

Minding Ps & Qs in Natural Capital Accounts

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(standard BEA disclaimer for Scott – not official position of BEA / USG)

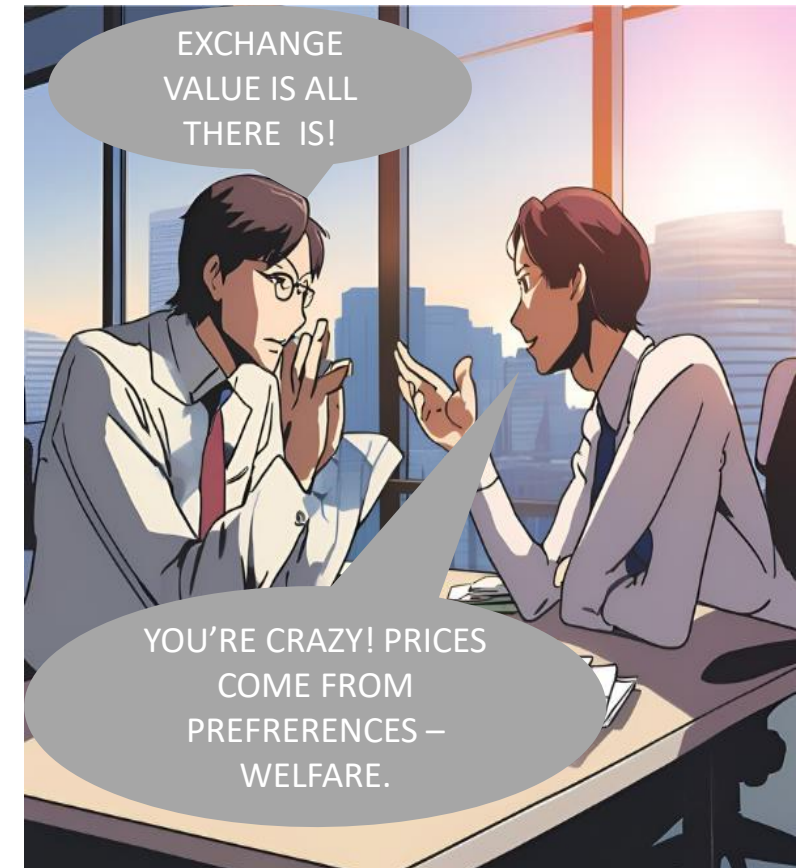
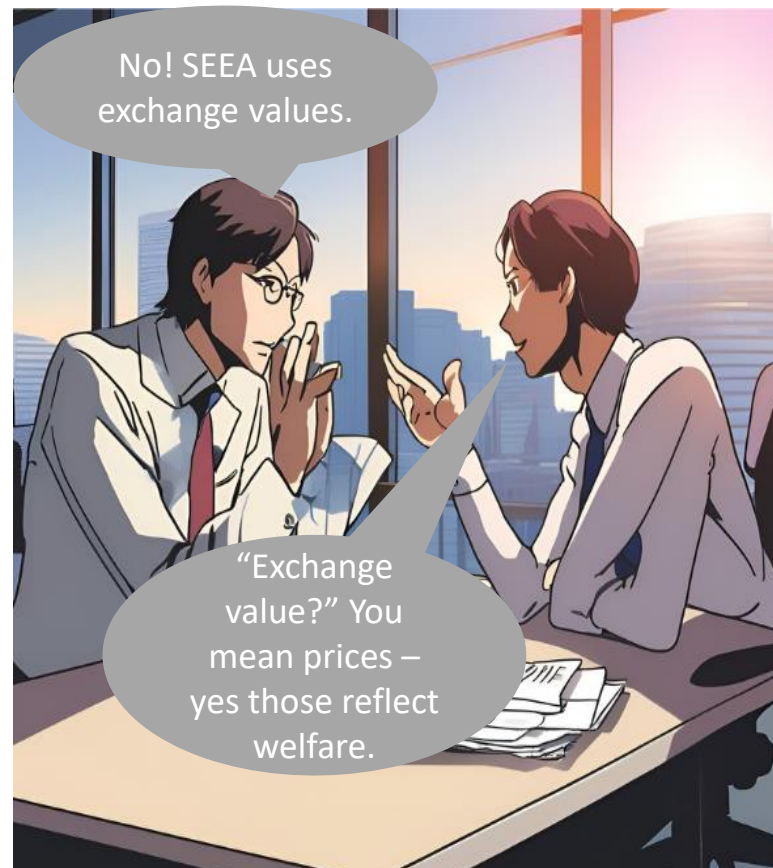
The SEEA-CF revision is important

Needs to be connected to serious economic thinking.

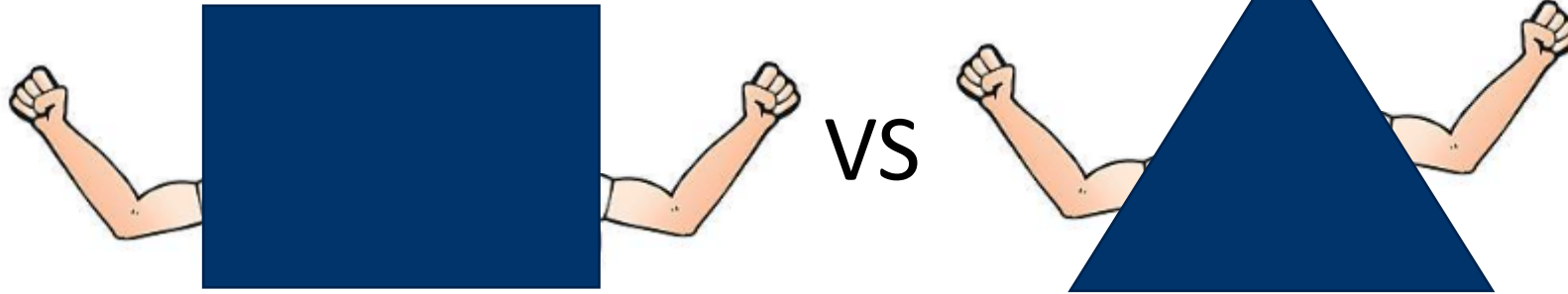
It needs to address what Economic Decision Makers (Treasuries, Finance Ministries, Central Banks etc) – even when they are not quite sure how to ask the questions.

