GERALD R. Ford School OF PUBLIC POLICY

UNIVERSITY OF MICHIGAN

Rules of Origin, Origins of Terms, and Terms of Trade

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Rules of Origin of Terms of Trade

- Three topics from my recent (?) work:
  - How Rules of Origin can hurt
  - Intro to Glossary
    - Origins of a few terms in my Glossary
    - Including the "Terms of Trade"

Rue the ROOs

Rue the ROOs

- Example of how ubiquitous FTAs can be worse then none
  - 3 countries, each with same amount of labor
  - 3 industries (but 6 goods)
  - Goods demanded in the same fixed proportions (X=Y=Z) in each country
  - Each industry has separate input & output
  - Constant labor requirements (*a la* Ricardo)

    differing symmetrically across countries and industries

Example

Country A				Country B				Country C			
	In	Out	Tot		In	Out	Tot		In	Out	Tot
X	10	30	40	X	20	10	30	X	15	40	55
Y	15	40	55	Y	10	30	40	Y	20	10	30
Z	20	10	30	Z	15	40	55	Z	10	30	40

- Results of Example:
- With tariffs on all trade of 30%, consumption bundle requires 5/60 = ~8% more labor with FTAs than without.

Cost of X=Y=Z=1	
Autarky	125
FT, no frag	90
FT, frag	60
t<33%, frag	60

Rue the ROOs

Implication (surprising?)

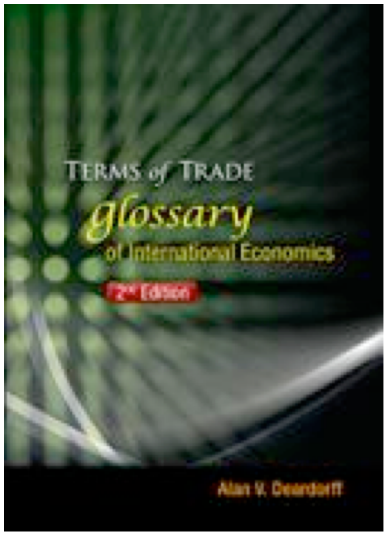
- ROOs actually can cause the net welfare effect of ubiquitous FTAs to be negative for all countries, compared to no FTAs and positive tariffs.

Glossary

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 (if there's time) at
  - CES function
  - Gravity model
  - Lerner diagram
  - Marshall-Lerner condition
  - Terms of trade
- For each I'll look both at the origin of the idea (the substance) and of 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.

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."

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 "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

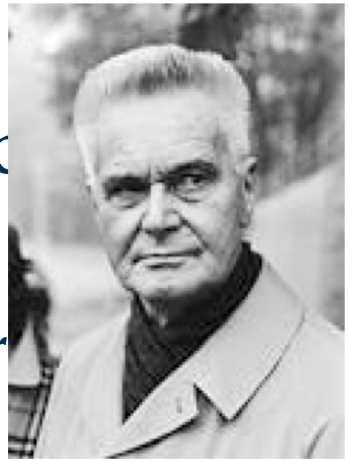
T_{ij} = trade between countries i and j

Y_i, Y_i = GDP of countries i and j

D_{ij} = distance between countries i and j

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

Origins of "Gravity Model"



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

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…"

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.

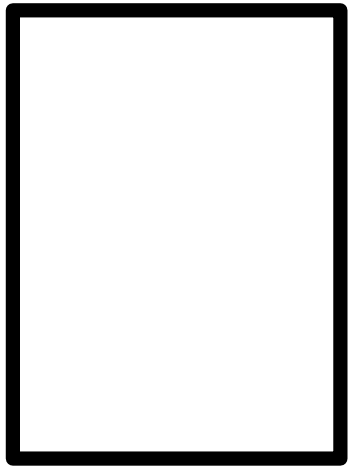
Origins of "Gravity Model"

- Earlier origins outside of trade
  - Substance

- Zipf 1946, "The P_1P_2/D Hypothesis" for inter-city movements of freight, persons, information, etc.
- Stewart 1947 for "Distribution and Equilibrium of Population," calling it "potential."

Origins of "Gravity Model"

