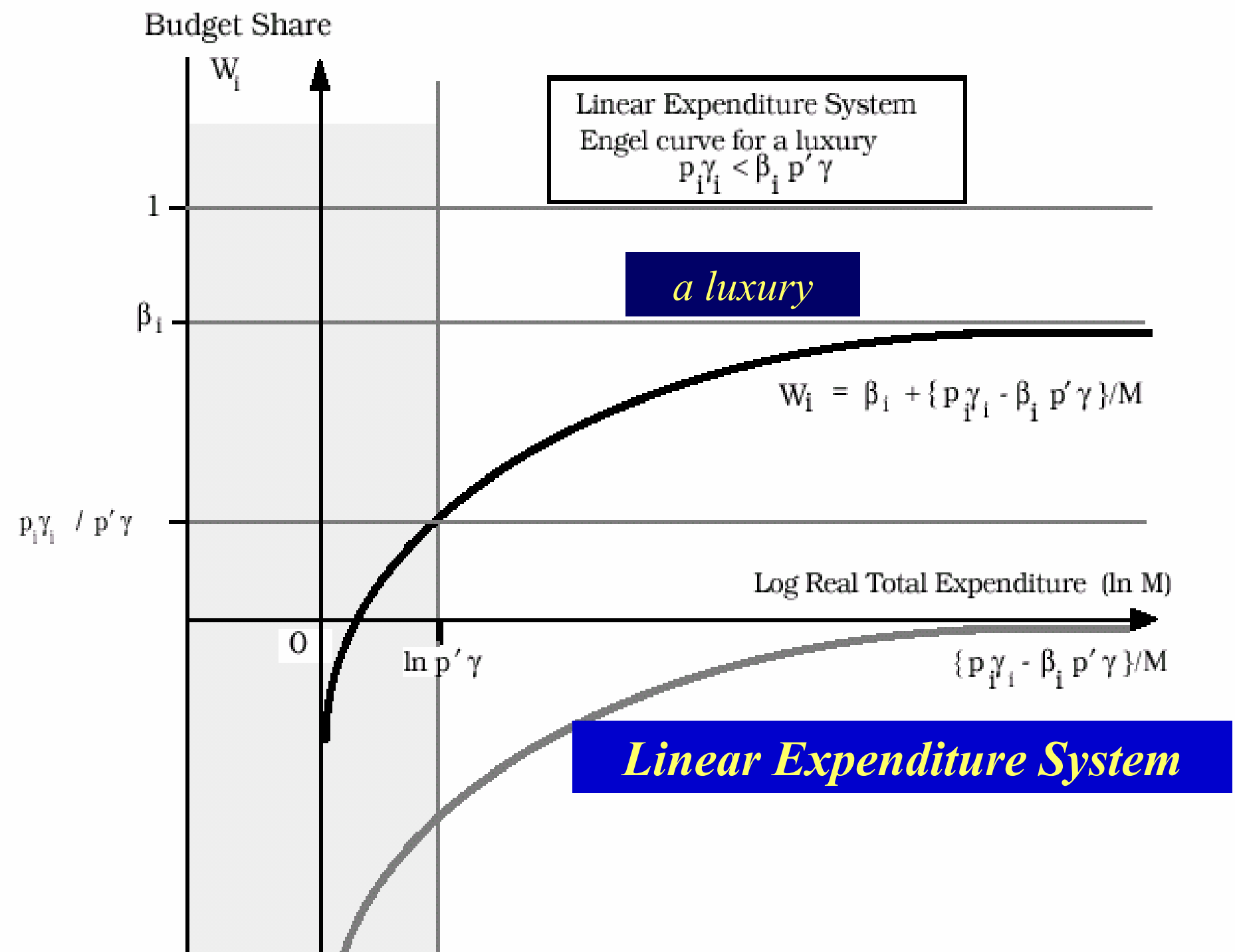
Main ideas to be covered in this presentation:

Engel Flexibility, [Engel] Regularity, Convergence to what as income $\rightarrow \infty$?

Relevance for CGE?

