Standard theory (hybrid Heckscher-Ohlin/New Trade Theory) does not well when matched with the data on the growth and composition of trade.

In the 1980s and 1990s trade economists reached a consensus that North-North trade — trade among rich countries — was driven by forces captured by the New Trade Theory and North-South trade — trade between rich countries and poor countries — was driven by forces captured by Heckscher-Ohlin theory. (South-South trade was negligible.)

A. V. Deardorff, "Testing Trade Theories and Predicting Trade Flows," in R. W. Jones and P. B. Kenen, editors, *Handbook of International Economics*, volume l, North-Holland, 1984, 467-517.

J. Markusen, "Explaining the Volume of Trade: An Eclectic Approach," *American Economic Review*, 76 (1986), 1002-1011.

In fact, a calibrated version of this hybrid model does not match the data.

R. Bergoeing and T. J. Kehoe, “Trade Theory and Trade Facts,” Federal Reserve Bank of Minneapolis, 2003.

TRADE THEORY

Traditional trade theory — Ricardo, Heckscher-Ohlin — says countries trade because they are different.

In 1990 by far the largest bilateral trade relation in the world was U.S.-Canada. The largest two-digit SITC export of the United States to Canada was 78 Road Vehicles. The largest two-digit SITC export of Canada to the United States was 78 Road Vehicles.

The New Trade Theory — increasing returns, taste for variety, monopolistic competition — explains how similar countries can engage in a lot of intraindustry trade.

Helpman and Krugman (1985)
Markusen (1986)

TRADE THEORY AND TRADE FACTS

- Some recent trade facts
- A “New Trade Theory” model
- Accounting for the facts
- Intermediate goods?
- Policy?

How important is the quantitative failure of the New Trade Theory?

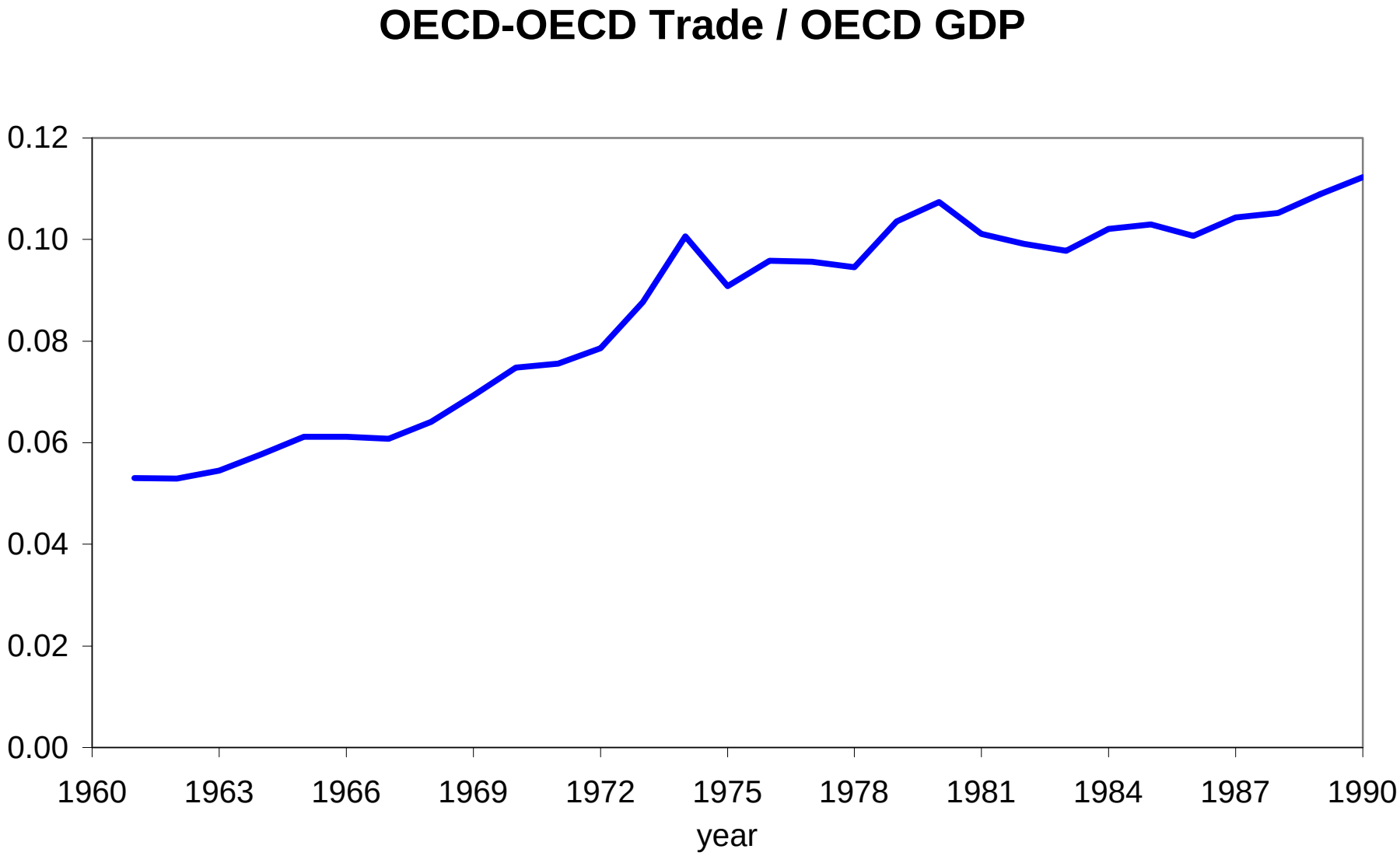
Where should trade theory and applications go from here?