Support from the Knobloch Family Foundation and Smart Prosperity Institute.

We have all experienced this for a long time...



Rectangles v Triangles



Measurement requires two concepts of value:

“Welfare value,” from welfare economics

“Exchange value,” from national accounting

Both:

- Agree marginal value is a price and price is a marginal value.
- General equilibrium and substitution or complementarity effects are important.
- Neither assumes that the market is first-best, and both operate in second-best worlds.
- Despite some important difference, change in real exchange value and change in real welfare value approximate each other.

Too much work to be done to keep talking past each other!

Discuss this in the context of change in wealth measures and the capital account.

It can translate to production or income measures.

Most of the discussion is really about the accounting boundary!

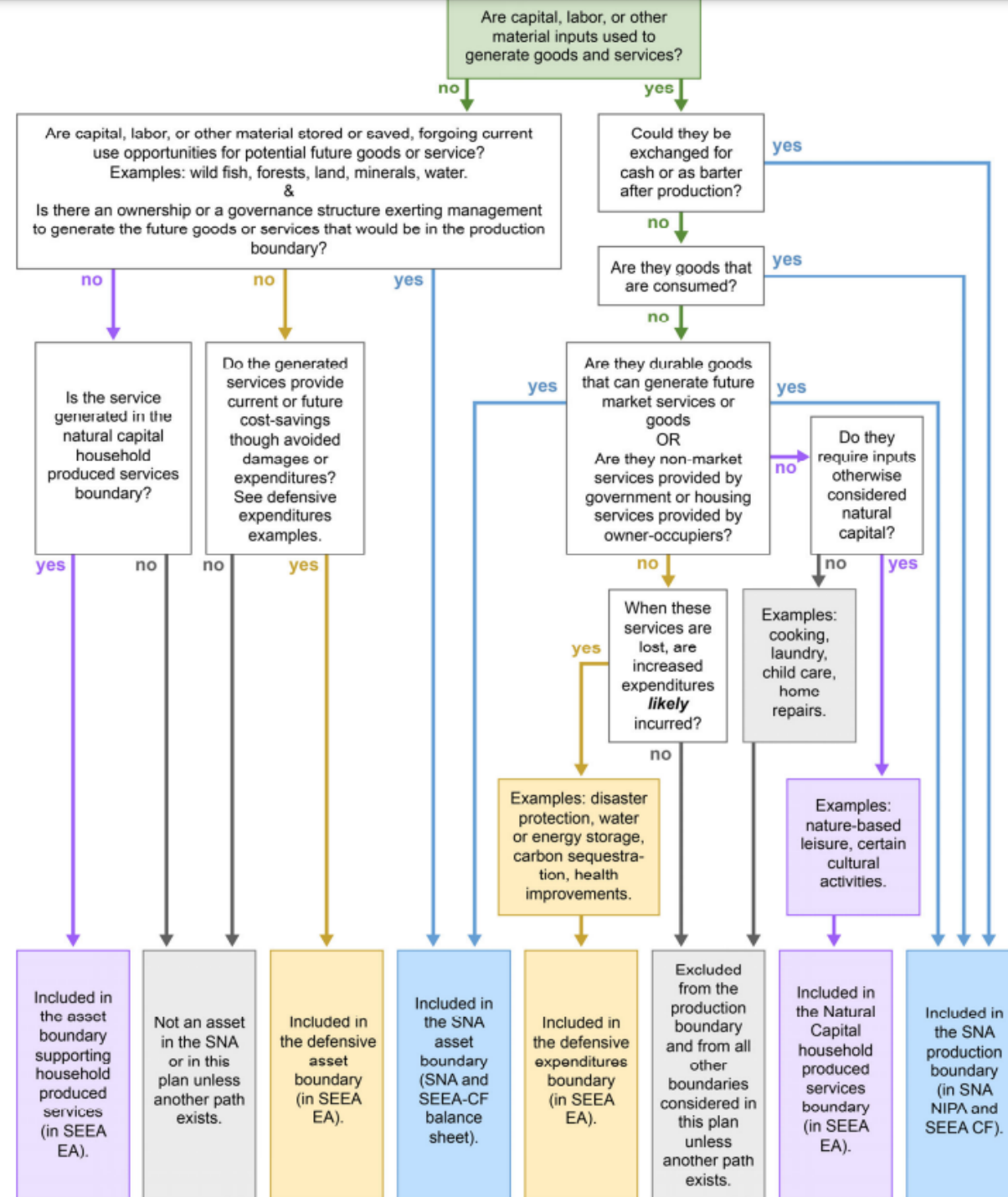
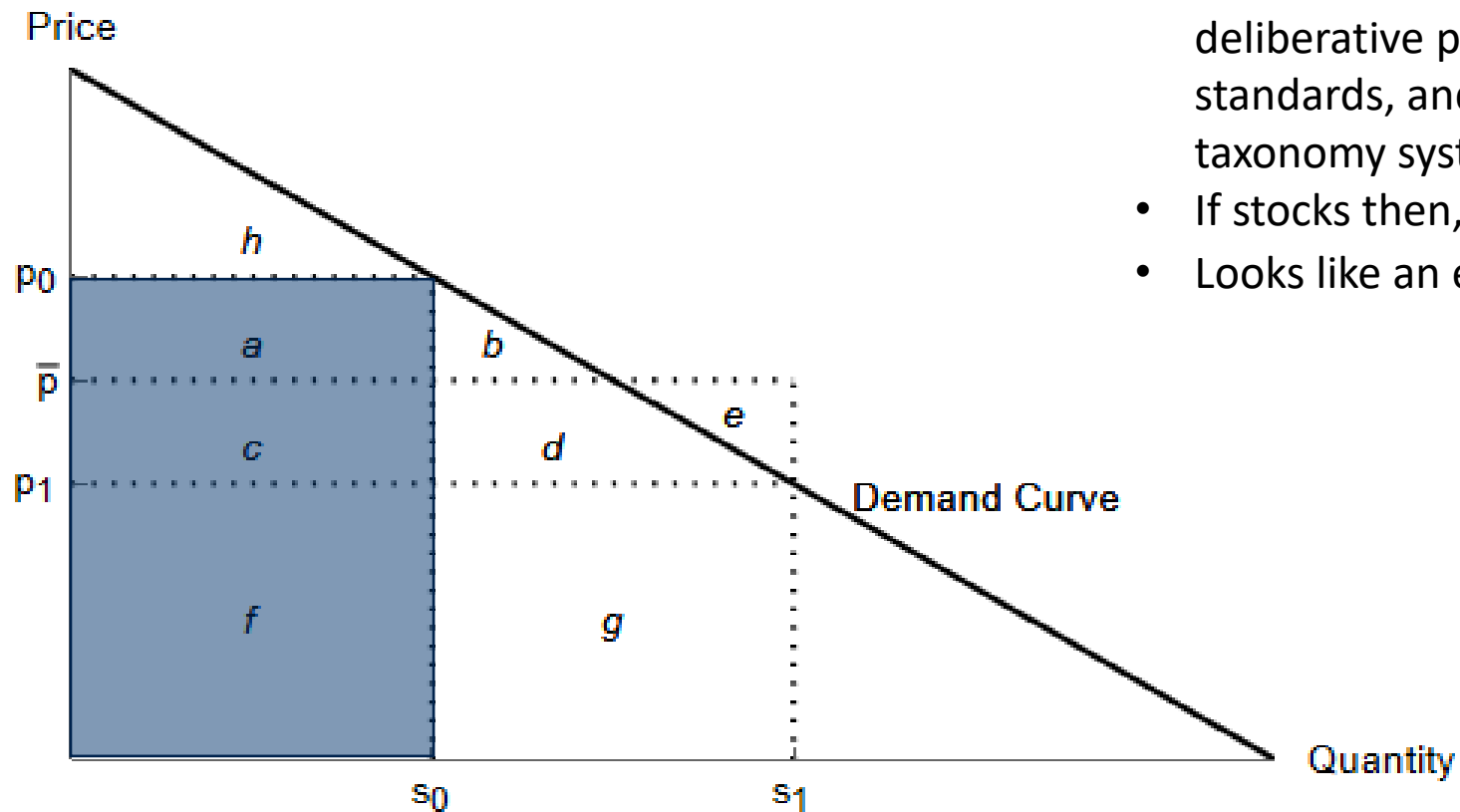


