Centre for the Study of International Economic Relations Working Papers

Centre for the Study of International Economic Relations

1987

Trade in the Presence of Endogenous Intermediation in an Asymmetric World

Cillian Ryan

Follow this and additional works at: https://ir.lib.uwo.ca/economicscsier_wp

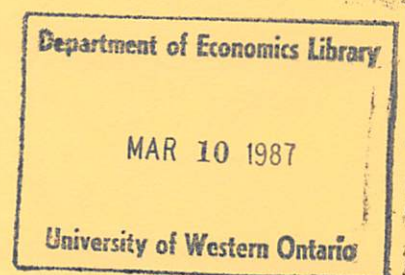Part of the Economics Commons

THE CENTRE FOR THE STUDY OF INTERNATIONAL ECONOMIC RELATIONS

WORKING PAPER 8703C

TRADE IN THE PRESENCE OF ENDOGENOUS INTERMEDIATION

IN AN ASYMMETRIC WORLD

Cillian Ryan

DEPARTMENT OF ECONOMICS
THE UNIVERSITY OF WESTERN ONTARIO
LONDON, ONTARIO
N6A 5C2

"Trade in the Presence of Endogenous Intermediation

in an Asymmetric World"

Cillian Ryan

Department of Economics

University of Western Ontario

INTRODUCTION

The growing importance of the service sector in most Western economies and the issue of trade in services scheduled for discussion in the next round of GATT talks has spawned a large body of literature in this area. The literature can be broken into three main areas. The first concentrates on descriptions and definitions of services (e.g., Bhagwati (1984), Melvin (1985), and Stern (1985)). The second area is a large body of case studies in various branches of trade in services such as technology, financial services, communications, etc., of Swan (1985), Dobell et al. (1986).

The third area, that of theoretical models, has not received much attention as yet. The exceptions are papers by Deardorff (1985) and Melvin and Markusen (1986). This paper continues in this vein and focuses on a theoretical model of mediation services. The principal debate in the theoretical area is whether services can be modelled in the same fashion as goods in conventional models.

In the wake of Debreu (1959) many writers were concerned about the introduction of non-convexities such as transactions costs into the general equilibrium model. In the early 1970's writers such as Foley (1970), Hahn (1971), Heller (1972), and Starr (1970) showed that with large numbers of agents, competitive equilibria were reasonable approximations for non-convex economies.

Kurz (1974) considered the possible existence of specialized transactors in a single market exchange economy with transactions costs and money. However from our point of view there are many problems with Kurz's analysis. Neither the trading environment itself nor the function of money within the

environment is specified in any way and thus the generation of specialized traders is ad hoc. Further his contention that "the act of establishing money is fundamentally an act ôf social choice"[1] is more pertinent to fiat money rather than to the sales record keeping devices that he refers to as money in his model. Thus there seems no good reason (unless we incorporate moral hazard) why such private contracts (inside money) should not arise.

Rubenstein and Wollinsky (1985) develop a model where mediators emerge endogenously due to an externality in the exchange process. In their model the more agents that are in the market place at any given time the more likely one is to make a transaction. Thus servicers make profits by eliminating time agents may have to spend if they wish to trade. Unfortunately Rubenstein and Wollinsky have to pay a high price in terms of structure to get this result.

The model in this paper is more closely related to the recent work in the financial intermediation literature. Boyd and Prescott (1985), Diamond (1984) and Williamson (1986) all have models in which intermediaries arise endogenously due to cost advantages in specialization.

In our case the model is of a three-sector, single-factor, n-agent economy. Two of the sectors, the x and y sectors, produce consumer goods, x and y, respectively. The third sector produces a service that provides a link between separated producers and consumers. Specifically, a service must be employed by an agent in order to consume a good which he himself does not produce.

Thus the service may be thought of as any coordinating activity that bridges gaps of space, information, and (with suitable reinterpretation) time. Therefore we may think of the servicer as a transport company, an auctioneer/market, a shop, a broker, or even as a financial or refrigeration

servicer.