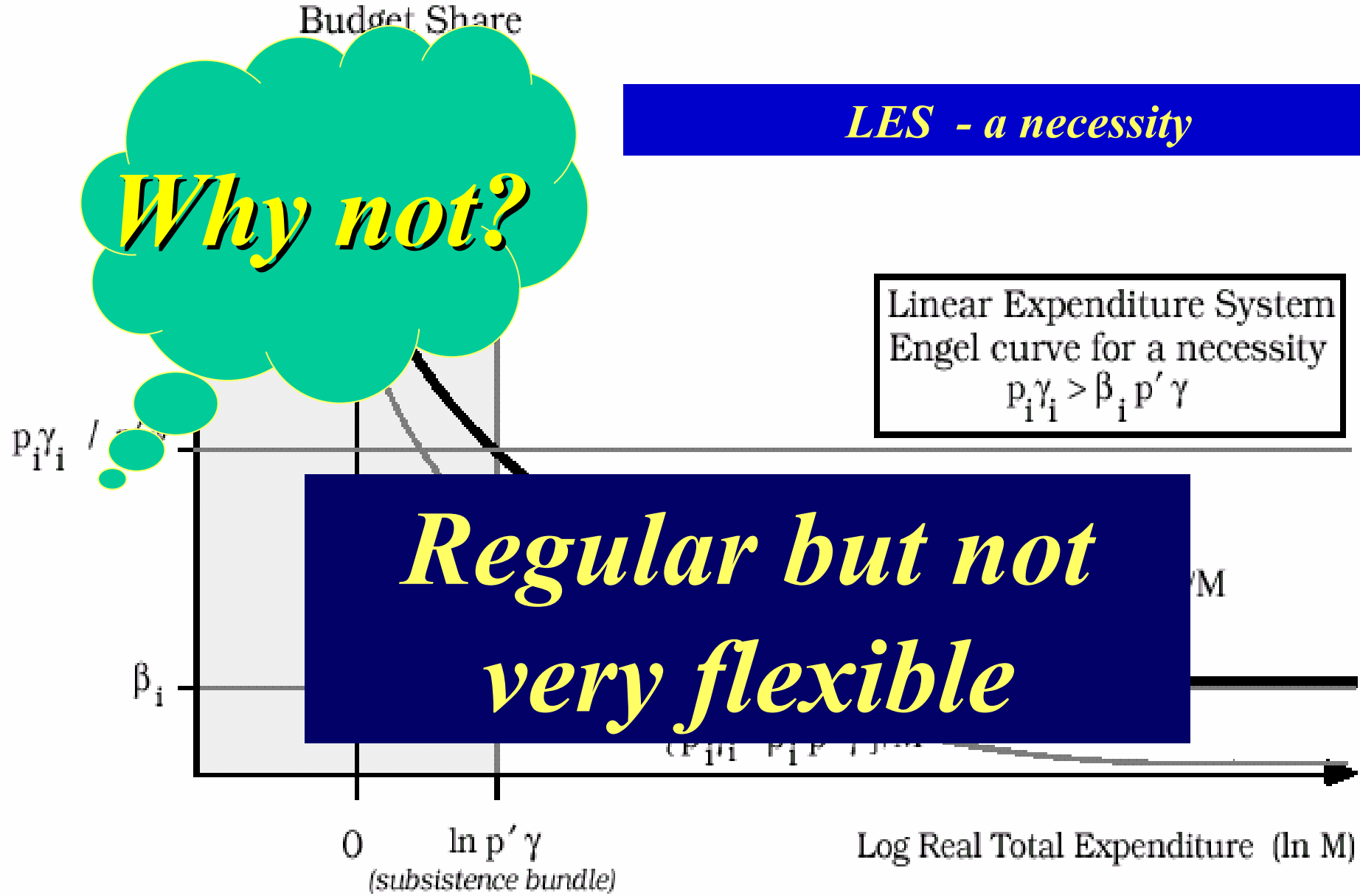
If large changes in per capita income are involved, Engel flexibility and regularity are needed to keep the consumer demand system valid over the course of a simulation


… but AIDS is much more flexible than CD
AIDS - a luxury good
Irregular and inflexible
AIDS - a necessity
Regular but inflexible
Constant budget shares (Cobb-Douglas)
0
Log Real Total Expenditure (ln M)
Figure 2.1(a) Engel curves which show globally constant unit elasticity or which are irregular in certain regions (indicated by shading)


Budget Share
W_i
Linear Expenditure System
Engel curve for a luxury
$p_i\gamma_i < \beta_i\, p'\gamma$
1
β_i
$p_i\gamma_i \;/\; p'\gamma$
a luxury
$W_i = \beta_i + \{p_i\gamma_i - \beta_i\, p'\gamma\}/M$
Log Real Total Expenditure (ln M)
0
$\ln p'\gamma$
$\{p_i\gamma_i - \beta_i\, p'\gamma\}/M$
Linear Expenditure System