Fig 1. National Strategy for Statistics for Environmental-Economic Decisions: Relations among three accounting boundaries.

Two concepts of value:

“Welfare value,” from welfare economics

“Exchange value,” from national accounting, ps (the rectangle)

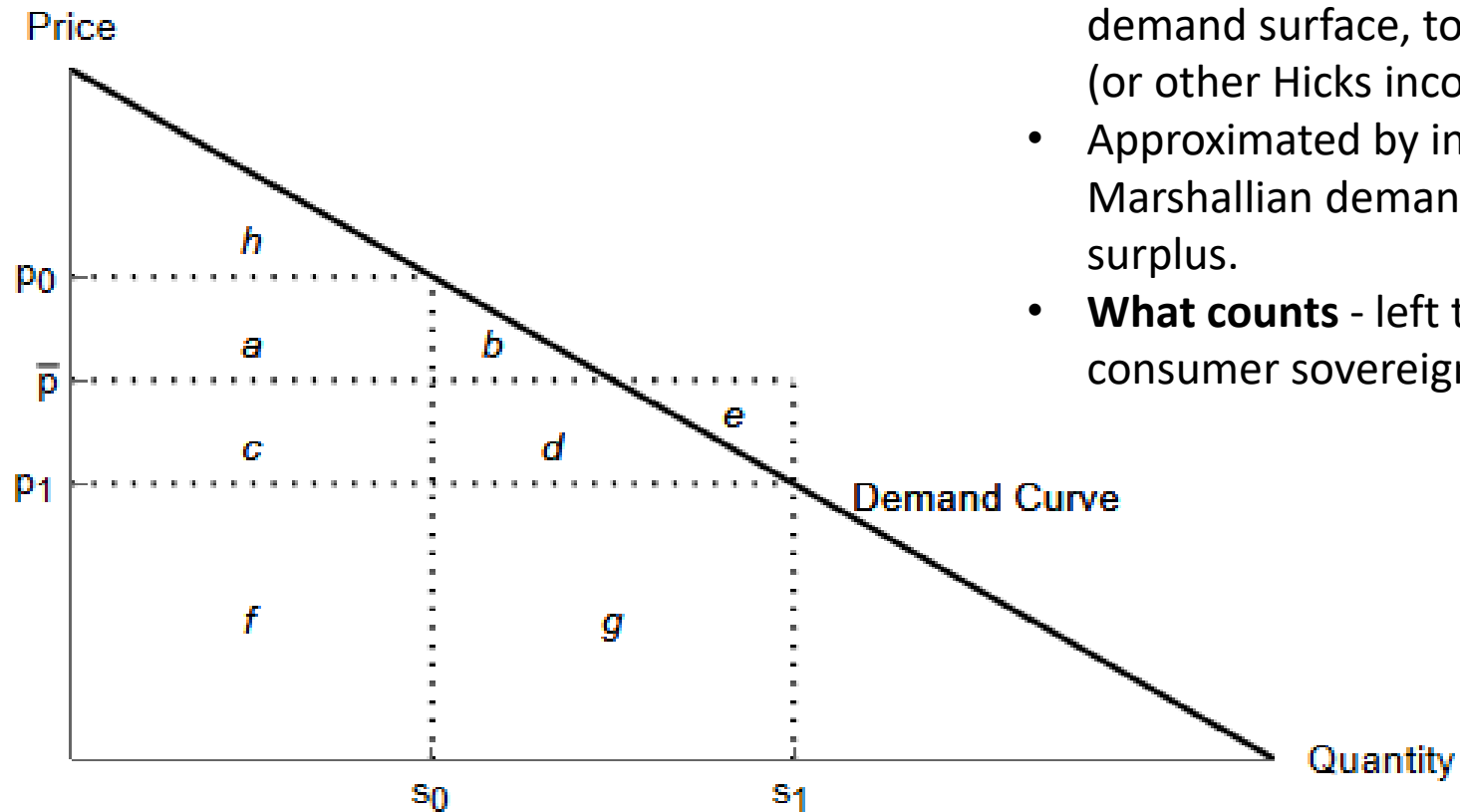


- **Zero** - meaningful.
- **What counts** - determined through deliberative process, statistical standards, and classification and taxonomy systems.
- If stocks then, $\mathcal{W} = p_i s_i + p_j s_j \dots$
- Looks like an expenditure function.