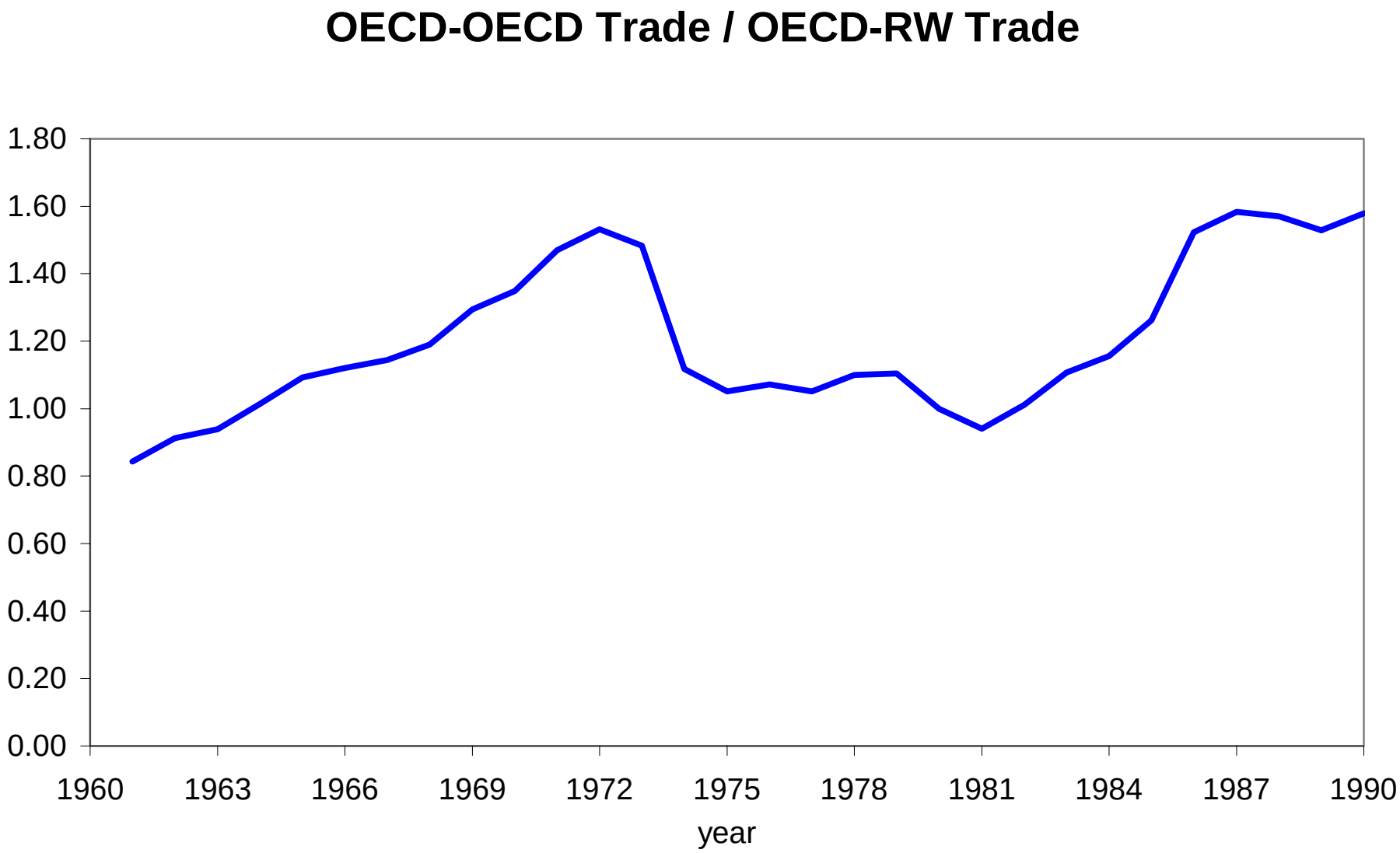
SOME RECENT TRADE FACTS

- **The ratio of trade to product has increased.**
  World trade/world GDP increased by 59.3 percent 1961-1990.
  OECD-OECD trade/OECD GDP increased by 111.5 percent 1961-1990.

- **Trade has become more concentrated among industrialized countries**
  OECD-OECD trade/OECD-RW trade increased by 87.1 percent 1961-1990.

- **Trade among industrialized countries is mostly intraindustry trade**
  Grubel-Lloyd index for OECD-OECD trade in 1990 is 68.4.
  Grubel-Lloyd index for OECD-RW trade in 1990 is 38.1.


OECD-OECD Trade / OECD GDP
0.12
0.10
0.08
0.06
0.04
0.02
0.00
1960
1963
1966
1969
1972
1975
1978
1981
1984
1987
1990
year


OECD-OECD Trade / OECD-RW Trade
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1960
1963
1966
1969
1972
1975
1978
1981
1984
1987
1990
year

Helpman and Krugman (1985):

"These....empirical weaknesses of conventional trade theory...become understandable once economies of scale and imperfect competition are introduced into our analysis."

Markusen, Melvin, Kaempfer, and Maskus (1995):

"Thus, nonhomogeneous demand leads to a decrease in North-South trade and to an increase in intraindustry trade among the northern industrialized countries. These are the stylized facts that were to be explained."

