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Origins of Terms of Trade

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University of Michigan

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Glossary

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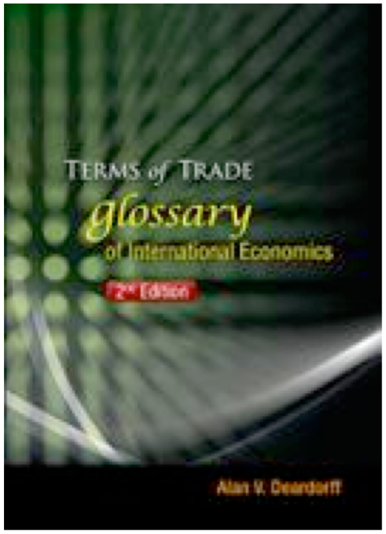
Deardorff's Glossary of International Economics:

The Terms of Trade and Other Wonders

- Intro
  - Terms, with search
  - Bibliography
  - Figures
  - Lists
  - Origins



Origins of Selected Terms

- I'll look here the starred items below, and others if there's time
  - *CES function
  - Dixit-Stiglitz utility
  - *Edgeworth box
  - (*)Gravity model
  - *Harberger triangle and Deadweight loss
  - Lerner diagram
  - Marshall-Lerner condition
  - *Offer curve
  - *Terms of trade
- For each I'll look at the origin of both
  - the idea (the substance), and
  - the name.

Origins of "CES function"

Origins of "CES function"

- Definition
  - With arguments $x = (x_1, \ldots, x_n)$

$$F(x) = A\left\{\sum_i^n a_i\, x_i^{\rho}\right\}^{1/\rho}$$

  - where a_i, A are positive constants and

$$\sigma = \frac{1}{(1-\rho)}$$

  - is the elasticity of substitution.

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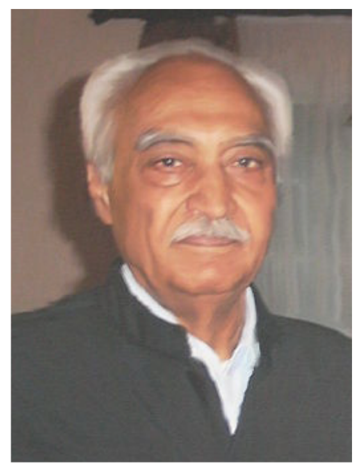
Origins of "CES function"

- Substance introduced by
  - Arrow, et al. 1961.
  - Motive: To "derive a mathematical function having the properties of
    - (i) homogeneity,
    - (ii) constant elasticity between capital and labor, and
    - (iii) the possibility of different elasticities for different industries."
  - Note that it was a production function, not a utility function.

Origins of "CES function"

- Arrow, K.J., H.B. Chenery, B.S. Minhas, and R.M. Solow. 1961. "Capital-Labor Substitution and Economic Efficiency," *Review of Economics and Statistics* 43(3), (August), pp. 225-250.



Origins of "CES function"

- Named CES Function by the authors
- Other names:
  - "homohypallagic" function (Minhas 1962)
    - From Greek: homo = same, hypallage = substitution
  - "SMAC function" (Mukerji 1963)
- Basis of (Spence-)Dixit-Stiglitz utility function, allowing number of goods (varieties) be variable

Origins of "Edgeworth box"

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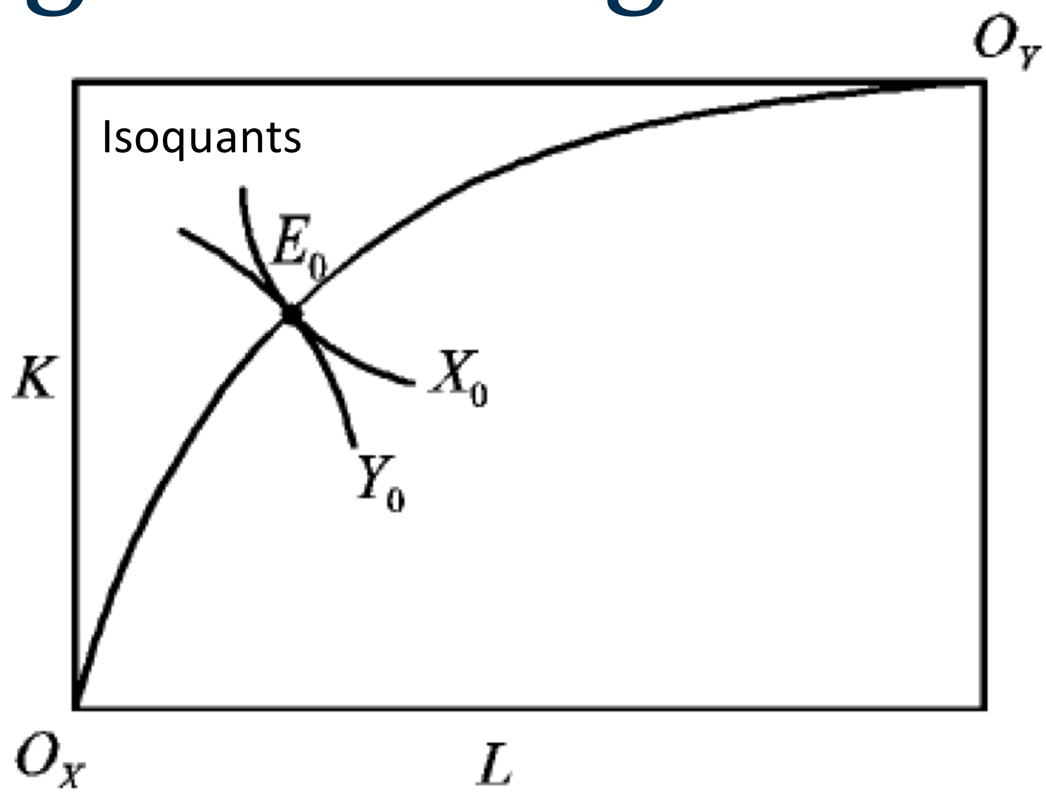
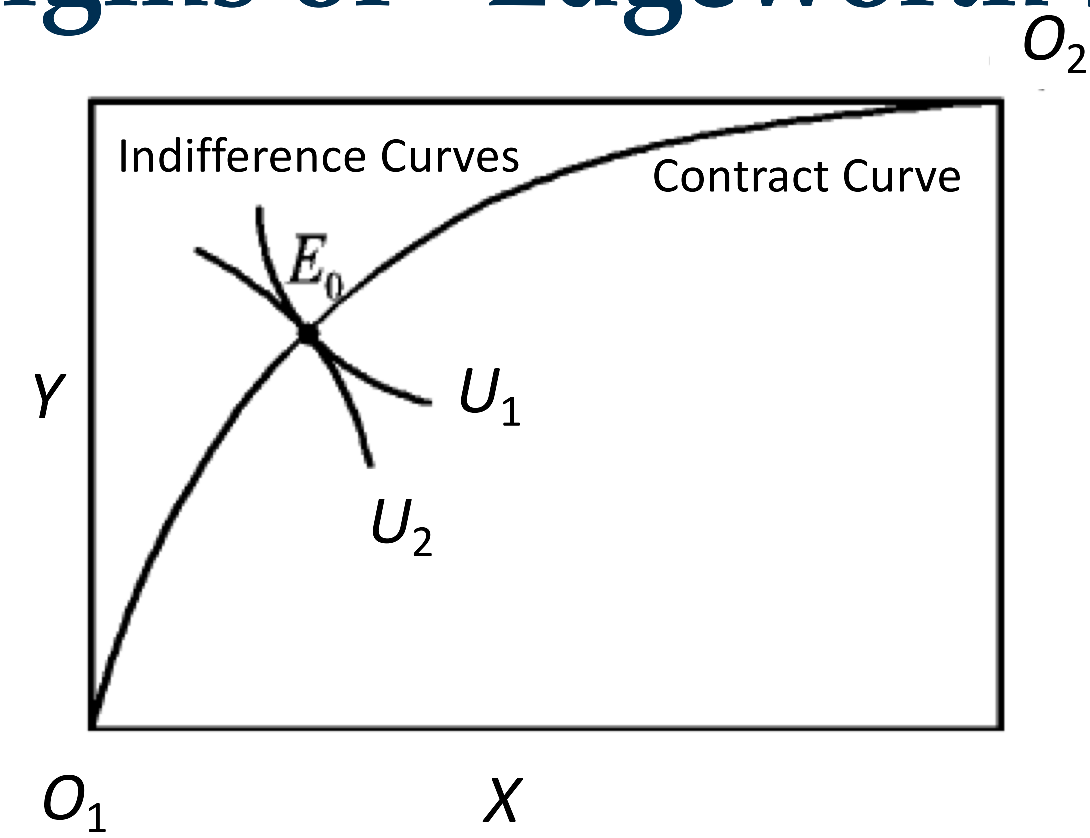
Origins of "Edgeworth box"



- This shows an Edgeworth production box, with isoquants for producing goods X and Y from factors L and K.
- The same figure with different labels shows consumption of two goods for two consumers

Origins of "Edgeworth box"



Origins of "Edgeworth box"

- Also called "Edgeworth-Bowley box"
- See however: Tarascio, Vincent J. 1972. "A Correction: On the Geneology of the So-Called Edgeworth-Bowley Diagram," *Western Economic Journal* 10, (June), pp. 193-197.