Two concepts of value:

“Welfare value,” from welfare economics

“Exchange value,” from national accounting

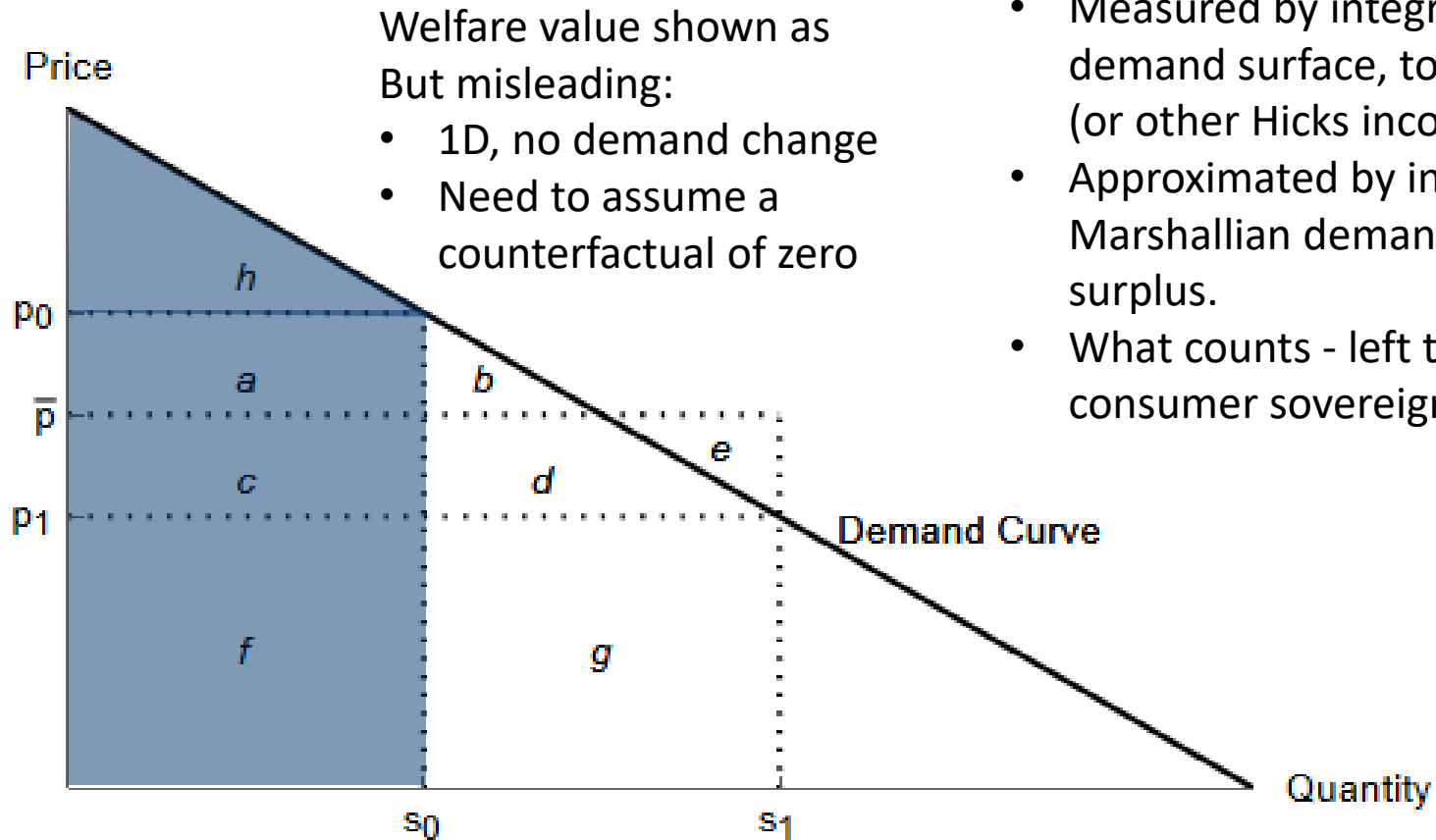


- It is ill-defined terms, because **zero is meaningless** – welfare theory is only about changes.
- Measured by integrating under a Hicksian demand surface, to get equivalent variation (or other Hicks income measure).
- Approximated by integrating under Marshallian demand curve with consumer surplus.
- **What counts** - left to the individual, consumer sovereignty.