Goal: To measure how much of the increase in the ratio of trade to output in the OECD and of the concentration of world trade among OECD countries can be accounted for by the "New Trade Theory."

PUNCHLINE

In a calibrated general equilibrium model, the New Trade Theory cannot account for the increase in the ratio of trade to output in the OECD.

Back-of-the-envelope calculations:

Suppose that the world consists of the OECD and the only trade is manufactures.

With Dixit-Stiglitz preferences, country j exports all of its production of manufactures Y_m^j except for the fraction $s^j = Y^j / Y^{oe}$ that it retains for domestic consumption.

World imports:

$$M = \sum_{j=1}^{n} \left(1 - s^j\right) Y_m^j .$$

World trade/GDP:

$$\frac{M}{Y^{oe}} = \frac{M}{Y_m^{oe}} \frac{Y_m^{oe}}{Y^{oe}} = \left(1 - \sum_{j=1}^{n} (s^j)^2\right) \frac{Y_m^{oe}}{Y^{oe}} .$$

World trade/GDP:

$$\frac{M}{Y^{oe}} = \frac{M}{Y_m^{oe}} \frac{Y_m^{oe}}{Y^{oe}} = \left(1 - \sum_{j=1}^{n} (s^j)^2\right) \frac{Y_m^{oe}}{Y^{oe}}.$$

$\left(1 - \sum_{j=1}^{n} (s^j)^2\right)$ goes from 0.663 in 1961 to 0.827 in 1990.