Origins of "Edgeworth box"

- First drawn by Pareto (1906), who wrote in French.
- Based, but only very partially, on Edgeworth (1881).
- Got "-Bowley" name because Bowley (1924) combined indifference maps for two consumers, each turned 90 degrees in opposite directions.
- Bowley did not claim originality.

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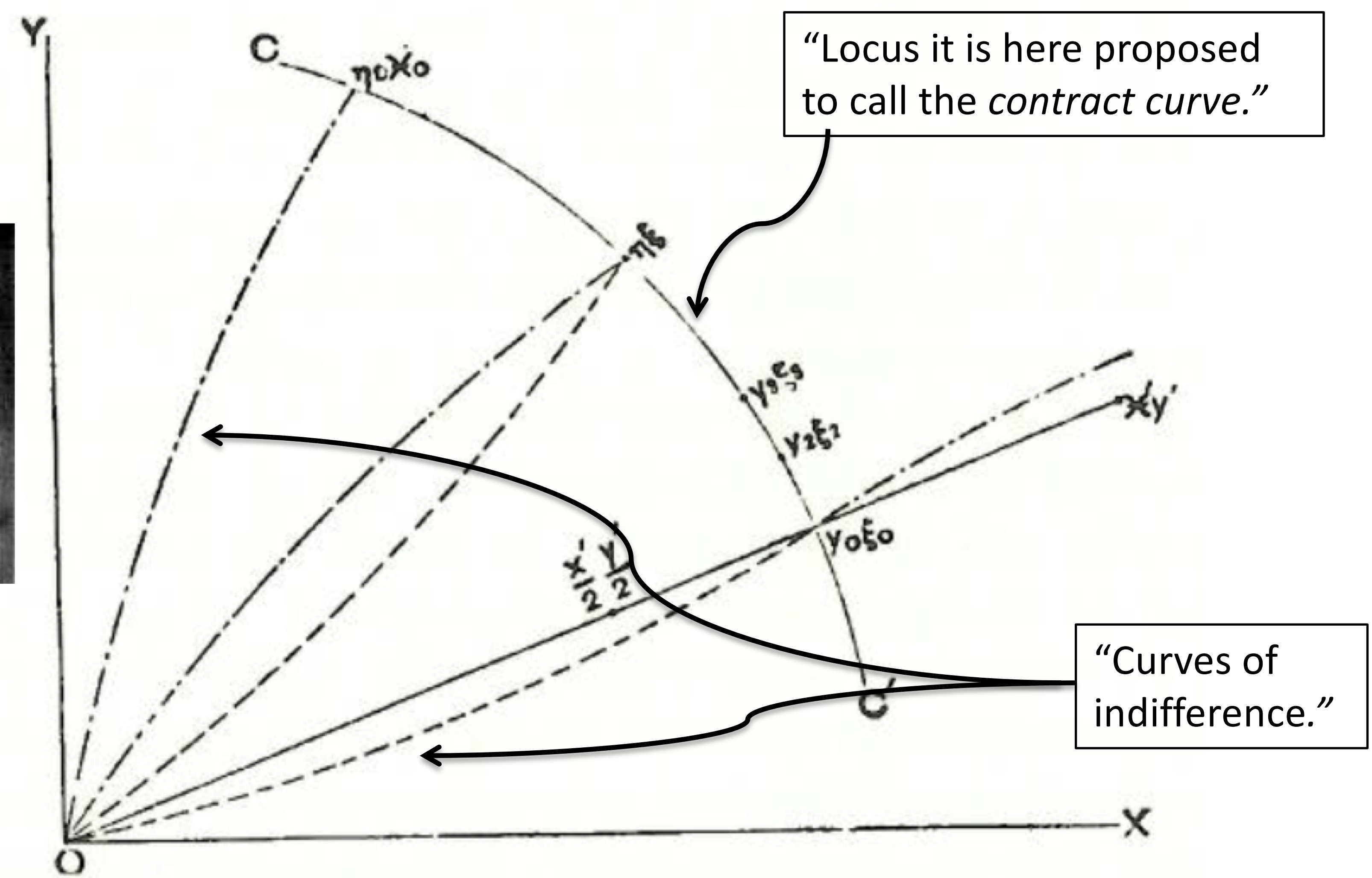
Edgeworth (1881)

FIG. 1.



Edgeworth, Francis Ysidro. 1881. *Mathematical Psychics: As Essay on the Application of Mathematics to the Moral Sciences*.

Origins of "Edgeworth box"

- Edgeworth did
  - Define the contract curve with an equation:
    - "It may be shown from a variety of points of view that the locus of the required point is

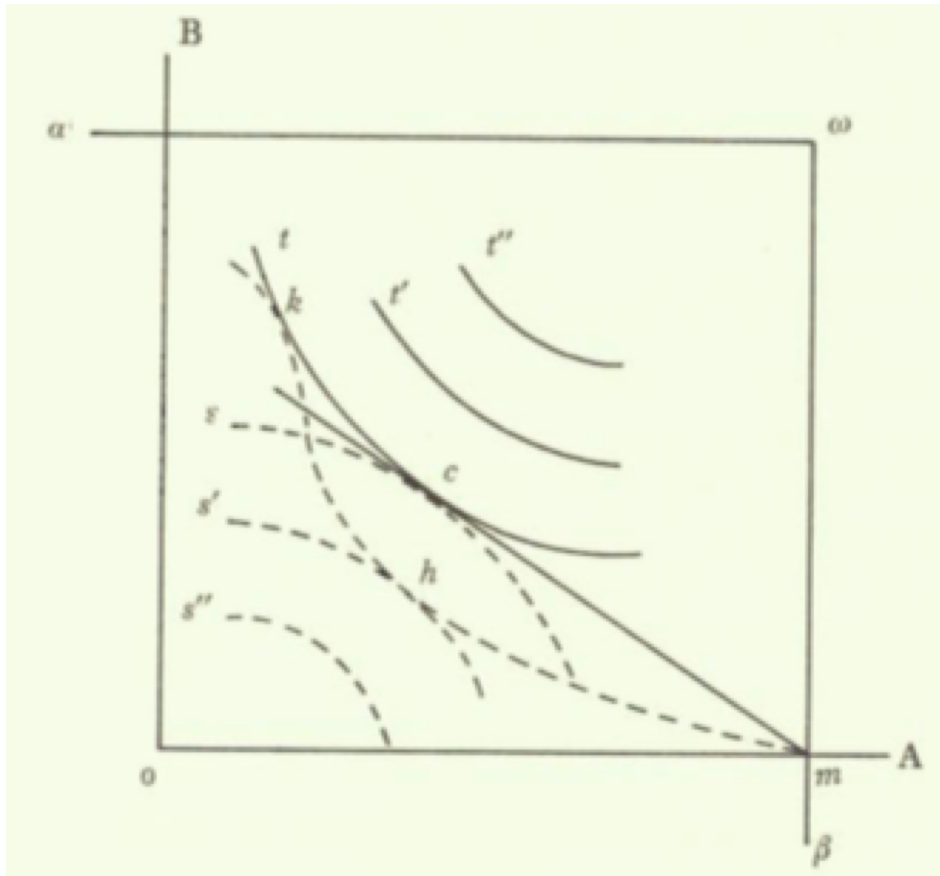
$$\frac{dP}{dx}\frac{d\Pi}{dy} - \frac{dP}{dy}\frac{d\Pi}{dx} = 0$$

(Equality of marginal rates of substitution)

which locus is it here proposed to call the *contract-curve.*"

  - Draw the contract curve, but without showing tangency of indifference curves. (Shape suggests he may not have understood that.)