LES - a necessity

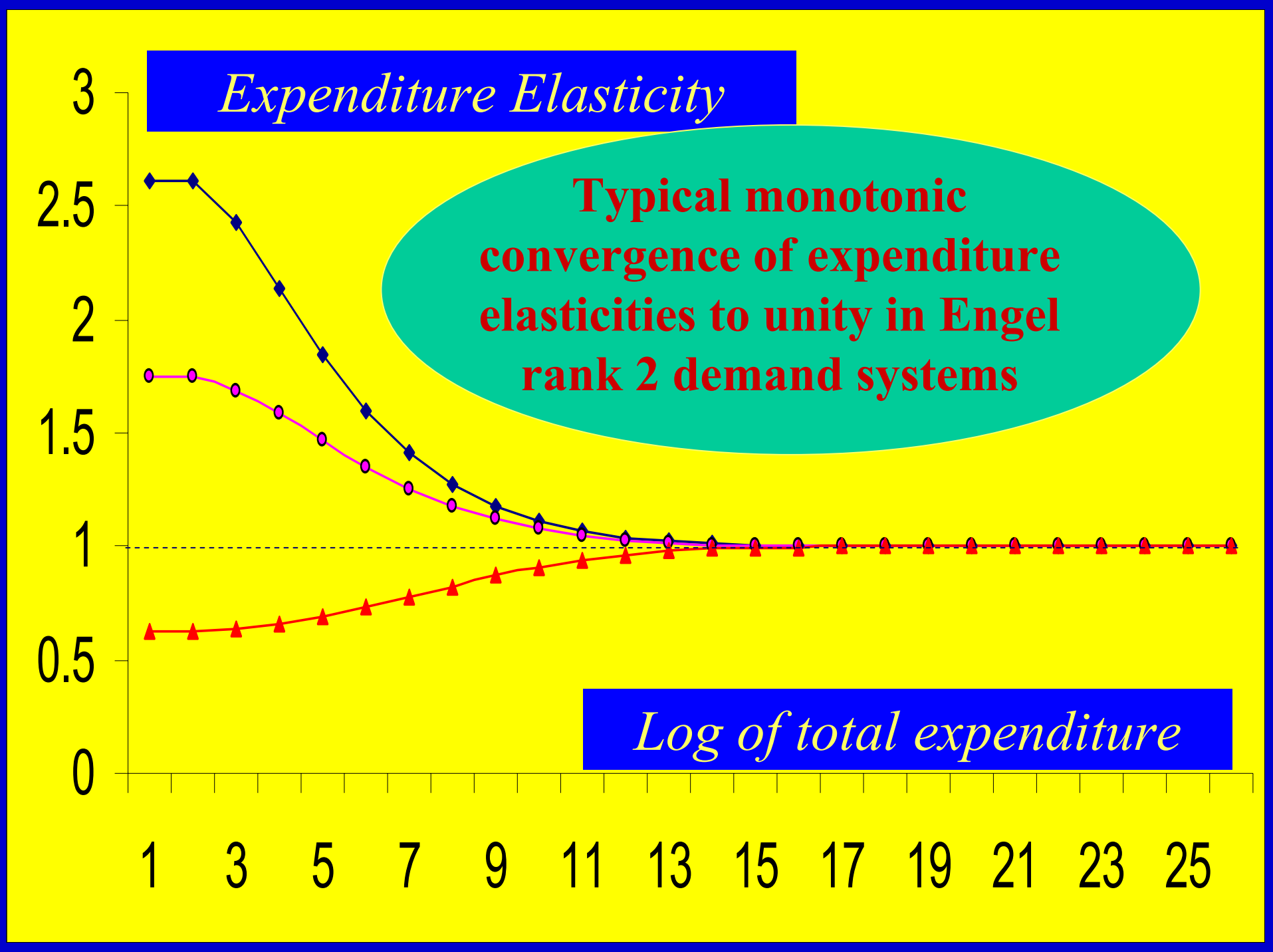
Why not?



Regular but not very flexible

Figure 2.1(b) Engel Curve in the Linear Expenditure System for a necessity
The irregular region of the LES is indicated by shading.

In the LES, budget shares and expenditure elasticities are monotonic in total expenditure


Expenditure Elasticity
Typical monotonic convergence of expenditure elasticities to unity in Engel rank 2 demand systems
Log of total expenditure
3
2.5
2
1.5
1
0.5
0
1
3
5
7
9
11
13
15
17
19
21
23
25

Engel Flexibility—Definitions

- *Extremely inflexible*

  *All budget shares are invariant to changes in total expenditure and to changes in relative prices; all total expenditure elasticities are equal to one, and all own price elasticities are equal to minus one; all cross price elasticities are equal to zero — **COBB-DOUGLAS** utility function*

Engel Flexibility [2]

- *Very inflexible*

  All expenditure elasticities are globally constant and equal to unity, but with budget shares varying as functions of relative prices — ***all homothetic utility functions, including CES***

Engel Flexibility [3]

- *Somewhat inflexible*

  Budget shares vary with changes in total expenditure at any given setting of relative prices, while expenditure elasticities vary among commodities and change with changes in total expenditure and changes in relative prices. Total expenditure elasticities are MONOTONIC in real total expenditure —