Y_m^{oe} / Y^{oe} goes from 0.295 in 1961 to 0.222 in 1990.

$$0.663 \times 0.295 = 0.196 \approx 0.184 = 0.827 \times 0.222.$$

Effects cancel!

A “NEW TRADE THEORY” MODEL

Environment:

- Static: endowments of factors are exogenous
- 2 regions: OECD and rest of world
- 2 traded goods: homogeneous — primaries (CRS) and differentiated — manufactures (IRS)
- 1 nontraded good — services (CRS)
- 2 factors: (effective) labor and capital
- Identical technologies and preferences (love for variety) across regions
- Primaries are inferior to manufactures

We only consider merchandise trade in both the data and in the model.

Key Features of the Model

Consumers' problem:

$$\max \quad \frac{\beta_p (c_p^j + \gamma_p)^\eta + \beta_m (\int_{D^w} c_m^j(z)^\rho dz_p)^{\eta/\rho} + \beta_s (c_s^j + \gamma_s)^\eta - 1}{\eta}$$

$$\text{s.t.} \quad q_p c_p^j + \int_{D^w} q_m(z) c_m^j(z) dz_p + q_s^j c_s^j \le r^j k^j + w^j h^j .$$

Firms' problems

Primaries and Services: Standard CRS problems.

$$Y_p^j = \theta_p (K_p^j)^{\alpha_p} (H_p^j)^{1-\alpha_p}$$

$$Y_s^j = \theta_s (K_s^j)^{\alpha_s} (H_s^j)^{1-\alpha_s}$$

Manufactures: Standard (Dixit-Stiglitz) monopolistically competitive problem:

- Fixed cost.

$$Y_m(z) = \max\left[\theta_m K_m(z)^{\alpha_m} H_m(z)^{1-\alpha_m} - F, 0\right]$$

- Firm z sets its price $q_m(z)$ to max profits given all of the other prices.

$$Y_m(z) = \sum_{j=1}^{n} C_m^j(z) + C_m^{rw}(z).$$

$$C_m^j(z) = \frac{\beta_m^{\frac{1}{1-\eta}}(r^j K^j + w^j H^j + q_p \gamma_p N^j + q_s^j \gamma_s N^j)}{q_m(z)^{\frac{1}{1-\rho}} \left[\int_{D^w} q_m(z')^{\frac{-\rho}{1-\rho}} dz' \right]^{\frac{\rho-\eta}{\rho(1-\eta)}} \Delta}$$

$$\Delta = \beta_p^{\frac{1}{1-\eta}} q_p^{-\frac{\eta}{1-\eta}} + \beta_m^{\frac{1}{1-\eta}} \left[\left(\int_{D^w} q_m(z')^{\frac{-\rho}{1-\rho}} dz' \right)^{\frac{-(1-\rho)}{\rho}} \right]^{\frac{-\eta}{1-\eta}} + \beta_s^{\frac{1}{1-\eta}} q_s^{-\frac{\eta}{1-\eta}}$$

- Every firm is uniquely associated with only one variety (symmetry).
- Free entry.
- $D^w = [0, d^w]$ with d^w finite and endogenously determined.