Pareto (1906)



Pareto, Vilfredo. 1906. *Manual of Political Economy*.
Manuel d'Économie politique

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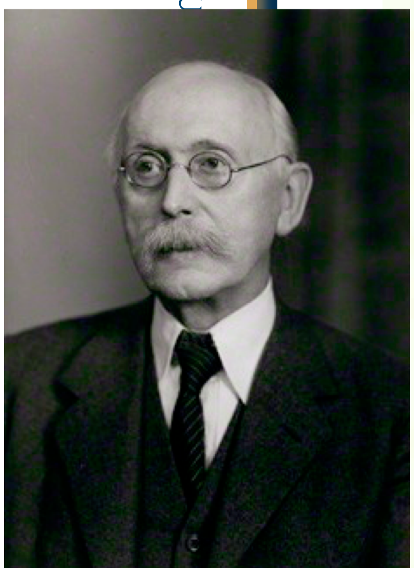
Bowley (1924)



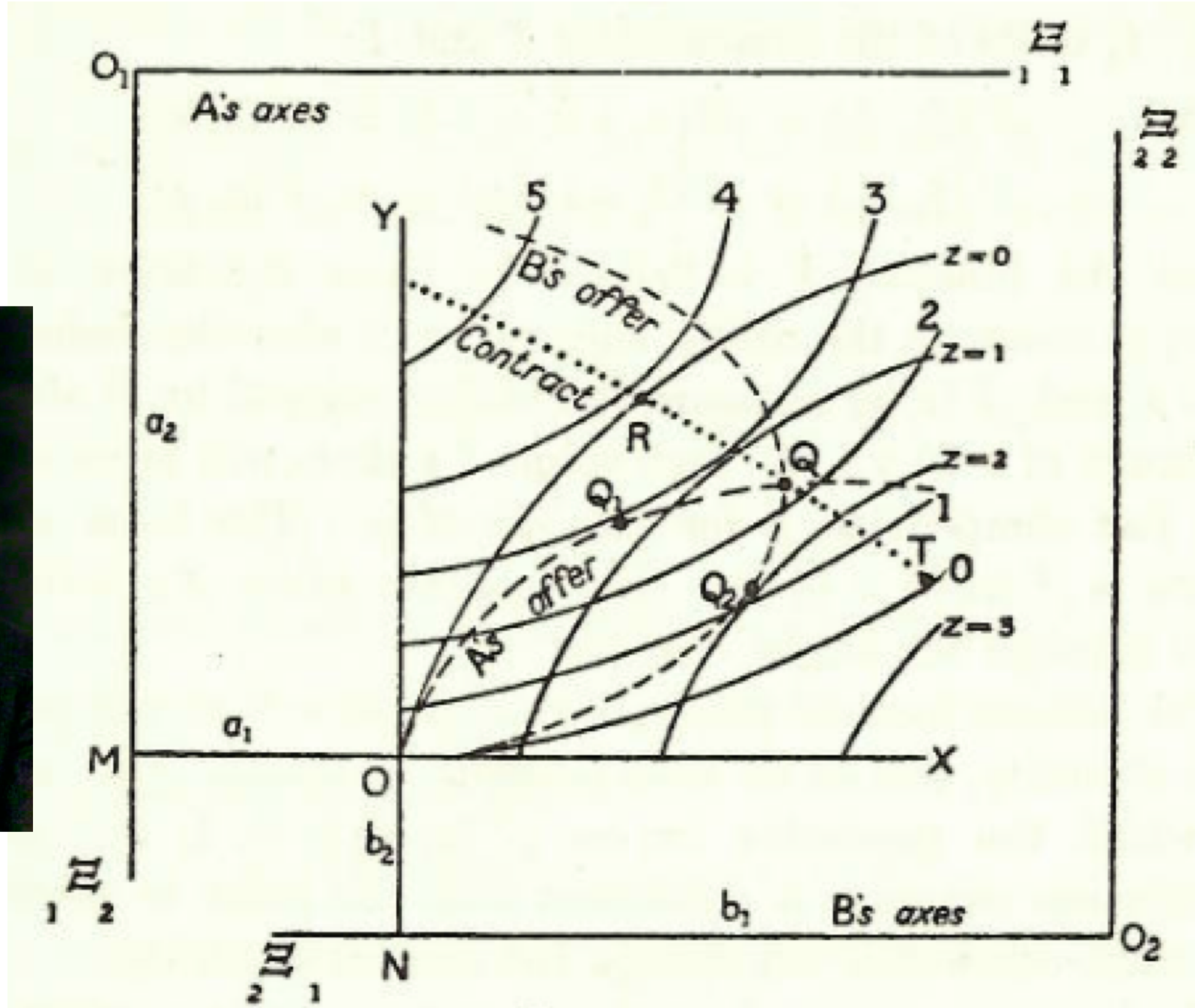


FIGURE 1.

Bowley, Arthur. 1924. *The Mathematical Groundwork of Economics: An Introductory Treatise*, Oxford: Clarendon Press.

Origins of "Edgeworth box"

- Both production and consumption boxes are called Edgeworth boxes, though Edgeworth never drew either.
- Better name might be Pareto box.

Origins of "Edgeworth box"

- But Pareto is already well recognized:
  - "Pareto criterion"
  - "Pareto distribution"
  - "Pareto improving"
  - "Pareto optimal"

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Origins of "Edgeworth box"

- Who called it the Edgeworth Box?
- Not Pareto or Bowley
- I've searched in Google Scholar for
  - "Edgeworth box"
  - "Edgeworth-Bowley box"
  - "box diagram"
  - "Edgeworth" and "box"

Origins of "Edgeworth box"

- Search results: nothing until:
  - Stolper and Samuelson (1941)
    - "This is done in Fig. 2 which consists of a modified box **diagram long utilised by Edgeworth and Bowley** in the study of consumers' behaviour."

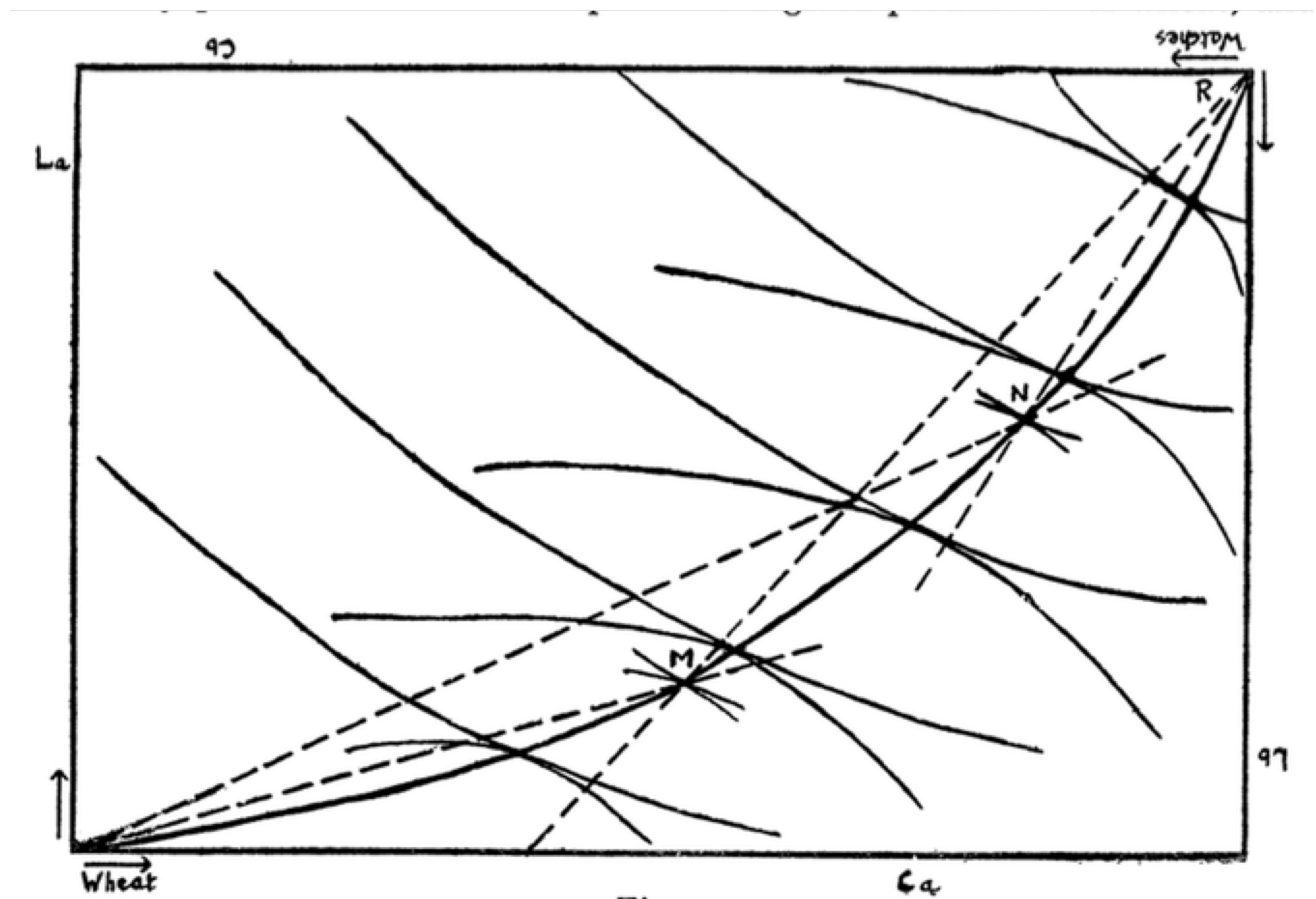
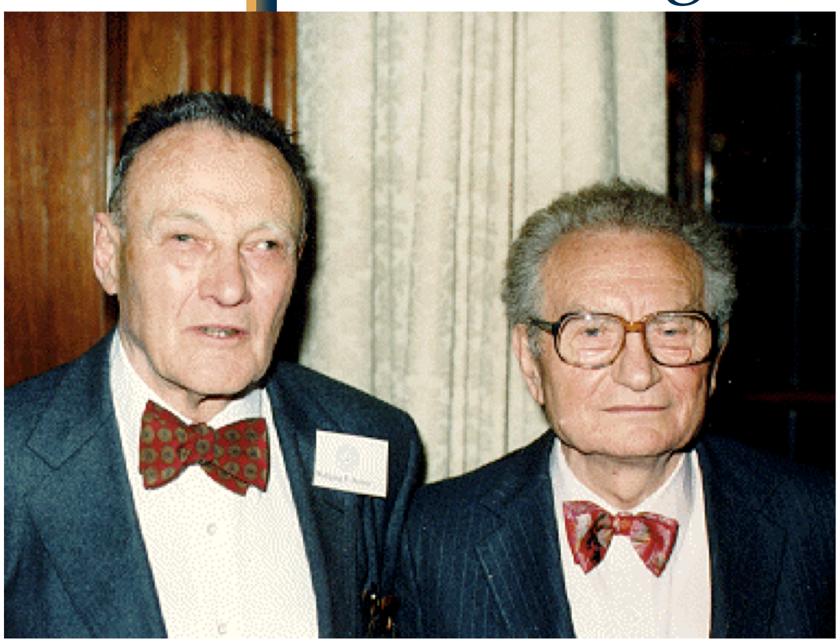


Fig. 2

Stolper, Wolfgang and Paul A. Samuelson. 1941. "Protection and Real Wages," *Review of Economic Studies* 9(1), (November), pp. 58-73.