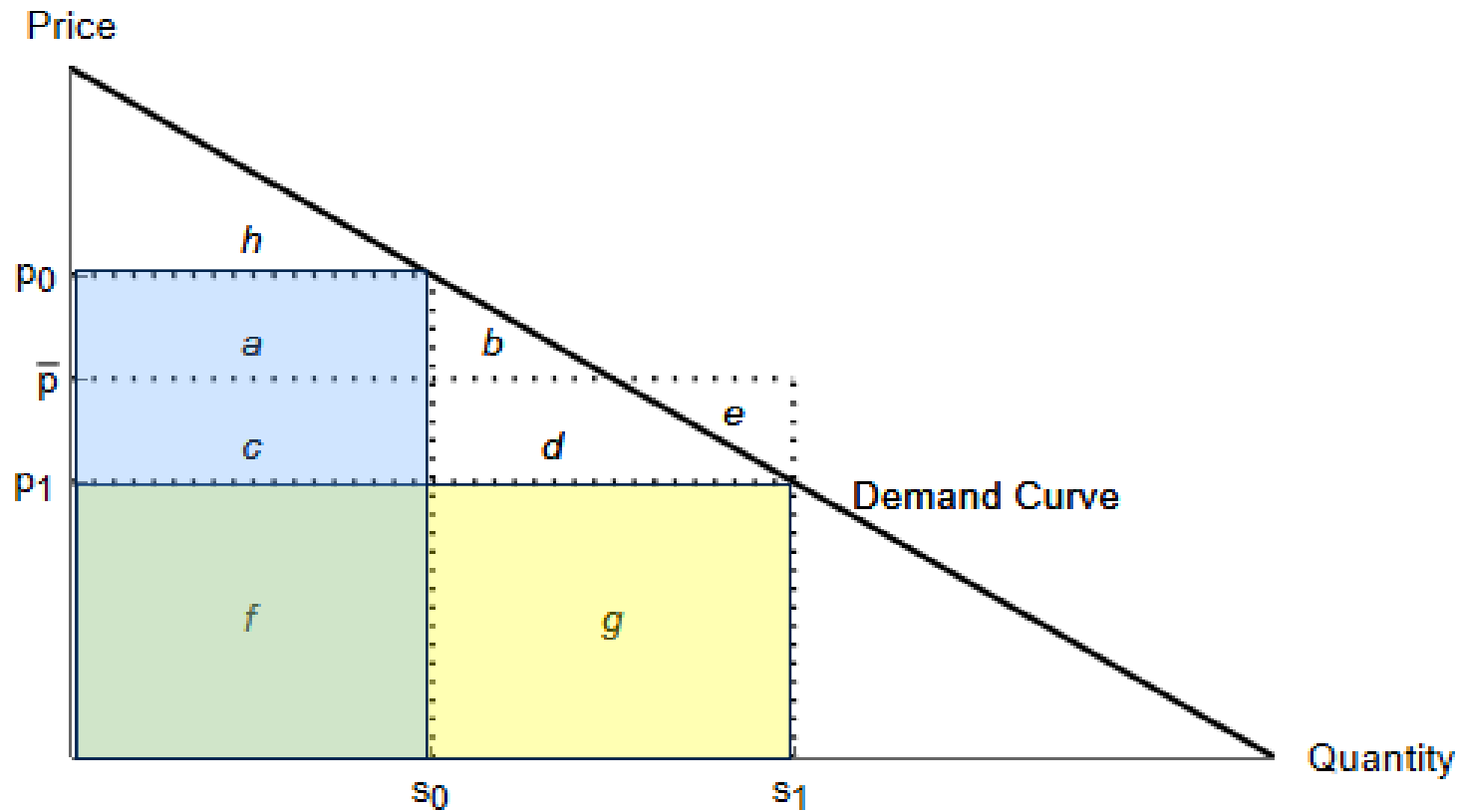
Two concepts of value:

“Welfare value,” from welfare economics (the triangle)

“Exchange value,” from national accounting

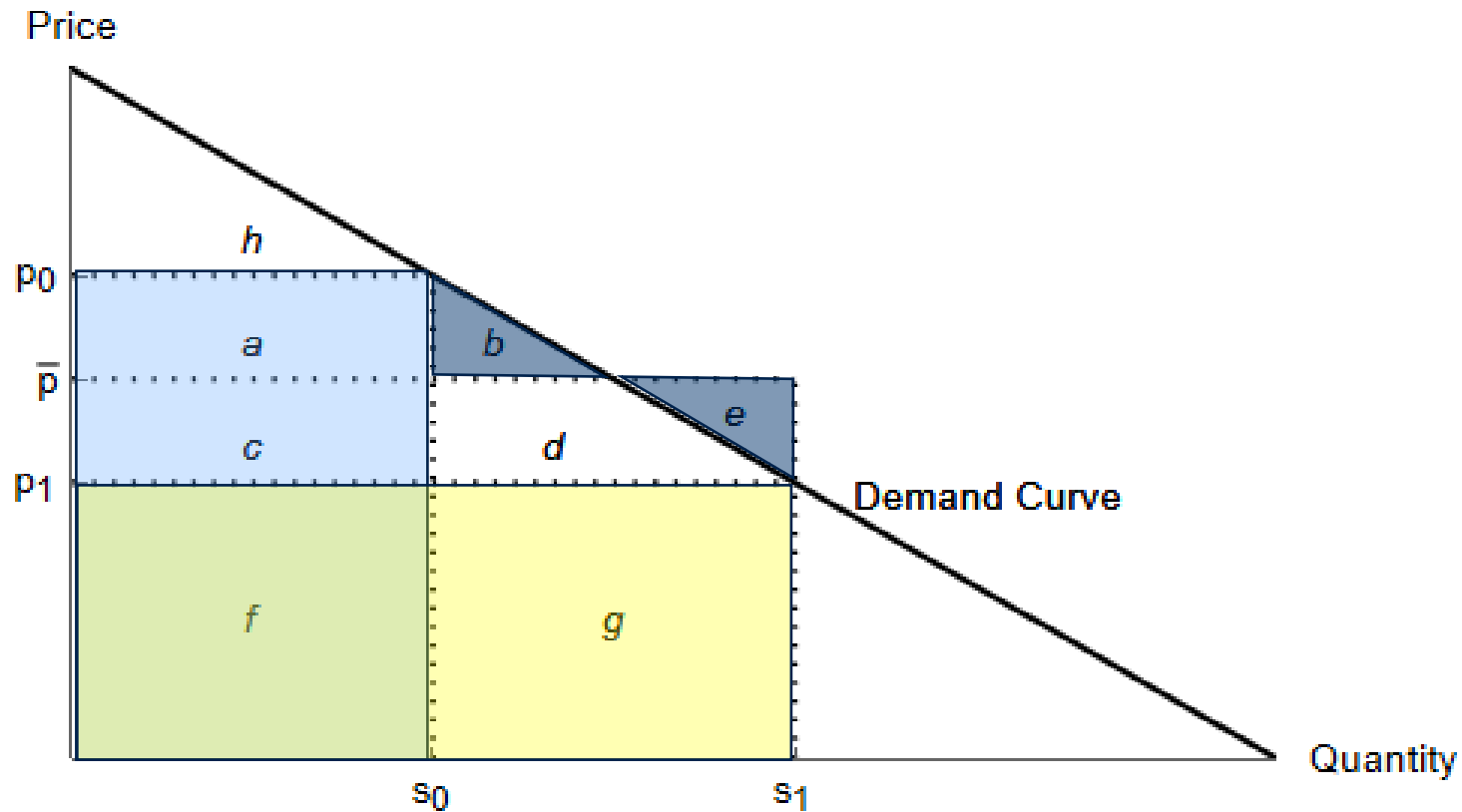


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$(f + g) - (a + c + f) \neq$ real change in exchange value -- why national accountant use index numbers to get real GDP