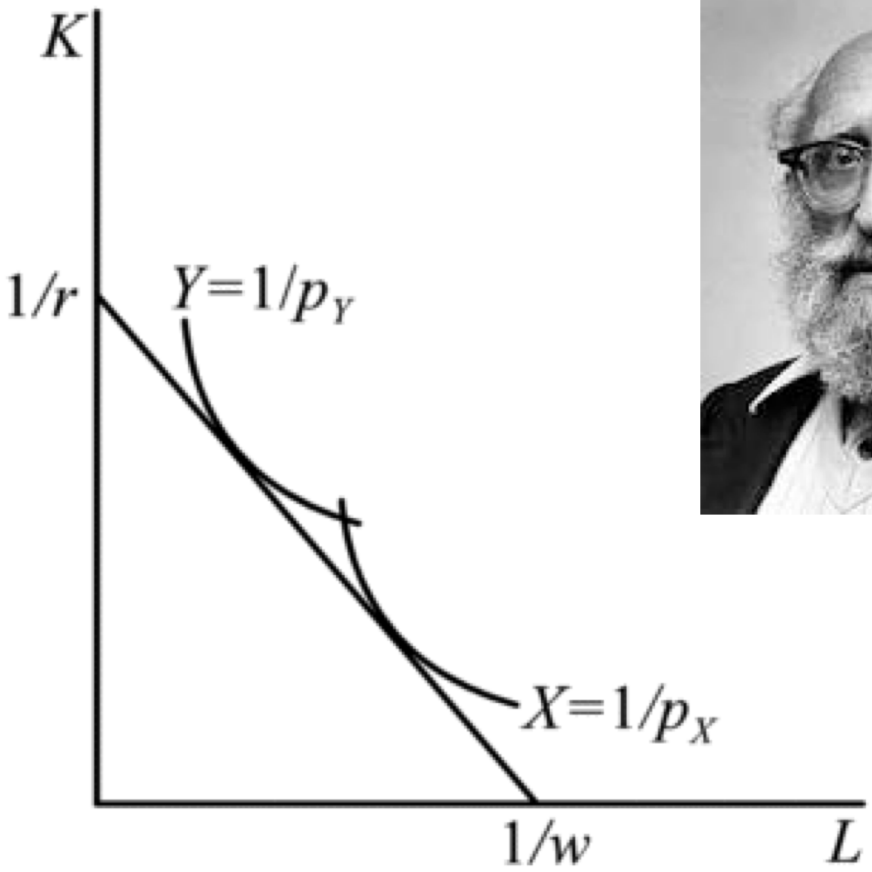
- Earlier origins outside of trade
  - Name
    - Bramhall & Isard 1960 on regional science: "gravity, potential, and spacial interaction models -- which for short we shall term gravity models."

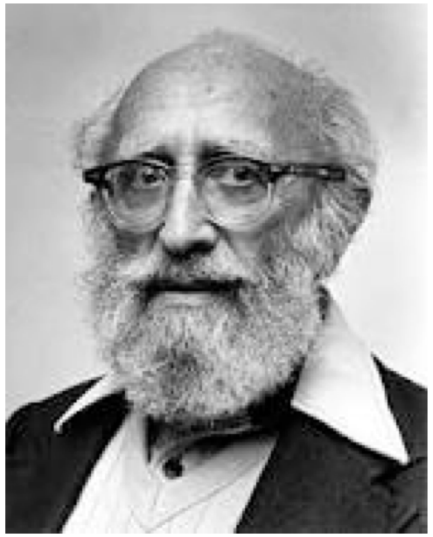


Origins of "Lerner diagram"

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 in 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*

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
  - Stability of international exchange of goods
  - Devaluation to improve the trade balance
  - Stability of the market for foreign exchange

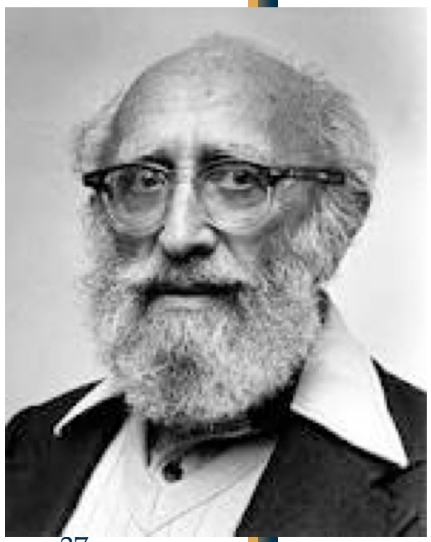
Origins of "Marshall-Lerner Condition"

- 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!]

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 the 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."

Origins of "Terms of Trade"

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

    $TT = P_x/P_m$

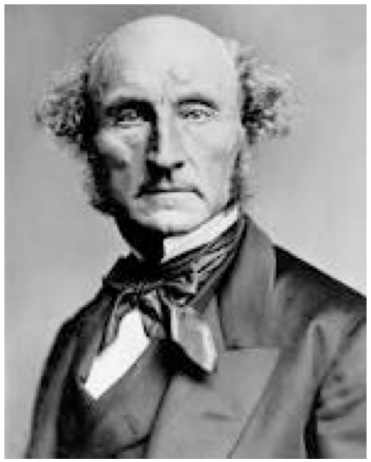
Origins of "Terms of Trade"

- 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 so.
  - 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"
      - (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

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

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_x = foreign factor productivity producing imports

Origins of "Terms of Trade"

- And in international finance (?)
  - 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…"