Origins of "Edgeworth box"

- Who should have credit for the idea?
  - As applied to consumption: Pareto
  - As applied to production: Stolper and Samuelson (if they need further recognition)



Origins of "Edgeworth box"

- My conclusion on who (mis-)named it the Edgeworth(-Bowley) Box?
- Stolper and Samuelson, in their 1941 paper which was surely written and circulating long before it was published.
- Samuelson may have learned of it from others as oral tradition.

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Origins of "Gravity Model"

Origins of "Gravity Model"

- The standard gravity model of trade:

$$T_{ij} = A \frac{Y_i^{\alpha_i} Y_j^{\alpha_j}}{D_{ij}^{\beta}}$$

where

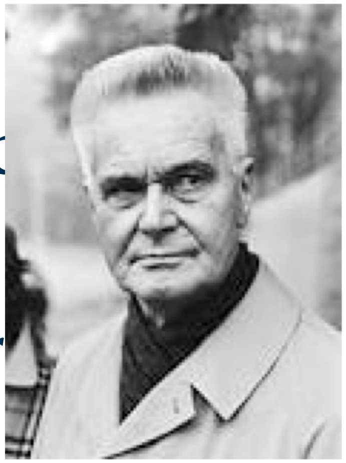
T_{ij} = trade between countries *i* and *j*

Y_i, Y_j = GDP of countries *i* and *j*

D_{ij} = distance between countries *i* and *j*

$A > 0, \alpha_i \approx 1, \alpha_j \approx 1, \beta \approx 1$

Origins of "Gravity Model"



- Substance (but not name) introduc
  trade independently by
  - Tinbergen, Jan. 1962. *Shaping the Wor Economy,*

  and also by
  - A Finnish team that included:
    - Pöyhönen, Pentti. 1963. "A Tentative Model for the Volume of Trade Between Countries," *Weltwirtschaftliches Archiv*
    - Pulliainen, Kyosti. 1963. "A World Trade Study: An Econometric Model of the Pattern of the Commodity Flows in International Trade in 1948-1960," *Ekonomiska samfundets tidskrift*

Origins of "Gravity Model"

- Tinbergen's version:

$$E_{ij} = \alpha_0 Y_i^{\alpha_1} Y_j^{\alpha_2} D_{ij}^{\alpha_3}$$

where

E_{ij} = exports of country i to country j

Y_i = GNP of country i

Y_j = GNP of country j

D_{ij} = distance between country i and country j

(very much like the basic gravity equation today)

Origins of "Gravity Model"

- Pöyhönen's version:

$$a'_{ij} = cc_i c_j \frac{e_{ii}^{\alpha} e_{jj}^{\beta}}{(1+\gamma r_{ij})^{\delta}}$$

where

a'_{ij} = exports of country *i* to country *j*

e_{ii} = national income of country *i*

e_{jj} = national income of country *ij*

r_{ij} = distance of transportation

- Differences:
  - Notation
  - Country fixed effects
  - Role of distance

Origins of "Gravity Model"

- Naming of the Gravity Model
  - None of these authors called it this
  - Tinbergen and Pöyhönen do not use the word gravity or note any analogy with gravitation

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Origins of "Gravity Model"

- Pulliainen does note the connection with gravity:
  - "The results of our empirical study show that the structure of international trade is **capable of description in terms of gravitational theory**. A formal analogy to the theory of gravitation (a=b=1, d=2) is attainable – provided one feels it is desirable…"

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Origins of "Gravity Model"

- But another early user of the model was Linnemann, Hans. 1966. *An Econometric Study of International Trade Flows*. But
  - "Some authors emphasize the **analogy with the gravitation law** in physics, and try to establish that [α_3=−2]. We **fail to see any justification** for this."

Origins of "Gravity Model"

- First to call it the Gravity Model: Waelbroeck, J. 1965. "On the Structure of International Trade Interdependence," *Cahiers Economiques de Bruxelles*

Origins of "Gravity Model"

- Waelbroeck
  - "Hypothesis 2: The gravity model"
  - "There is, as has been pointed out, an **odd similarity** between formulae (6) and (7) and the **law of gravity**, with Y_i and Y_j playing the role of masses, and **this justifies christening the model as the gravity, or G, model**.

Origins of "Gravity Model"

- Earlier origins outside of trade: Others used gravity-like models in other fields earlier:
  - Substance
    - Zipf, George Kingsley 1946, "The **P_1P_2/D Hypothesis**" for inter-city movements of freight, persons, information, etc.

      and
    - Stewart 1947 for "Distribution and Equilibrium of Population," calling it "potential."

Origins of "Gravity Model"

- Earlier origins outside of trade
  - Name
    - Bramhall & Isard 1960 on regional science: "gravity, potential, and spacial interaction models -- which for short we shall term gravity models."

Origins of "Harberger triangle" and "Deadweight loss"

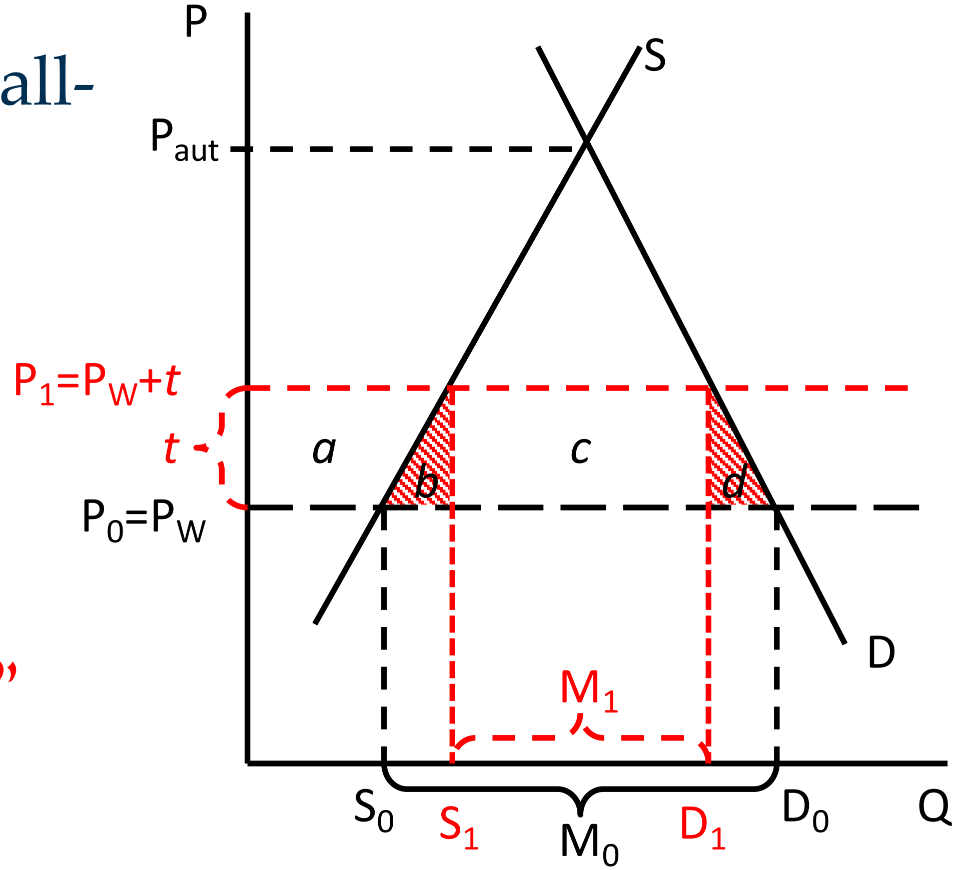
Origins of "Harberger triangle" and "Deadweight loss"

- Diagram in the context of a small-country tariff

Harberger triangles

measure

"Dead Weight Loss"



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Origins of "Harberger triangle" and "Deadweight loss"

- Harberger triangle
  - Best source is Hines (1999)
    - Idea goes back to Dupuit (1844) and, independently, Jenkin (1871-72)
    - Harberger made repeated use of it, starting in 1954
  - It wasn't clearly called Harberger Triangle until 1976, but then by more than one author

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Origins of "Harberger triangle" and "Deadweight loss"

- Harberger triangle applied to trade
  - First done by Johnson (1958)
  - The tool was used frequently, but without the Harberger name until 1989
  - Then suddenly the "Harberger triangle" was mentioned in a trade context by Tullock (1989), Williamson (1990), and Vousden (1991)
- But trade economists have tended to prefer "deadweight loss"

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Origins of "Harberger triangle" and "Deadweight loss"

- Deadweight loss
  - Term was introduced to literature on both taxes and trade by Samuelson (1952):
    - "and the "deadweight loss" resulting from interferences with perfect competition."
    - His use of quotation marks suggests (oddly) that term was not yet standard

Origins of "Harberger triangle" and "Deadweight loss"

- Deadweight loss
  - Prior to Samuelson, I've only found "dead loss" for this purpose:
  - Earliest was Bickerdike (1906):
    - "It can be shown geometrically that the "loss" *Aka* comprises all the dead loss involved in the reduction of imports, including the waste of energy."