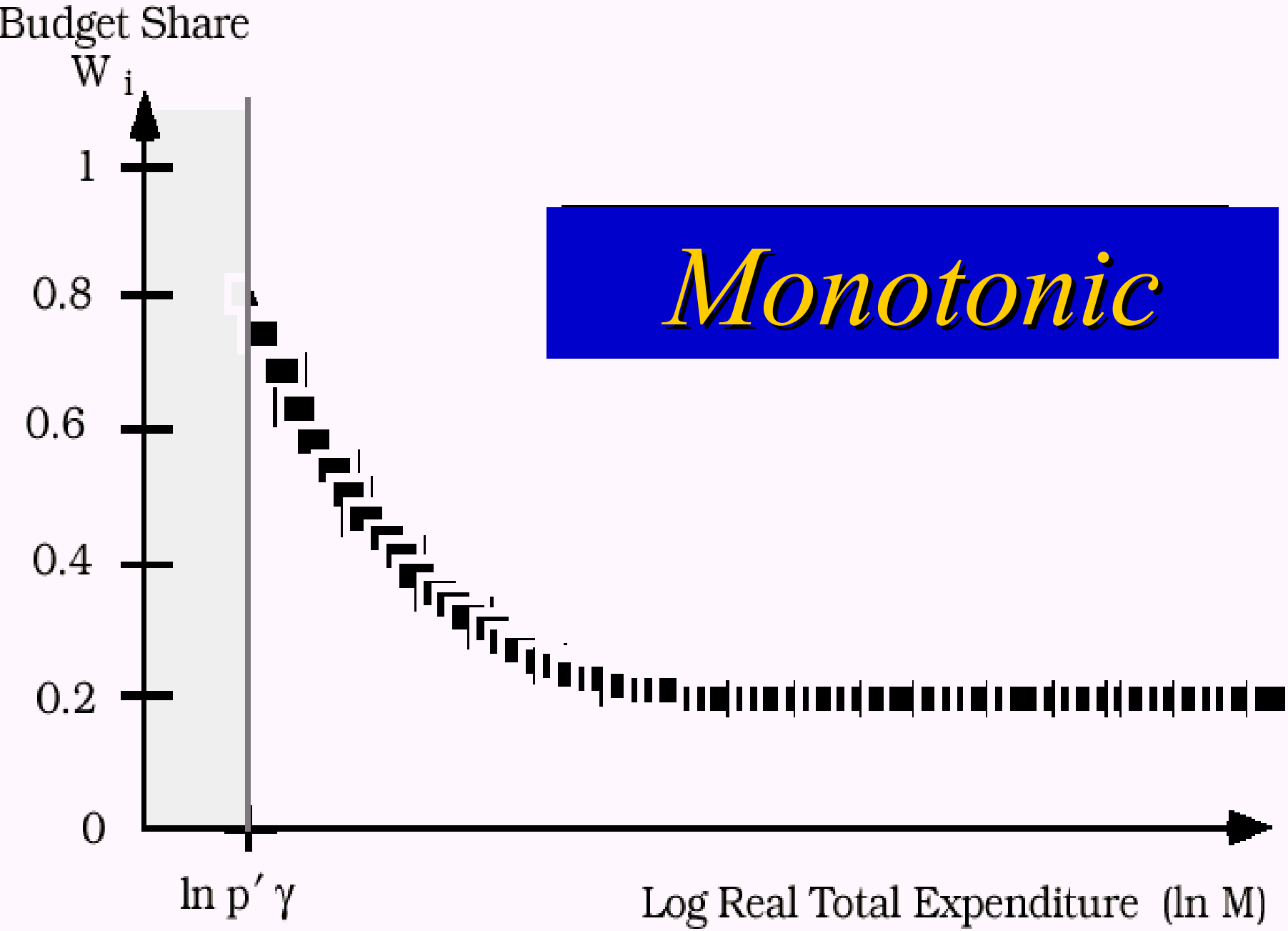
  all demand systems of Engel rank 2 *(which means* ***virtually all demand systems*** *commonly in use, including the* ***LES****).*