Volume of Trade

Let s^j be the share of country j, $j = 1,...,n$, rw, in the world production of manufactures,

$$s^j = \int_{D^j} Y_m(z)dz \; / \int_{D^w} Y_m(z)dz \; = Y_m^j / Y_m^w.$$

The imports by country j from the OECD are

$$M_{oe}^j = (1 - s^{rw} - s^j)C_m^j$$
$$M_{oe}^{rw} = (1 - s^{rw})C_m^{rw}.$$

Total imports in the OECD from the other OECD countries are

$$M_{oe}^{oe} = \sum_{j=1}^{n} M_{oe}^j (1 - s^{rw} - \sum_{j=1}^{n} (s^j)^2 / (1 - s^{rw}))C_m^{oe}.$$

OECD in 1990

Country	Share of GDP %	Country	Share of GDP %
Australia	1.79	Japan	18.04
Austria	0.97	Netherlands	1.72
Belgium-Lux	1.26	New Zealand	0.26
Canada	3.45	Norway	0.70
Denmark	0.78	Portugal	0.41
Finland	0.81	Spain	3.00
France	7.26	Sweden	1.40
Germany	9.96	Switzerland	0.17
Greece	0.50	Turkey	0.91
Iceland	0.04	United Kingdom	5.92
Ireland	0.28	United States	33.72
Italy	6.64		

ACCOUNTING FOR THE FACTS

Compare the changes that the model predicts for 1961-1990 with what actually took place.

Focus on key variables:

- OECD-OECD Trade/OECD GDP
- OECD-OECD Trade/OECD-RW Trade
- OECD Manfacturing GDP/OECD GDP

Calibrate to 1990 data.

Backcast to 1961 by imposing changes in parameters:

- relative sizes of countries in the OECD
- populations
- sectoral productivities
- endowments

ACCOUNTING FOR THE FACTS

Benchmark 1990 OECD Data Set
(Billion U.S. dollars)

	Primaries	**Manufactures**	**Services**	**Total**
H_i^{oe}	228	2,884	8,644	11,756
K_i^{oe}	441	775	3,497	4,713
Y_i^{oe}	669	3,659	12,141	16,469
C_i^{oe}	862	3,466	12,141	16,469
$Y_i^{oe} - C_i^{oe}$	-193	193	0	0

ACCOUNTING FOR THE FACTS

Benchmark 1990 Rest of the World Data Set
(Billion U.S. dollars)

	Primaries	**Manufactures**	**Services**	**Total**
Y_i^{rw}	1,223	1,159	3,447	5,829
C_i^{rw}	1,030	1,352	3,447	5,829
$Y_i^{rw} - C_i^{rw}$	193	-193	0	0

ACCOUNTING FOR THE FACTS

- $N^{oe} = 854,\ N^{rw} = 4,428.$
- $\sum_{i=p,m,s} Y_i^{rw} = \sum_{i=p,m,s} C_i^{rw} = 5,829.$
- Set $q_p = q_m(z) = q_s = w = r = 1$ (quantities are 1990 values).
- $\rho = 1/1.2$ (Morrison 1990, Martins, Scarpetta, and Pilat 1996).
- Normalize $d^w = 100.$
- Calibrate H^{rw}, K^{rw} so that benchmark data set is an equilibrium.

- Alternative calibrations of utility parameters γ_p, γ_s, and η.

OECD in 1961

Country	Share of GDP %	Country	Share of GDP %
Austria	0.75	Netherlands	1.37
Belgium-Lux	1.25	Norway	0.60
Canada	4.22	Portugal	0.32
Denmark	0.70	Spain	1.38
France	6.99	Sweden	1.62
Germany	9.71	Switzerland	1.07
Greece	0.50	Turkey	0.83
Iceland	0.03	United Kingdom	8.08
Ireland	0.21	United States	55.74
Italy	4.64		

Numerical Experiments

Calculate equilibrium in 1961:

$$\theta_{p,1961} = \theta_{p,1990}$$
$$\theta_{m,1961} = \theta_{m,1990}/1.014^{29},\ F_{1961} = F_{1990}/1.014^{29}$$
$$\theta_{s,1961} = \theta_{s,1990}/1.005^{29} \text{ (Echevarria 1997)}$$