Origins of "Harberger triangle" and "Deadweight loss"

- Deadweight loss
  - After Samuelson (1952), several more uses by Samuelson in the 50s
  - Then 26 uses of "deadweight loss" in 1961-70, mostly by others

Origins of "Harberger triangle" and "Deadweight loss"

- No uniformity regarding
    1. Deadweight loss
    2. Dead-weight loss
    3. Dead weight loss
  - Samuelson (1960) himself used both #1 and #2 on the same page
  - Google-scholar search 1970-2016 finds #1 favored

Origins of "Offer Curve"

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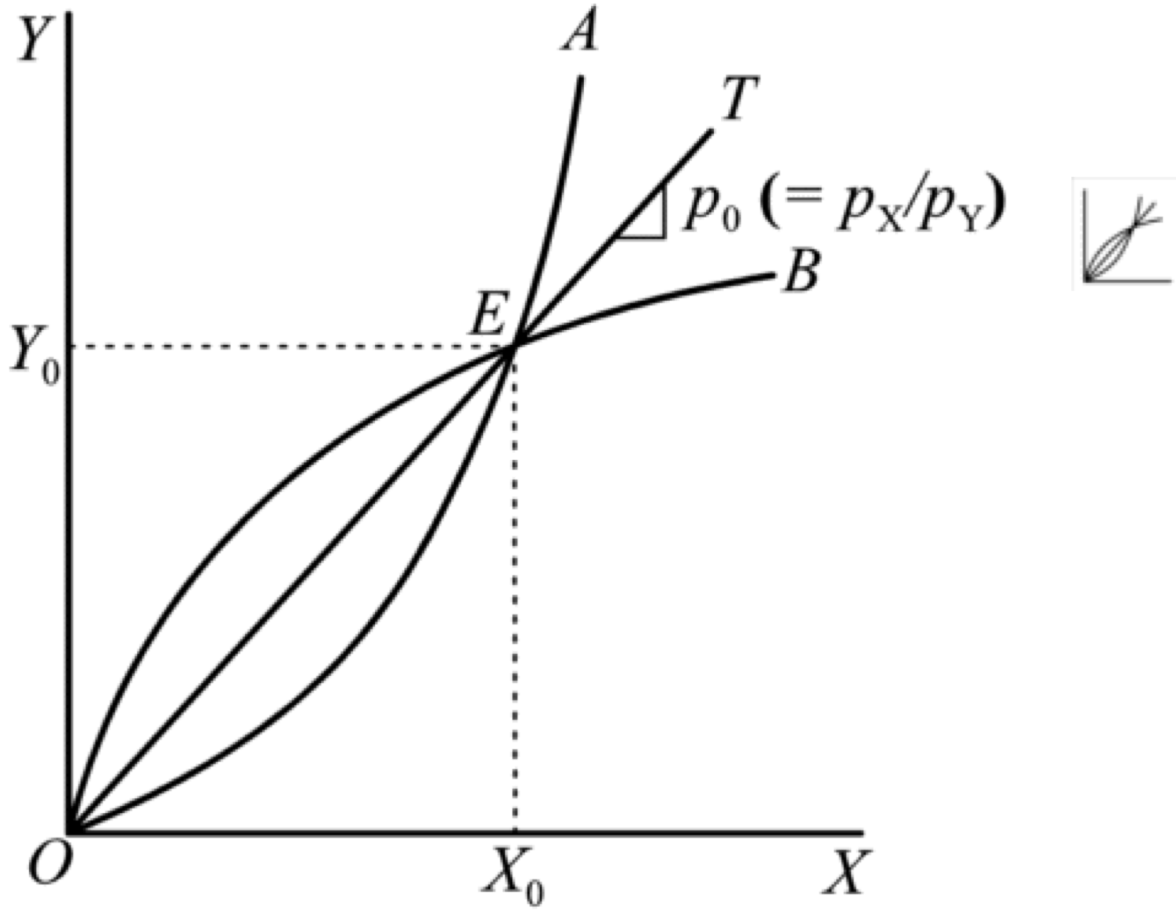
Origins of "Offer Curve"

- Diagram:



Origins of "Offer Curve"

- Substance:
  - – Marshall (1923)
  - – But as with M-L Condition, he did the work before 1879.
  - – He said credit should be shared with others, including
    - Auspitz und Lieben. 1879. *Théorie des Preises*

Origins of "Offer Curve"

- The name:
  - Marshall called his two curves only *OE* and *OG* (for England and Germany)
  - He used "offer" only once: "*E* will be prepared to offer only *OM''* of her bales in return for *P''M''* bales from *G*."

Origins of "Offer Curve"

- The name -- my best candidate for having named it:
  - Edgeworth (1894) (a 3-part article)
    - In Part II, he showed the curves, using the verb "offer."
    - In Part III, referring to Auspitz und Lieben, he said
      - "Accordingly **their supply- or offer- curve** is never inelastic in our sense of the term...."

Origins of "Offer Curve"

- The name -- others who deserve credit:
  - Bowley (1924), who explicitly applied it to trade
  - Lerner (1936) "The Symmetry between Import and Export Taxes"
    - Used it extensively for his analysis in his still widely-cited paper

Origins of "Terms of Trade"

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Origins of "Terms of Trade"

- Definition
  - The relative price, on world markets, of a country's exports compared to its imports
  - Most commonly, if

    P_X = price of exports

    P_M = price of imports

    then

    $TT = P_X / P_M$

Origins of "Terms of Trade"

- Substance and Name
  - Marshall, Alfred. 1923. *Money, Credit and Commerce*
  - (For countries *E* and *G*,)

  "the amounts to which *E* and *G* would be severally willing to trade at various '**terms of trade**'; or, to use a phrase which is more appropriate in some connections, at various 'rates of exchange."

Origins of "Terms of Trade"

- Was Marshall the first?
  - Taussig (1927) says yes.
  - Mill (1848) did not use the phrase
  - I've not checked all in between

Origins of "Terms of Trade"

- Alternative (or more precise) definitions
  - Taussig (1927)
    - Preferred the term "barter terms of trade"
    - Also defined
      - "Net barter terms of trade"
      - "Gross barter terms of trade"

      (These differ if trade is not balanced.)

Origins of "Terms of Trade"

- "Net barter terms of trade"

  $NBTT = P_X/P_M$

  P_X = price of exports

  P_M = price of imports

- "Gross barter terms of trade"

  $GBTT = Q_M/Q_X$

  Q_X = quantity of exports

  Q_M = quantity of imports

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Origins of "Terms of Trade"

- Alternative (or more precise) definitions
  - Viner (1937) said classical economists cared about exchange of factors, as well as goods
    - Thus defined
      - Single factoral terms of trade
      - Double factoral terms of trade

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Origins of "Terms of Trade"

- "Single factoral terms of trade"

  $SFTT = NBTT \times A_X = (P_X/P_M) \times A_X$

  A_X = own factor productivity producing exports

- "Double factoral terms of trade"

  $DFTT = NBTT \times A_X/A_M \; (P_X/P_M) \times (A_X/A_M)$

  A_M = foreign factor productivity producing imports

Table 1
Definitions of the Terms of Trade*

Commodity Terms of Trade	
= Net Barter Terms of Trade	p_X / p_M
Gross Barter Terms of Trade	M / X
Single Factoral Terms of Trade	$A_X p_X / p_M$
Double Factoral Terms of Trade	$A_X p_X / A_M p_M$
Income Terms of Trade	$p_X X / p_M$

where

p_X, X, and A_X are the price, quantity, and productivity of factors producing exports

p_M, M, and A_M are the price, quantity, and productivity of factors producing imports

*All are defined here such that an increase is an improvement for the exporting country.

Meaning of "Terms of Trade"

- Another ambiguity arose more recently when scholars of International Finance defined TT
  - NOT as P_X/P_M
  - But as P_M/P_X!