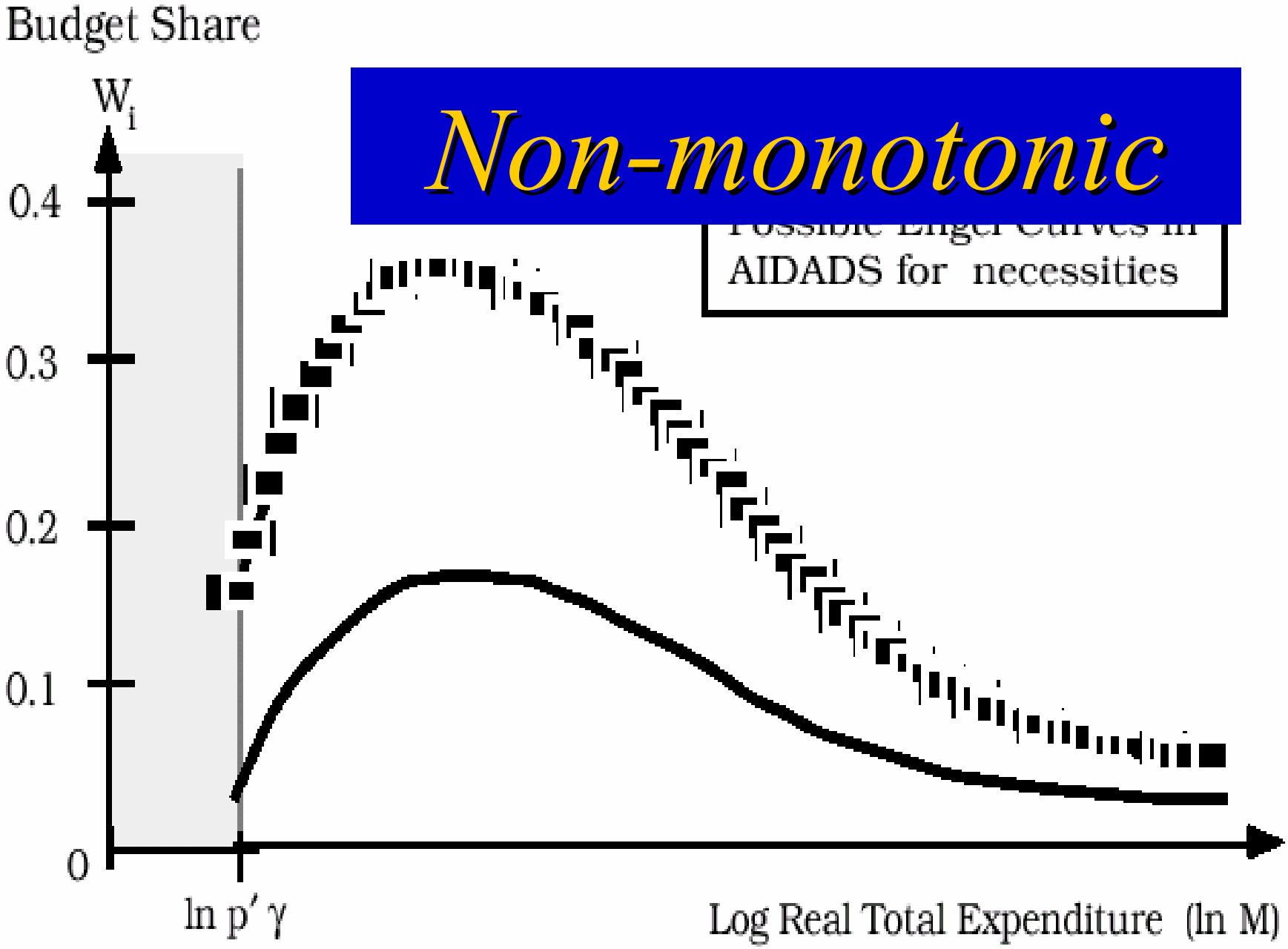
Engel Flexibility [4]

- *Flexible*

Engel elasticities & budget shares are not necessarily monotonic in total expenditure at any given setting of relative prices —
Engel rank 3 demand systems, including AIDADS

An Implicitly Directly Additive Demand System


Budget Share
W i
1
0.8
0.6
0.4
0.2
0
ln p′ γ
Log Real Total Expenditure (ln M)
Monotonic



Non-monotonic

Non-parametric empirical work with household survey data establishes that such non-monotonic behavior is a factual attribute of the data: Lewbel (1991), Rimmer & Powell (1994)

Convergence to Cobb-Douglas with increasing per capita income — 1st opinion

(a) As the real income of a consumer becomes indefinitely large, re-mixing the consumption bundle becomes irrelevant: having chosen the ultimately satisfying budget shares at any given set of relative prices, the superlatively wealthy continue to allocate additional income in the same proportions. With very large and increasing per capita income, ultimately the utility function becomes indistinguishable from Cobb-Douglas.

2nd opinion

(b) Consumer demand systems in which the income elasticities monotonically approach one (from above, in the case of luxuries; from below, in the case of necessities) are unsatisfactory both theoretically and empirically. For instance, a necessity with a low (< 1) income elasticity may very well become less elastic with further increases in income.