$$N^{oe} = 536,\ N^{rw} = 2,545$$

Numerical Experiments

Choose H^{oe}_{1961}, K^{oe}_{1961}, H^{rw}_{1961}, K^{rw}_{1961} so that

$$\frac{\sum_{i=p,m,s} Y^{oe}_{i,1990} / N^{oe}_{1990}}{\sum_{i=p,m,s} Y^{oe}_{i,1961} / N^{oe}_{1961}} = 2.400$$

$$\frac{\sum_{i=p,m,s} Y^{rw}_{i,1990} / N^{rw}_{1990}}{\sum_{i=p,m,s} Y^{rw}_{i,1961} / N^{rw}_{1961}} = 2.055$$

$$\frac{K^{oe}_{1961}}{H^{oe}_{1961}} = \frac{K^{oe}_{1990}}{H^{oe}_{1990}}$$

$$\frac{q_{p,1961}(Y^{rw}_{p,1961} - C^{rw}_{p,1961})}{\sum_{i=p,m,s} q_{i,1961} Y^{rw}_{i,1961}} = 0.050$$

How Can the Model Work in Matching the Facts?

- The ratio of trade to product has increased:

  The size distribution of countries has become more equal (Helpman-Krugman).

- Trade has become more concentrated among industrialized countries:

  OECD countries have comparative advantage in manufactures, while the RW has comparative advantage in primaries. Because they are inferior to manufactures, primaries become less important in trade as the world becomes richer (Markusen).

How Can the Model Work in Matching the Facts?

- Trade among industrialized countries is largely intraindustry trade:

  OECD countries export manufactures. Because of taste for variety, every country consumes some manufactures from every other country (Dixit-Stiglitz).

- The different total factor productivity growth rates across sectors imply that the price of manufactures relative to primaries and services has fallen sharply between 1961 and 1990. If price elasticities of demand are not equal to one, a lot can happen.

Experiment 1

$\gamma_p = \gamma_p = \eta = 0$

	1961	1990	Change
Data			
OECD-OECD Trade/OECD GDP	0.053	0.112	111.5%
OECD-OECD Trade/OECD-RW Trade	0.844	1.579	87.1%
OECD Manf GDP/OECD GDP	0.295	0.222	–24.6%
1. $\gamma_p = 0$, $\gamma_s = 0$, $\eta = 0$			
OECD-OECD Trade/OECD GDP	0.108	0.136	25.8%
OECD-OECD Trade/OECD-RW Trade	0.893	1.169	30.9%
OECD Manf GDP/OECD GDP	0.223	0.222	–0.4%

Experiment 2

$\gamma_p = -169.5$, $\gamma_s = 314.7$ to match consumption in RW in 1990,
$\eta = 0$

	1961	1990	Change
Data			
OECD-OECD Trade/OECD GDP	0.053	0.112	111.5%
OECD-OECD Trade/OECD-RW Trade	0.844	1.579	87.1%
OECD Manf GDP/OECD GDP	0.295	0.222	–24.6%
2. $\gamma_p = -169.5$, $\gamma_s = 314.7$, $\eta = 0$			
OECD-OECD Trade/OECD GDP	0.103	0.132	28.1%
OECD-OECD Trade/OECD-RW Trade	0.739	1.060	43.6%
OECD Manf GDP/OECD GDP	0.225	0.222	–1.4%

Experiment 3

$\gamma_p = -169.5$, $\gamma_s = 314.7$,
$\eta = 0.559$ to match growth in OECD-OECD Trade/OECD GDP

	1961	1990	Change
Data			
OECD-OECD Trade/OECD GDP	0.053	0.112	111.5%
OECD-OECD Trade/OECD-RW Trade	0.844	1.579	87.1%
OECD Manf GDP/OECD GDP	0.295	0.222	–24.6%
3. $\gamma_p = -169.5$, $\gamma_s = 314.7$, $\eta = 0.559$			
OECD-OECD Trade/OECD GDP	0.063	0.132	111.5%
OECD-OECD Trade/OECD-RW Trade	0.738	1.060	43.7 %
OECD Manf GDP/OECD GDP	0.137	0.222	62.7%