Meaning of "Terms of Trade"

- History
  - Early writers didn't need to be explicit:
    - they spoke of TT "improving" or "deteriorating" and that was clear
    - They didn't assign it a number or graph it, so didn't need to define it further

Meaning of "Terms of Trade"

- History
  - Taussig (1927) first spoke of TT of a country
  - "The net barter terms of trade are then 9.8 wheat = 11 ½ linen"
  - Later included graphs of TT, which defined it as P_M/P_X

Meaning of "Terms of Trade"

- History
  - Viner (1937) reversed this
    - "This reverses Taussig's procedure, where a rise in the index indicates an *unfavorable* movement of the terms of trade. No question of principle is involved, but it seems to me to be more convenient to represent favorable movements of the indices by rising indices."

Meaning of "Terms of Trade"

- History
  - Since Viner, most writers followed his example, using P_X/P_M
  - But around 1980, writers in International Finance began sometimes to use P_M/P_X

Meaning of "Terms of Trade"

- History
  - Obstfeld (1980):
    - "… where τ denotes the terms of trade, defined as the price of foreign consumption goods in terms of home goods"
  - Obstfeld (1981):
    - Defined p as the terms of trade, then had: "a rise from p to p' in the relative price of the foreign good"
  - Obstfeld may have been following Dornbusch (1976)

Meaning of "Terms of Trade"

- History
  - Since then
    - Trade economists (as well as development economists) have mostly stuck to P_X/P_M
    - International Finance economists (including Obstfeld himself) have used P_X/P_M sometimes and P_M/P_X other times.

P_X/P_M	P_M/P_{MX}
1920s	
	Taussig (1927)
1930s	
Leontief (1933)	
Viner (1937)	
Belshaw (1939)	Mauldon & Anderson (1939)
1940s	
Benham (1940), Kaldor (1940)	
Schiff (1942)	
Boulding (1947)	
Dorrance (1948)	

P_X/P_M	P_M/P_{MX}
1950s	
Imlah (1950), Pigou (1950)	
Johnson, (1951)	
Meier (1952), Samuelson (1952)	Harberger (1952)
Baldwin (1955), Kemp (1955), Kindleberger (1955)	
Corden (1957)	
1960s	
Mundell (1964)	
Krueger & Sonnenschein (1967)	
1970s	
	*Dornbusch (1976a,b)

*Red is International Finance

P_X/P_M	P_M/P_{MX}
1980s	
*Branson & Katseli-Papaefstratiou (1980), *Díaz Alejandro (1980), Findlay (1980), Spraos (1980)	*Obstfeld (1980)
	*Obstfeld (1981)
*Svensson & Razin (1983)	
Diewert & Morrison (1985), *Persson & Svensson (1985), Sapsford (1985)	*Svensson (1985)
*Ahmed (1987)	*Frenkel & Razin (1987)
Grilli & Yang (1988)	*Ostry (1988)
Cuddington & Urzua (1989)	*Sen & Turnovsky (1989)

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P_X/P_M	P_M/P_{MX}
1990s	
Powell (1991), Sarkar & Singer (1991)	
	*Ostry & Reinhart (1992)
Bleaney & Greenaway (1993), Shiells & Reinert (1993)	
*De Gregorio & Wolf (1994), *Gruen & Wilkinson (1994)	*Backus et al. (1994)
*Amano & van Norden (1995), *Mendoza (1995), *Obstfeld & Rogoff (1995)	
*Obstfeld & Rogoff (1996)	
Bagwell & Staiger (1999)	

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P_X/P_M	P_M/P_{MX}
2000s	
*Broda (2001), Hadass & Williamson (2001)	
Kohli (2004)	
Kaplinsky (2006)	
Blattman et al. (2007)	*Corsetti et al. (2007)
	*Kehoe & Ruhl (2008)
*Aghion et al. (2009), Epifani & Gancia (2009), Spatafora & Tytell (2009)	

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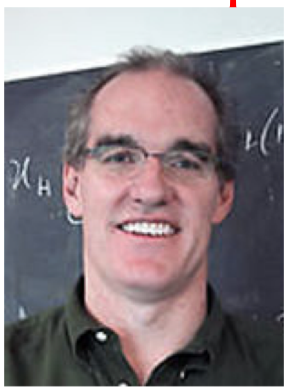
P_X/P_M	P_M/P_{MX}
2010s	
*Choudhri & Schembri (2010)	
*Crucini et al. (2011)	
*Aizenman et al. (2012), Hanson (2012)	*Berka et al. (2012)
Feenstra et al. (2013)	*Jacob & Peersman (2013)
Caliendo & Parro (2015)	

Origins of "Terms of Trade"

- One of the first that I noticed was:
  - Backus, David K., Patrick J. Kehoe, and Finn E. Kydland. 1994. "Dynamics of the Trade Balance and the Terms of Trade: The J-Curve?" *American Economic Review*

"The terms of trade, in this paper, is the relative price of imports to exports…"


Meaning of "Terms of Trade"

- Why the difference?
  - Obstfeld e-mail:
    - "I suspect this comes from the monetary approach to the exchange rate/bop. Monetary neutrality means that when the money stock rises, all prices rise, including that of foreign exchange. Easy to remember."
  - Itskhoki e-mail:
    - "In International Macro, it is convenient to have nominal and real exchange rates and the terms of trade to be positively correlated."

Meaning of "Terms of Trade"

- Why I prefer P_X/P_M
  1. It's what I've always done.
  2. As Viner said, it feels right to have a rise in the terms of trade be associated with rising welfare.
  3. Most countries export far fewer products than they import, often relying on only one. With P_X/P_M the terms of trade is the price of that product, not an index of prices of all others.

Origins of "Terms of Trade"

- Because of this ambiguity in meaning, it is best
  - Not to say that the terms of trade "rises" or "falls"
  - Better to say it "improves" or "deteriorates"

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Topics Skipped for Grinnell

- Dixit-Stiglitz utility
- Lerner diagram
- Marshall-Lerner condition

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Origins of “Dixit-Stiglitz utility”

Origins of "Dixit-Stiglitz utility"

$$U = \left(\sum_{i=1}^{n} c_i^{\rho} \right)^{1/\rho} \qquad 0 < \rho < 1$$

where *n* is variable.

This is the innovation.
The rest is just CES.

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Origins of "Dixit-Stiglitz utility"

The role of variety, *n*:

If $c_i = c$, i=1,…,n,

$$U = \left(\sum_{i=1}^{n} c^{\rho}\right)^{1/\rho} = \left(c^{\rho}\sum_{i=1}^{n} 1\right)^{1/\rho} = (c^{\rho} n)^{1/\rho} = n^{1/\rho} c$$

$$\frac{\partial U}{\partial n}\frac{n}{U} = \frac{1}{\rho} = \frac{\sigma}{\sigma - 1} > 1 \quad \text{for } 0 < \rho < 1, \sigma > 1$$

Thus utility rises with *n* –
"Preference for Variety" –
and by more the smaller is *σ*.

Origins of “Dixit-Stiglitz utility”

- Due to:
  - Dixit, Avinash K. and Joseph E. Stiglitz. 1977. “Monopolistic Competition and Optimum Product Diversity,” *American Economic Review* 67(3), June, pp. 297-308.

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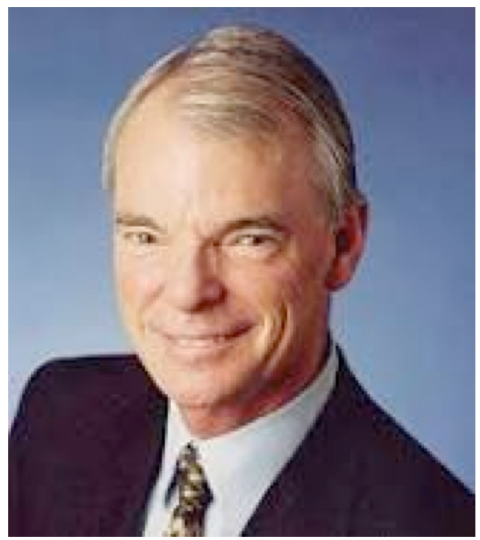
Origins of "Dixit-Stiglitz utility"

- But also due to:
  - Spence, Michael. 1976. "Product Selection, Fixed Costs, and Monopolistic Competition," *Review of Economic Studies* 43(2), June, pp. 217-235.



- Hence "Spence-Dixit-Stiglitz"

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Origins of "Dixit-Stiglitz utility"

- Dixit and Stiglitz (1977)
  - Started with

$$u = U\left(x_0, V(x_1, x_2, x_3, \dots)\right)$$

  - Then used mostly

$$u = U\left(x_0, \left\{\sum_i^n x_i^\rho\right\}^{1/\rho}\right)$$

  - Thus D-S also included a second sector, used as numeraire.