An index number is just a sort of average



$(f + g) - (a + c + f) \neq$ real change exchange value -- why national accountant use index numbers to get real GDP

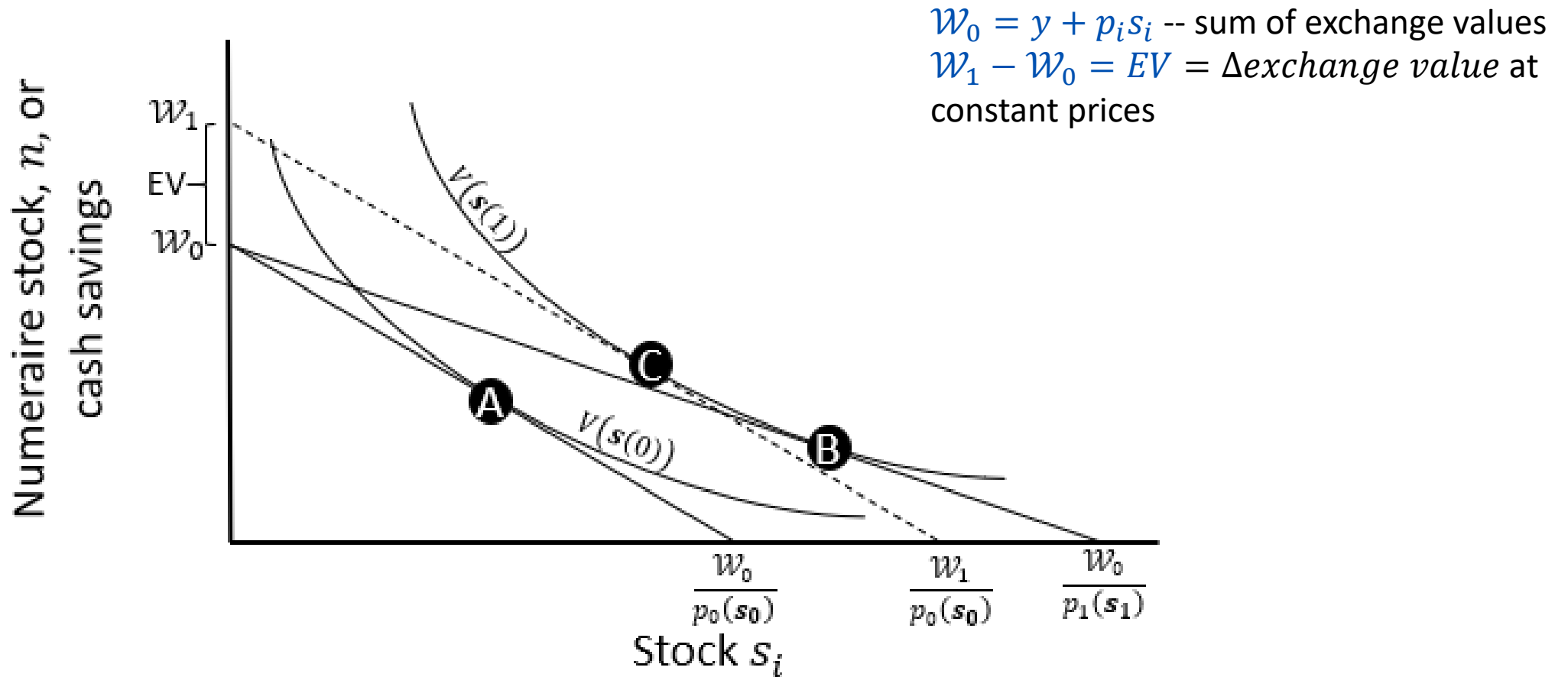
Real value changes are at constant prices

Take an average of price p_0 and p_1 and the real change in wealth using exchange value is $\bar{p}(s_1 - s_0) = d + e + g$