Experiments 4 and 5

$\gamma_p = -169.5$, $\gamma_s = 314.7$, reasonable values of η $(0.5 \geq 1/(1-\eta) \geq 0.1)$

	1961	1990	Change
Data			
OECD-OECD Trade/OECD GDP	0.053	0.112	111.5%
OECD-OECD Trade/OECD-RW Trade	0.844	1.579	87.1%
OECD Manf GDP/OECD GDP	0.295	0.222	–24.6%
4. $\gamma_p = -169.5$, $\gamma_s = 314.7$, $\eta = -1$			
OECD-OECD Trade/OECD GDP	0.118	0.132	11.7%
OECD-OECD Trade/OECD-RW Trade	0.739	1.060	43.5%
OECD Manf GDP/OECD GDP	0.259	0.222	–14.1%
5. $\gamma_p = -169.5$, $\gamma_s = 314.7$, $\eta = -9$			
OECD-OECD Trade/OECD GDP	0.118	0.132	1.6%
OECD-OECD Trade/OECD-RW Trade	0.739	1.060	43.5%
OECD Manf GDP/OECD GDP	0.284	0.222	–21.8%

Sensitivity Analysis:
Alternative Calibration Methodologies

- Alternative specifications of nonhomogeneity
- Gross imports calibration
- Alternative RW endowment calibration
- Alternative RW growth calibration
- Intermediate goods

INTERMEDIATE GOODS?

$$Y_p^j = \min\left[\frac{X_{pp}^j}{a_{pp}}, \frac{\int_{D^w} X_{mp}^j(z)dz}{a_{mp}}, \frac{X_{sp}^j}{a_{sp}}, \theta_p\left(K_p^j\right)^{\alpha_p}\left(H_p^j\right)^{1-\alpha_p}\right]$$

$$Y_m(z) = \min\left[\frac{X_{pm}^j(z)}{a_{pm}}, \frac{\int_{D^w} X_{mm}^j(z,z')dz'}{a_{mm}}, \frac{X_{sm}^j(z)}{a_{sm}}, \theta_m\left(K_m(z)\right)^{\alpha_m}\left(H_m(z)\right)^{1-\alpha_m} - F\right]$$

$$Y_s^j = \min\left[\frac{X_{ps}^j}{a_{ps}}, \frac{\int_{D^w} X_{ms}^j(z)dz}{a_{ms}}, \frac{X_{ss}^j}{a_{ss}}, \theta_s\left(K_s^j\right)^{\alpha_s}\left(H_s^j\right)^{1-\alpha_s}\right]$$