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Origins of "Dixit-Stiglitz utility"

- Spence (1976) was more complex (for me) but Neary (2000) said he assumed quasi-linear preferences. What I see in Spence, among several specifications, is

$$u(x) = \left[\int_i a_i x_i^{\beta}\right]^{\theta}$$

Origins of "Dixit-Stiglitz utility"

- D-S also considered special cases that included
  - CES form for V
  - Symmetry of V in x_i

  (As in the second form above.)
  - Cobb-Douglas form for U
- Neary (2000) says these have become standard, but because D-S never used all 3 together, this should be called "**Dixit-Stiglitz lite**":

$$u = x_0^{(1-\mu)} V^{\mu} \qquad V = \left(\sum_i^n x_i^{\rho} \right)^{1/\rho}$$

Origins of "Dixit-Stiglitz utility"

- In fact, later users have often omitted the numeraire good, x_0, or replaced it with other goods.
- The symmetric CES with variable n has become common, as
  - Dixit-Stiglitz utility

  or sometimes
  - Dixit-Stiglitz subutility

Origins of "Dixit-Stiglitz utility"

- The name
  - Not until 1987 did these names appear in the published literature, but then by more than one author. It was used increasingly after that.
  - Before then it was frequent for authors to build on the "(Spence-)Dixit-Stiglitz model"
  - Krugman (1979, 1980) said his formulation was "borrowed from" or "derived from" "recent work by Dixit and Stiglitz (1977)"

Origins of “Dixit-Stiglitz utility”

- Application to production was introduced by
  - Ethier, Wilfred J. 1982. "National and international returns to scale in the theory of international trade," *American Economic Review*, 72(3), (June), pp. 389-405.
  - He cited Dixit-Stiglitz and Dixit-Norman, as well as Krugman and others.
  - His purpose was to “treat the differentiated producer goods central to my own theory.”

Origins of "Dixit-Stiglitz utility"

- Ethier's formulation:

$$M = n^{\alpha}\left[\sum_{i=1}^{n}\left(x_i^{\rho}/n\right)\right]^{1/\rho}, \qquad 0 < \rho < 1, \quad \alpha > 1$$

Thus he had a second parameter, α, for the role of variety.

Origins of "Dixit-Stiglitz utility"

- Variety in Dixit-Stiglitz and Ethier compared:
- If $x_i = x$, i=1,…,n, Ethier's becomes

$$M = n^{\alpha-1}(nx)$$

so that an equal rise in n and fall in x (keeping total quantity nx constant) raises M to the extent that α>1.

Origins of "Dixit-Stiglitz utility"

- Ethier's reduces to Dixit-Stiglitz if

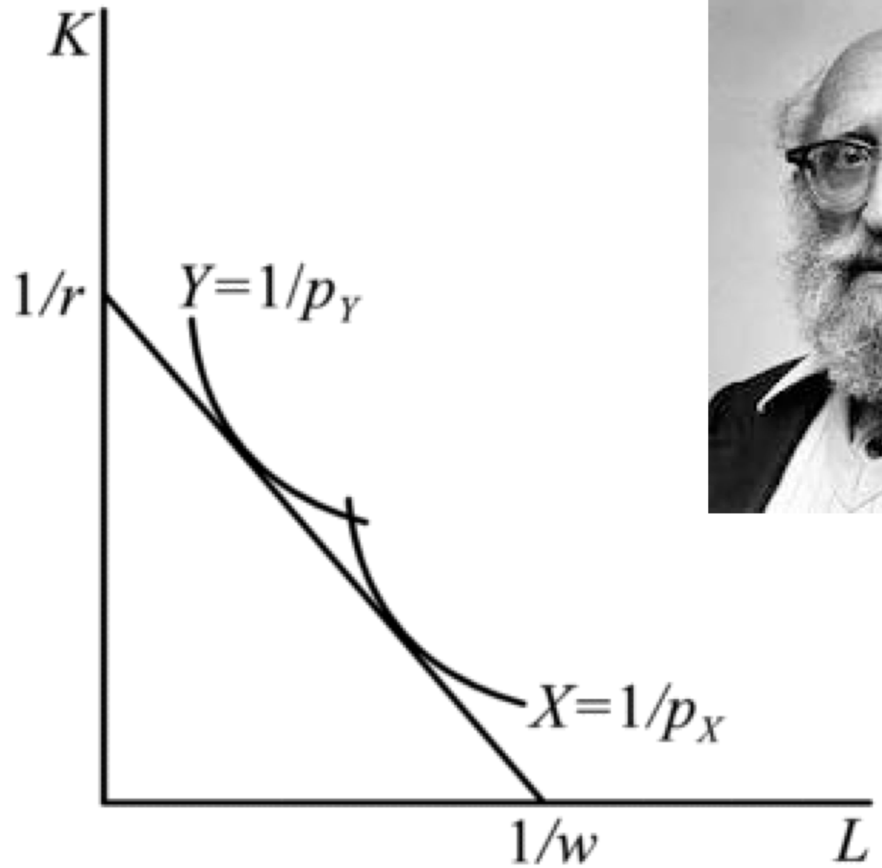
$$\alpha = 1/\rho$$

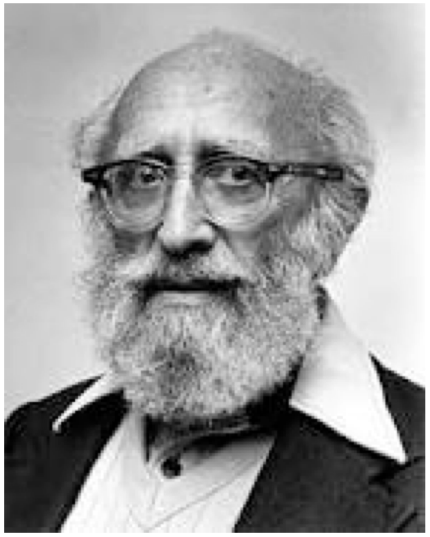
- Thus since $\rho < 1$, DS implies $\alpha > 1$.
- Note that Either
  - Made the benefit of variety independent of the elasticity of substitution, unlike DS, and
  - Left the benefit of variety open to estimation.
- Ethier's example was followed later by Benassy (1996), who was followed in turn by Acemoglu, Antras, and Helpman (1999).

Origins of “Lerner diagram”

Origins of "Lerner diagram"

- Diagram





Origins of "Lerner diagram"

- Diagram was first published in Lerner, Abba P. 1952. "Factor Prices and International Trade," *Economica*
- But Lerner first drew it in an unpublished seminar paper in 1933.
- That paper was reproduced in 1952 "as it was originally written," according to the journal editor.

Origins of "Lerner diagram"

- First noticed in print by Findlay and Grubert. 1959. They cited Lerner, but never called it the "Lerner diagram."

Origins of "Lerner diagram"

- Findlay, Ronald and Harry Grubert. 1959. "Factor Intensities, Technological Progress and the Terms of Trade," *Oxford Economic Papers*

Origins of "Lerner diagram"

- First to call it the "Lerner diagram" was Findlay 1971.

- Findlay, Ronald. 1971. "Comparative Advantage, Effective Protection and the Domestic Resource Cost of Foreign Exchange," *Journal of International Economics*

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Origins of "Lerner diagram"

- Others – apparently before Findlay 1971 -- have called it the "Lerner-Pearce diagram," due to Pearce, Ivor F. 1952. "The Factor Price Equalization Myth," *Review of Economic Studies*
- That uses unit isoquants, not unit-value isoquants, and thus cannot do what the true Lerner diagram is able to.

Origins of "Marshall-Lerner Condition"

Origins of "Marshall-Lerner Condition"

- The condition:

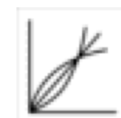
$$\eta_X + \eta_M > 1$$

  η_X, η_M are the demand elasticities for a country's exports and imports

- Condition for three different things:
  1. Stability of international exchange of goods
  2. Devaluation to improve the trade balance
  3. Stability of the market for foreign exchange

Origins of "Marshall-Lerner Condition"

- Substance
  - Marshall, Alfred. 1923. *Money, Credit and Commerce*
  - In the context of offer-curve stability (of international exchange of goods)



  - "elasticity of demand of each country…be **on average to be less than one half**."
  - had done much of the work between 1869 and 1873, privately printed & circulated in 1879.

    [So he published 50 years later. Wow!]

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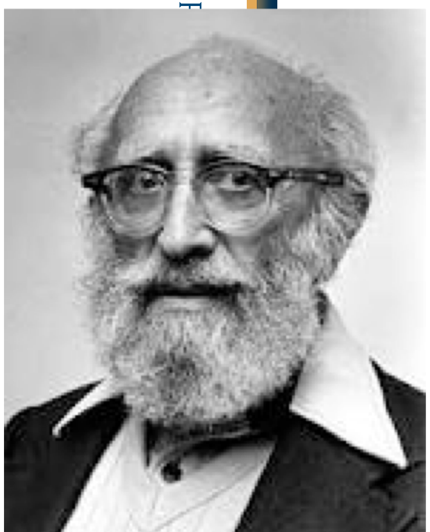
Origins of "Marshall-Lerner Condition"



- Substance
  - Lerner, Abba P. 1944. *The Economics of Control: Principles of Welfare Economics*
  - Context: Stability of full employment in Keynesian model where net exports are part of aggregate demand.
  - Thus, will fall in prices (or currency depreciation) cause net exports to rise or fall?
  - "The critical point is where the **sum of the elasticity of demand for imports plus the elasticity of demand for exports is equal to unity**."

Origins of "Marshall-Lerner Condition"

- Substance
  - Robinson?