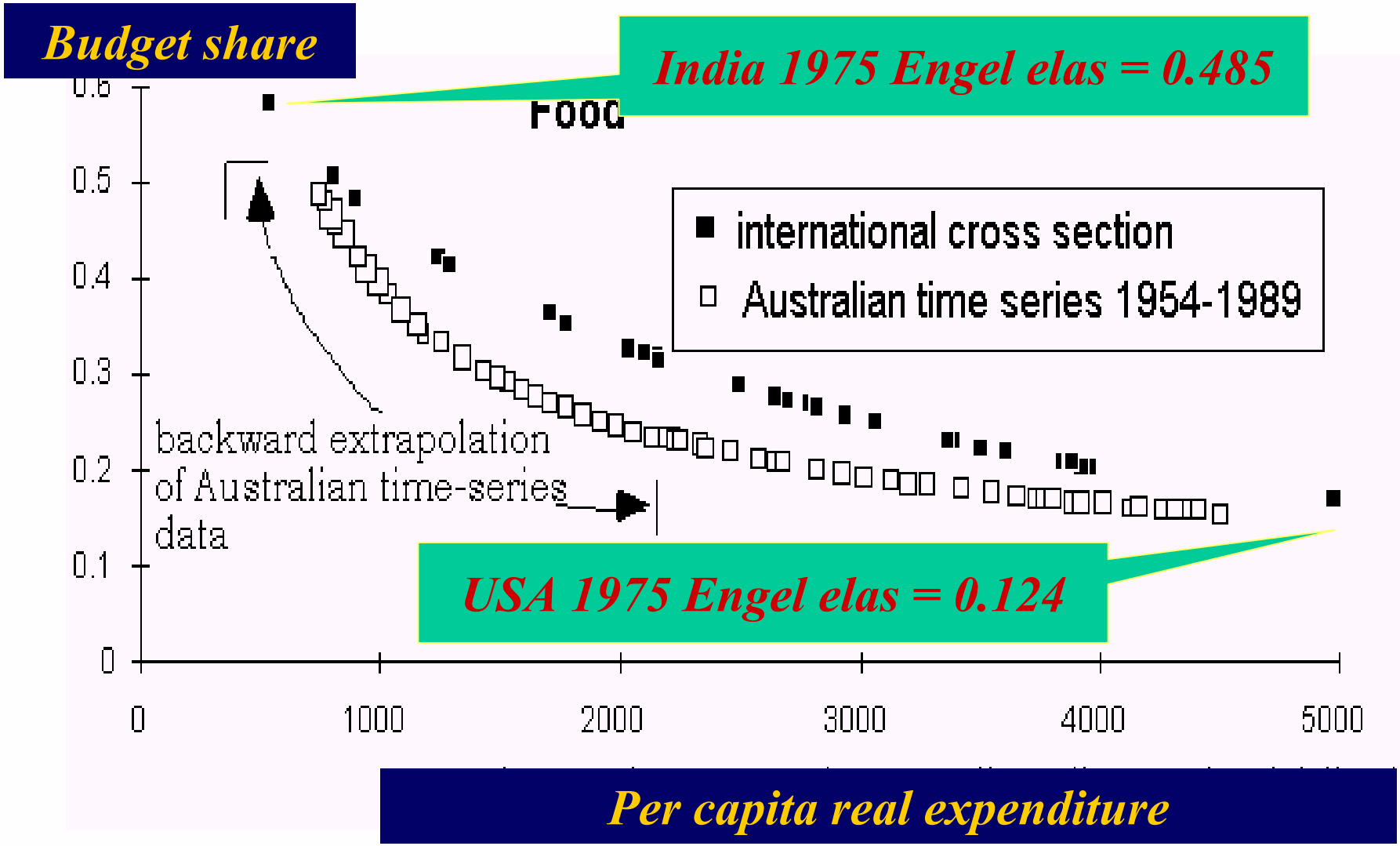
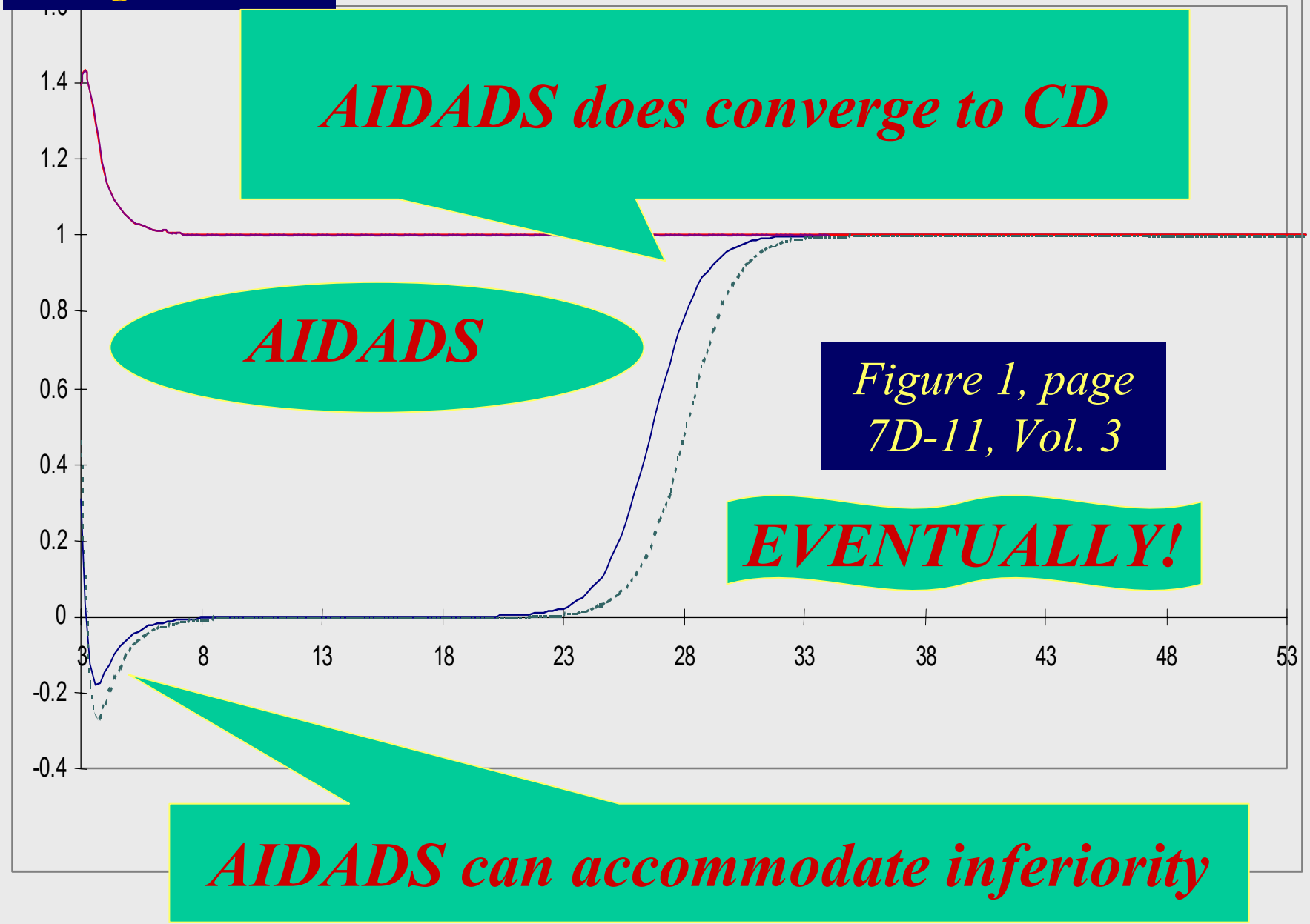
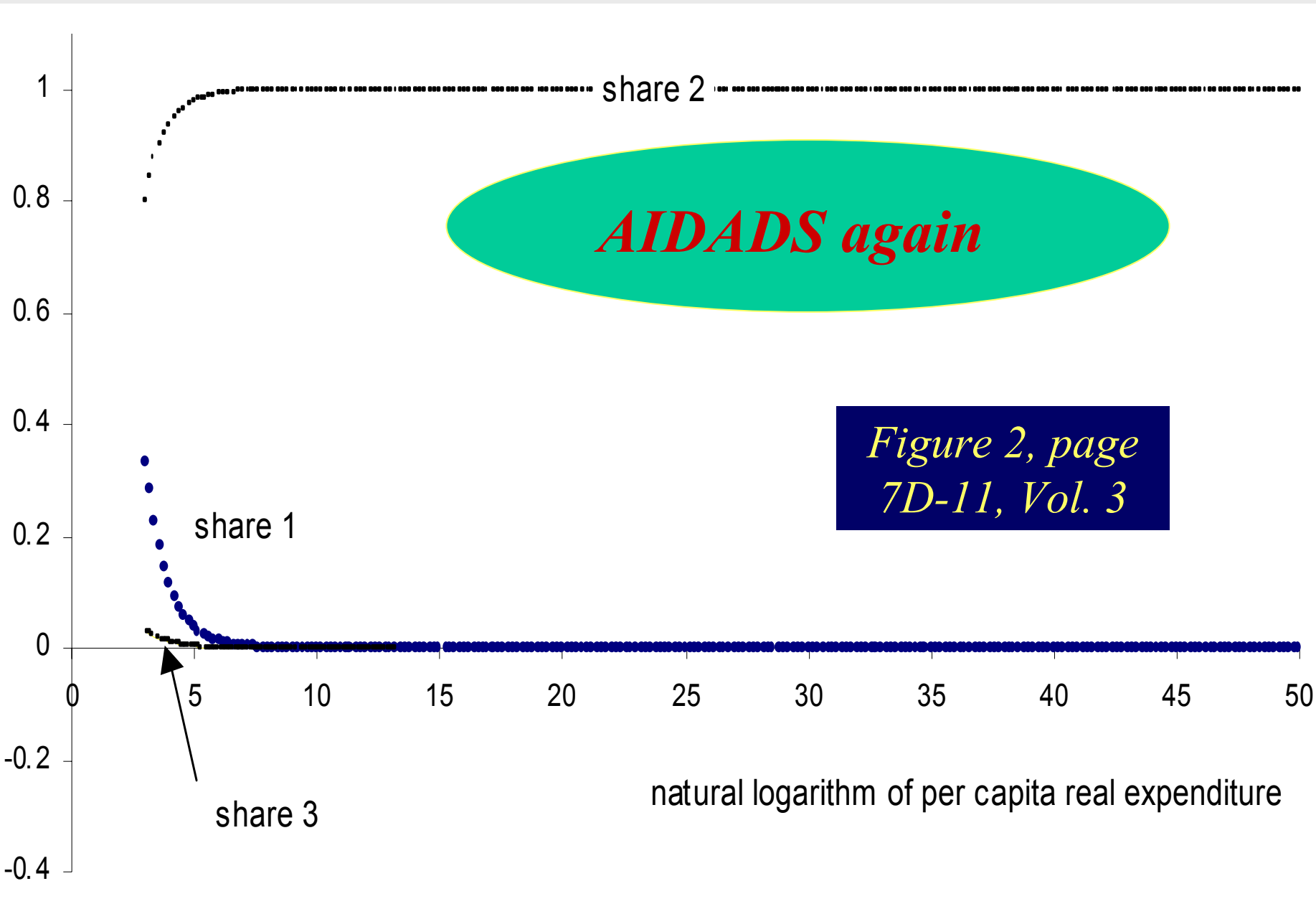
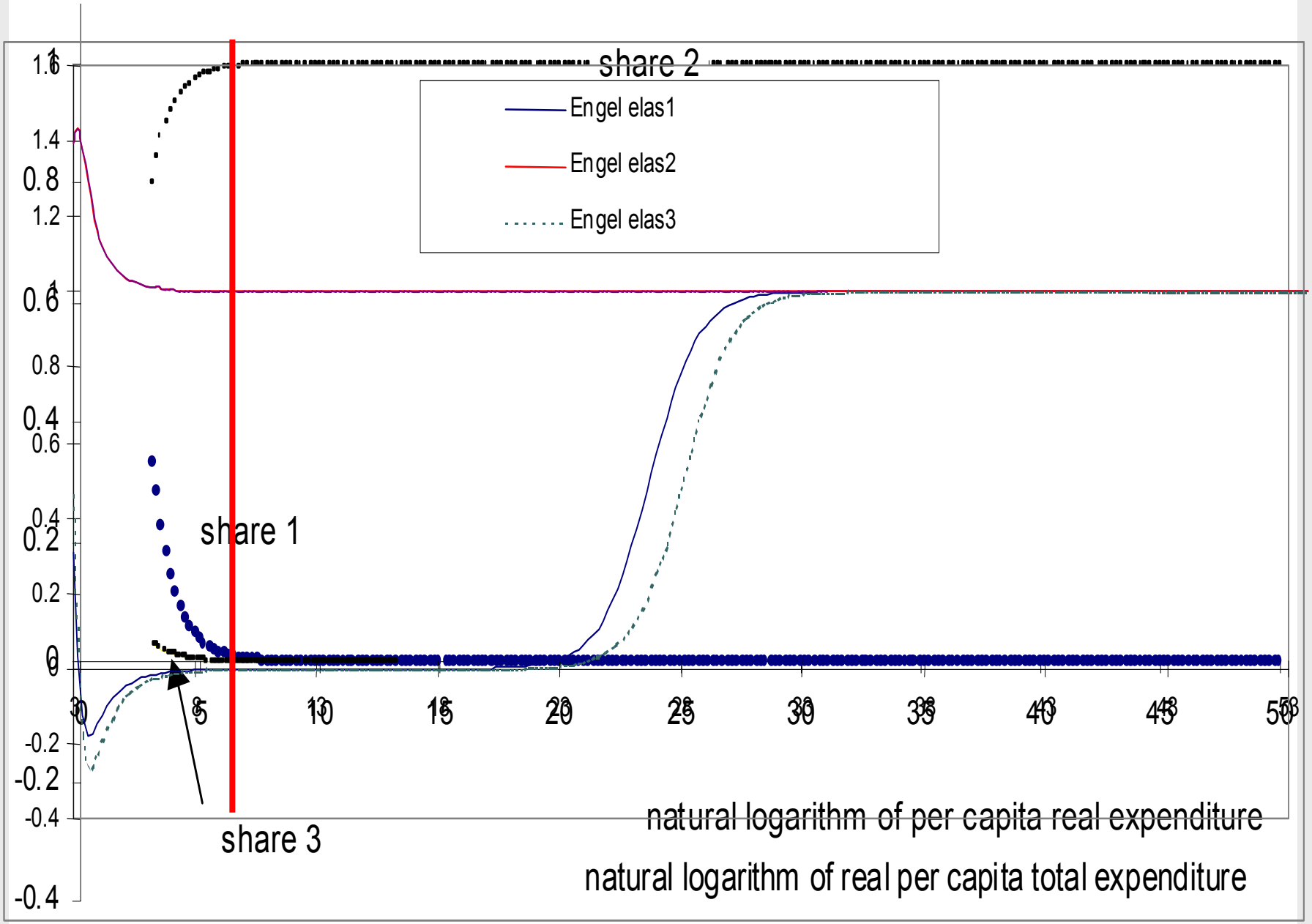


Figure 3: Behaviour of food's budget share under AIDADS estimated from 1975 cross sectional international comparisons data and from Australian national accounts time series data. The lowest income country in the data is India and the highest the USA. (Source: Rimmer and Powell (1992).

Budget shares




share 2
AIDADS again
Figure 2, page 7D-11, Vol. 3
share 1
share 3
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
0
5
10
15
20
25
30
35
40
45
50
natural logarithm of per capita real expenditure


share 2
Engel elas1
Engel elas2
Engel elas3
share 1
share 3
natural logarithm of per capita real expenditure
natural logarithm of real per capita total expenditure

The end