Results for Model with Intermediate Goods

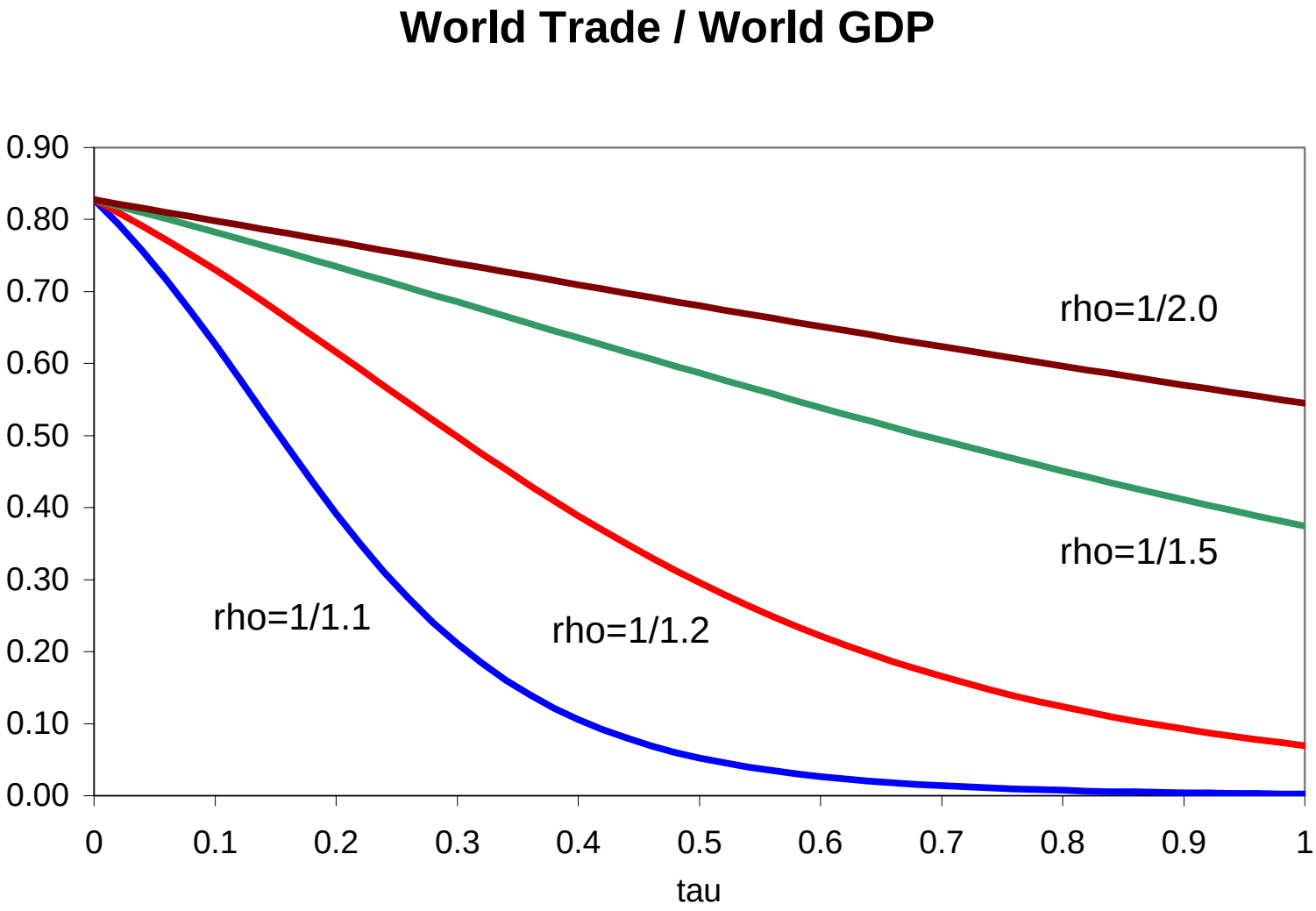
	1961	1990	Change
Data			
OECD-OECD Trade/OECD GDP	0.053	0.112	111.5%
OECD-OECD Trade/OECD-RW Trade	0.844	1.579	87.1%
OECD Manf GDP/OECD GDP	0.295	0.222	–24.6%
4. γ_p = –307.8, γ_s = 262.2, η = –1			
OECD-OECD Trade/OECD GDP	0.323	0.370	14.5%
OECD-OECD Trade/OECD-RW Trade	0.994	1.305	31.3%
OECD Manf GDP/OECD GDP	0.263	0.222	–15.6%
5. γ_p = –307.8, γ_s = 262.2, η = –9			
OECD-OECD Trade/OECD GDP	0.337	0.370	9.7%
OECD-OECD Trade/OECD-RW Trade	0.933	1.305	39.9%
OECD Manf GDP/OECD GDP	0.307	0.222	–27.5%

POLICY?

In a version of our model with *n* OECD countries, a manufacturing sector, and a uniform ad valorem tariff τ, the ratio of exports to income is given by

$$\frac{M}{Y} = \frac{(n-1)C_f}{Y} = \frac{n-1}{n-1+(1+\tau)^{1/(1-\rho)}}$$

Fixing *n* to replicate the size distribution of national incomes in the OECD, and setting $\rho = 1/1.2$, a fall in τ from 0.45 to 0.05 produces an increase in the ratio of trade to output as seen in the data.


World Trade / World GDP
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
tau
rho=1/2.0
rho=1/1.5
rho=1/1.2
rho=1/1.1