    - Robinson, Joan. 1937. *Essays in the Theory of Employment*
    - Same question as Lerner, but her answer was:

      $k\{[\varepsilon_f(1+\eta_h)/(\varepsilon_f+\eta_h)] - Ip[\eta_f(1-\varepsilon_h)/(\eta_f+\varepsilon_h)]\} > 0$

      (Notation is different. $\varepsilon_f, \varepsilon_h$ are the demand elasticities.)
    - This becomes the M-L condition with balanced trade and infinite supply elasticities, but Robinson didn't mention this until her 1947 revision.
    - So no.

Origins of "Marshall-Lerner Condition"

- Name
  - Condition was cited by others – Polak (1947), Haberler (1949) – but not by that name.
    - Polak: "the well-known formula"
    - Haberler: "Lerner condition" (although he acknowledged both Marshall and Robinson)

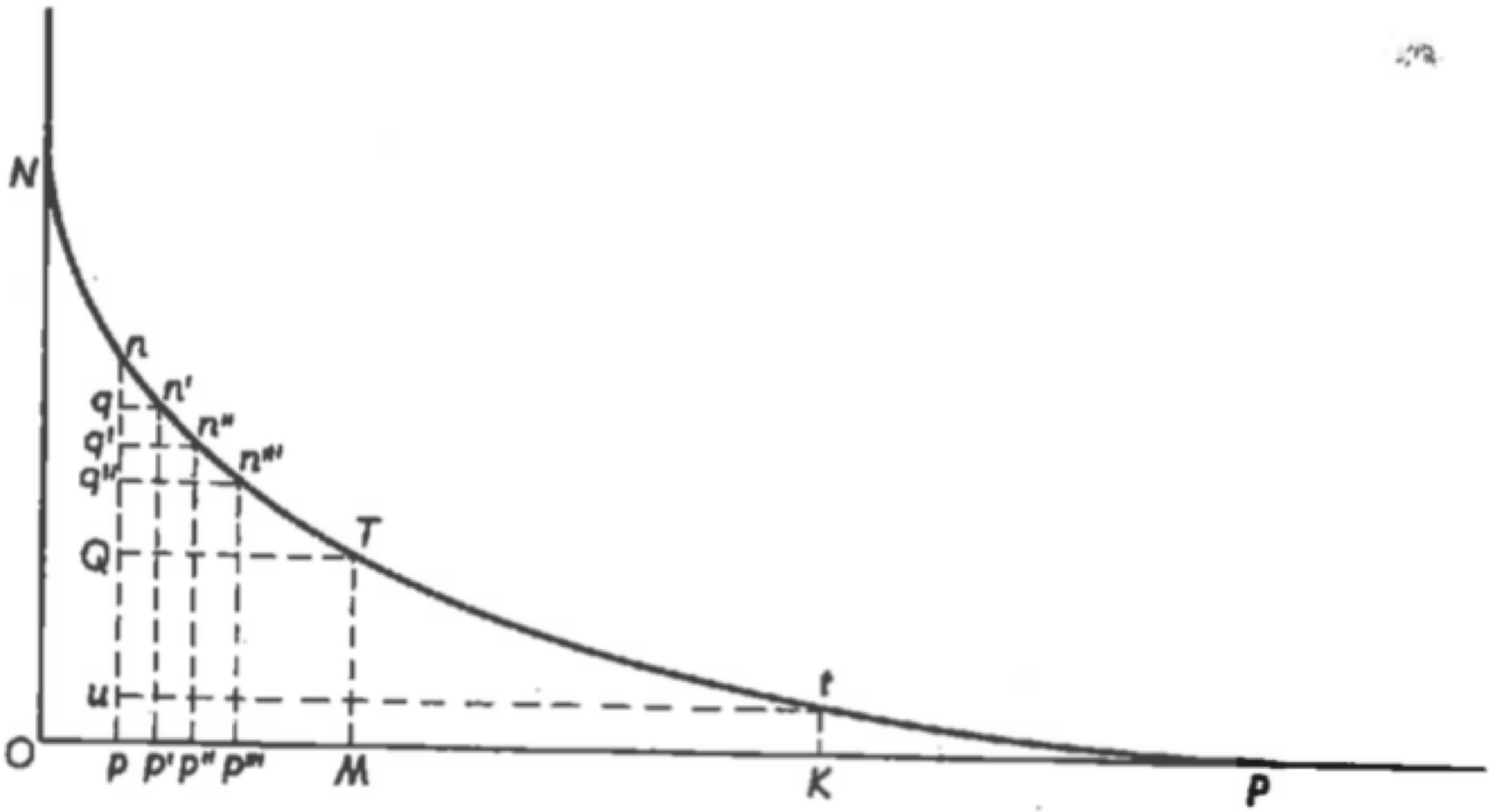
Origins of "Marshall-Lerner Condition"

- Name: First was
  - Hirschman, Albert O. 1949. "Devaluation and the Trade Balance: A Note," *Review of Economics and Statistics*
    - His point was that M-L is wrong for improving a non-zero trade balance:
    - "Our results permit the following conclusions:
      - (a) **The "Marshall-Lerner" condition** for devaluation to have a favorable effect on the trade balance (sum of the two elasticities larger than unity) holds only when imports are equal to exports."

Additional Slides for Possible Later Use

Dupuit 1844, Fig 3, p. 282

Figure 3



Jenkin 1870-71, Fig 3, p. 113

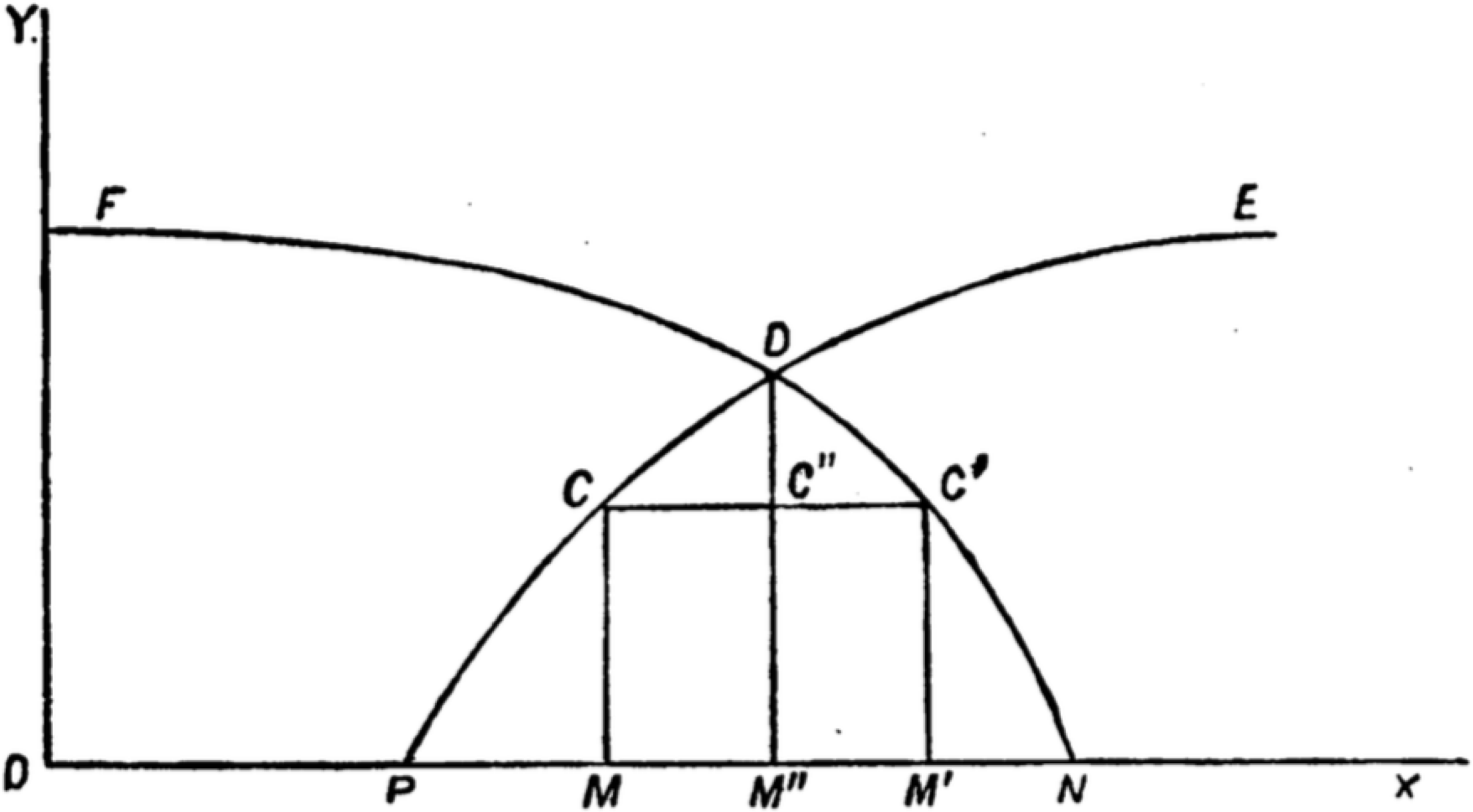


Fig. 8