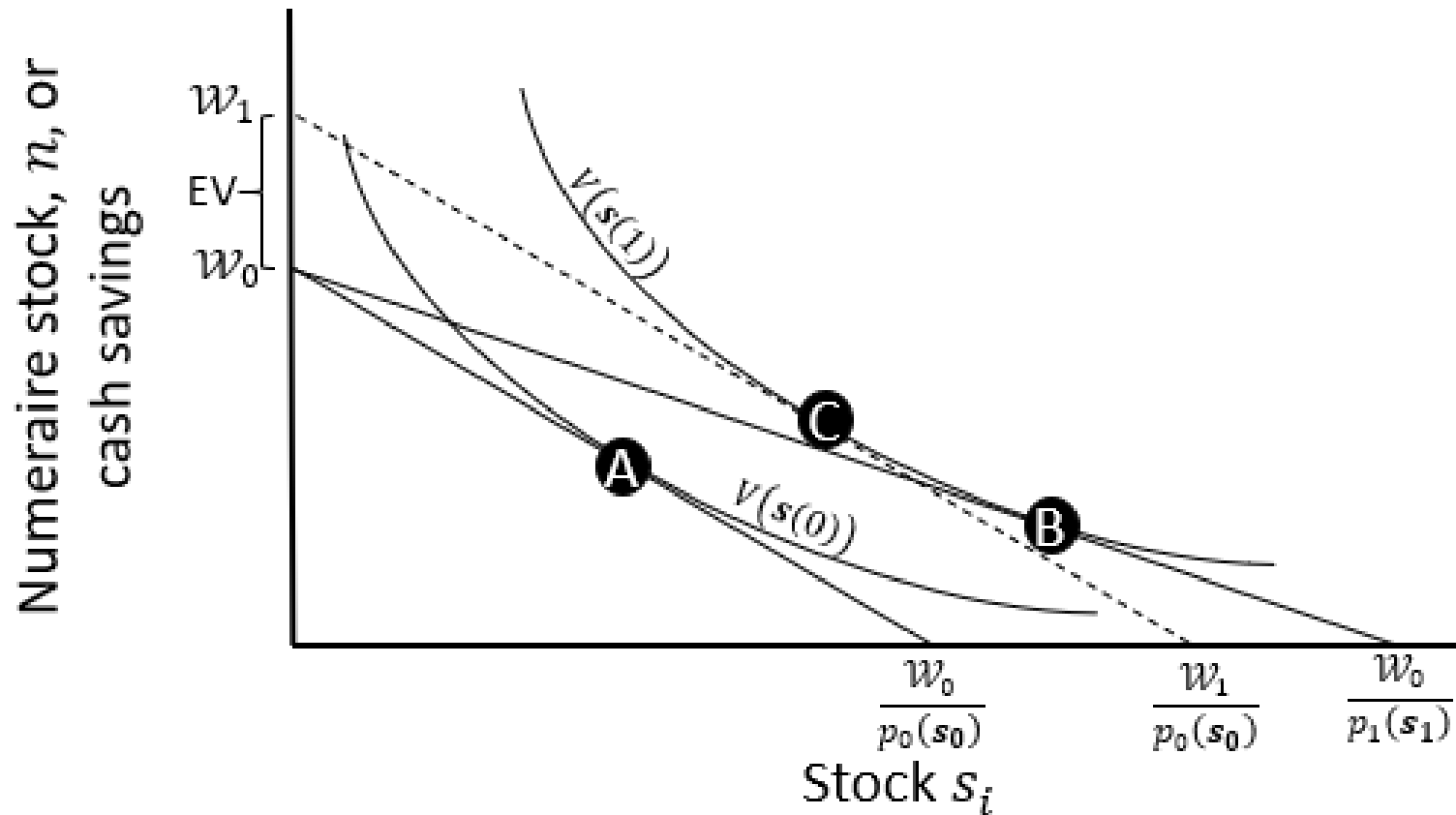
First indications that change in welfare and change in exchange values are close approximations.

These arithmetic mean (Hicks, Hotelling, Harberger) – is a transformation of the mean of Lespeyres & Paasche indices

Actual demand shifts – very important in GE, substitutes or complements



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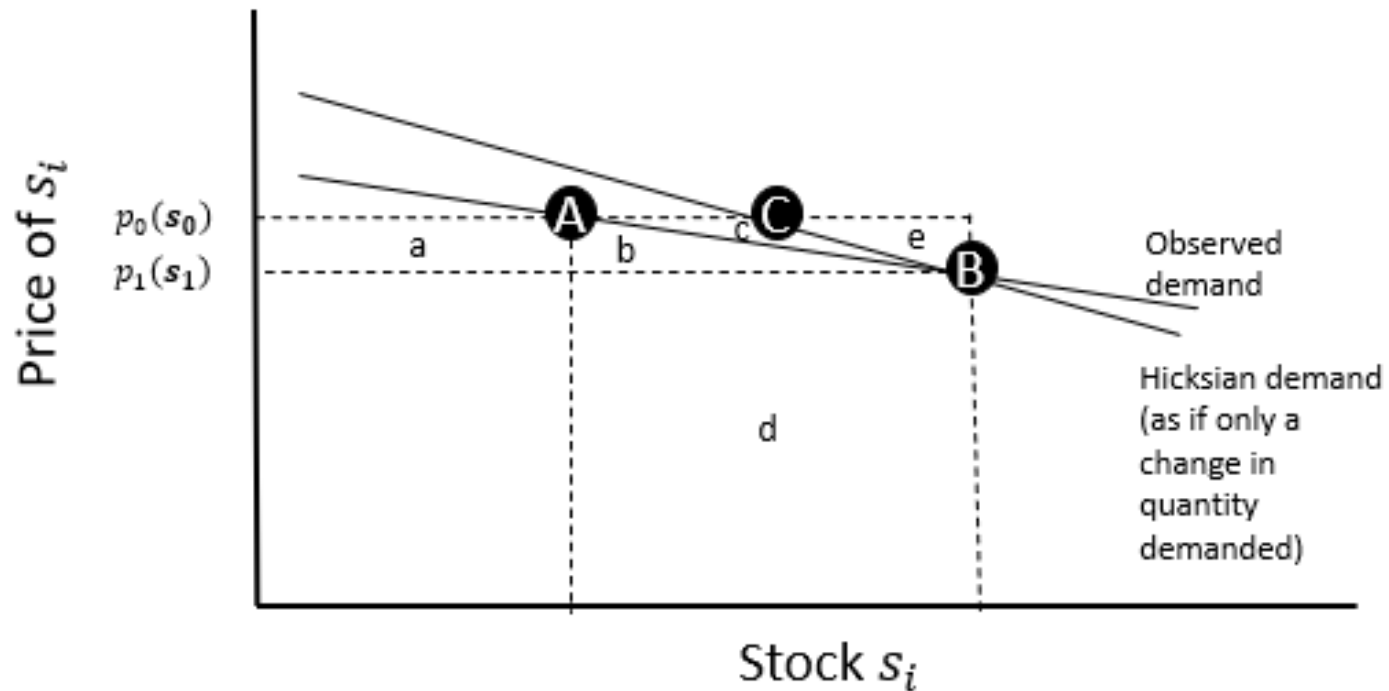
$$V(s_1|B) - V(s_0|A) = V(s_1|C) - V(s_0|A) = \mathcal{W}_1 - \mathcal{W}_0 = \Delta \text{welfare value}$$

$\mathcal{W}_0 = y + p_i s_i$ -- exchange value
 $\mathcal{W}_1 - \mathcal{W}_0 = EV = \Delta \text{exchange value at constant prices}$

Both exchange and welfare approach use hypothetical point: \mathcal{W}_0 and point C.

Superlative indices (Fisher Ideal, Tornqvist) provide 2nd approximation to EV (Diewert 1992)

National accounts don't like consumer surplus



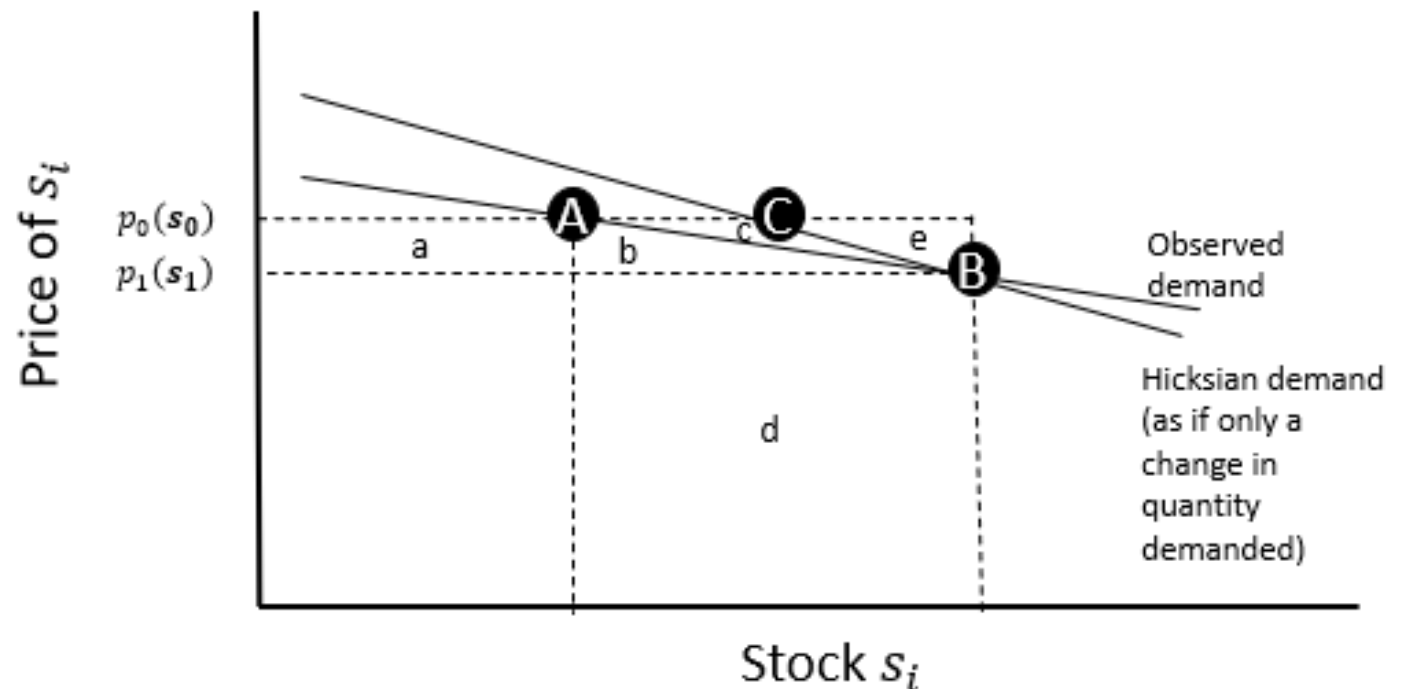
- Region d – rent or welfare of producers and is intermediate services or future production
- Region a – is shift from intermediate to final services or a shift if welfare from producers to consumers (or vice versa)
- The problem with consumer surplus is it does not allow a change in demand or substitutes and complements to have a role.
- If you use consumer surplus it mucks up index numbers.
- CS is a good approximation if there are only a change in quantity demanded – no cross-price effects. So, error is small (in many cases smaller than other errors in national accounts).

Implications for national accounts valuation (and connection to benefit-cost analysis measures)

- Most nonmarket valuation (natural resource or environmental) is in the BCA context
- Wealth accounting is ex-post benefit-cost assessment over a poorly defined set of changes, where last period is used as the counterfactual for the current period.
- If you do a nonmarket valuation at time 1, if it is a Hick's compensated measure or consumer surplus your demand curve should go through point B.
- Core question is does a study provide a price-quantity pair at the observed stock quantity

Caveats

- Are services generated from capital in the accounting boundary?
- Scope, scale, or selection effects – typical benefits-transfer concerns: solution – need to think about research to production



Implications for statistical standards

- Need to recognize that wealth is a hypothetical, it is a normalization that facilitates welfare change
- The core elements are price-quantity pairs not value
- Lean into the superlative index approach
- Most of the argument is about accounting boundaries not valuation standards

Implications for sustainability

- The weak v strong sustainability debate is misguided –requires extreme ex ante assumptions
- Savings rule or wealth rule approaches do not have unconstrained elasticities of substitution
- Change in wealth is neither linear in prices or quantities (e.g., using the Fisher Ideal Index)

$$\Delta \mathcal{W} = \left[\left(\frac{\sum_i p_i(\mathbf{s}_1) s_{i,1}}{\sum_i p_i(\mathbf{s}_1) s_{i,0}} \frac{\sum_i p_i(\mathbf{s}_0) s_{i,1}}{\sum_i p_i(\mathbf{s}_0) s_{i,0}} \right)^{\frac{1}{2}} - 1 \right] \mathcal{W}_0$$

Conclusions

- There are no conceptual barriers to doing valuation.
- There needs to be a standard taxonomy that is workable if imperfect - should also be expandable.
- Need a way of reporting prices and quantities that are useful for national natural capital accounting
 - A sort of newish benefits-transfer problem.
- There needs to be scalable & replicable measurement designs – we need to think about this more.
- Change in wealth measurement addresses many of the first-order concerns about measuring sustainability.