The principal element in the structure of the model is that agents are forced by increasing returns to scale to specialize either in production of a final good or in the provision of mediation services. Given that each agent is specialized in one sector he/she must acquire goods he/she does not produce via trade. The exchange technology is defined in the following manner. In any given time period a servicer meets with a producer, collects a maximum of s units of the goods and the payment. He/she consumes the payment immediately and then services the output (carries it to the other consumer/producer). There the process is repeated and the servicer returns to the first producer with a maximum of s units of the other consumer good. The consequent asymmetry in consumption possibilities implied by this trading process is an important aspect of the model. It can be defended either as describing the problem facing individuals or specialized regions within a country.

The nature of equilibrium in this model provides some new insights into the trading process. Because services are demanded indirectly the equilibrium price and quantity demanded depend more upon demand considerations than on the service technology itself. In particular any asymmetry either in demand, production or in service technology may lead to excess capacity in the service sector in equilibrium.

Secondly, and as a consequence of the above, if free trade makes the world more symmetrical then there is an added gain from trade over and above the conventional gains.

Another interesting result is that an improvement in the service technology may in fact lead to a fall in the production of final goods. This arises because an improvement that reduces the cost of market activity may

cause the demand for services to rise such that new agents enter the service sector.

Finally we find that the principal propositions of trade theory still hold under trade with mediation services. The layout of the paper is as follows. Part I sets out the basic single country model in a perfectly symmetrical world and defines the equilibrium. Part II then considers some comparative static and other single country results. In Part III we consider the effect of relaxing our symmetry assumptions and hence derive our two country trade model.

PART I

The Model

The Production Sector

For the service sector to play a role in this economy, an agent must have an incentive to specialize, a notion that has some empirical validity. Thus we assume that agents face increasing returns to scale for individual output in each sector.

We assume there are n agents in the economy with identical tastes. Each agent i is endowed with one unit of labour which she/he can allocate across the three production sectors such that

$$\text{e.g.,} \quad \sum_j L_{ij} = \bar{L}_i = 1,$$

where L_{ij} is the amount of labour allocated by an agent i, to sector j, $i \in \{1,\ldots,n\}$, $j \in \{x,y,s\}$.

The most general specification of the production technology allows for various degrees of returns to scale to the industry and the individual. Output of x, y and s by ân individual agent is given by

$$x_i = f(L_{ix}; L_x)$$

$$y_i = g(L_{iy}; L_y)$$

$$s_i = s(L_{is}; L_s)$$

where $L_j = \sum_i L_{ij}$, $j \epsilon \{x,y,s\}$ is the number of agents employed in the j industry. Output then depends not only on individual inputs but also on the number of agents in the industry. For the economy as a whole, output is given by

$$x = \sum_i f(L_{ix}; L_x)$$

$$y = \sum_i g(L_{iy}; L_y)$$

$$s = \sum_i s(L_{is}; L_s) \quad .$$

Initially we assume constant returns to scale in all sectors at the industry level, thus x_i depends only on L_{xi}. In Ryan (1986a) we show that agents will choose either autarky or specialization depending of the service technology and the degree of returns to scale faced by the individual. In particular we show that production and servicing will always be dominated by specialization as long as there is increasing returns to scale in either the

production or the service sector at the individual level. Thus in this paper we will consider only the case where agents specialize, i.e., L_{ij} = 1 or 0. Consequently we will ignore any intermediate case from now on and we will note the appropriate conditions for autarky where relevant. Thus, the simplest specification of individual output of x and y are that

$$x_i = L_{ix}; \quad y_i = L_{iy}, \quad s_i = sL_{is}.$$

The above assumptions yield

$$x = L_x = \sum_i L_{ix} \tag{1}$$

$$y = L_y = \sum_i L_{iy} \tag{2}$$

$$s = sL_s = \sum_i L_{is} \; . \tag{3}$$

Consumption

Each agent's utility function is defined over the two consumer goods x and y

$$U = U(x,y).$$

The budget constraints facing the agents in each sector are:

for x producers:

$$x_i = 1 = x^i + p_y^x \, y^i \tag{4}$$

for y producers:

$$y_i = 1 = p_x^y x^i + y^i \tag{5}$$

for servicers:

$$(p_x^y - 1)s = x^i \quad \text{and} \quad (p_y^x - 1)s = y^i \tag{6}$$

where x^i is the amount of x consumed by an agent i

y^i is the amount of y consumed by an agent i

p_k^j is the price of a good k ϵ (x,y) to an agent in sector j

Note we normalize $p_i^i = 1$.

Each agent who specializes in one of the production sectors can consume the good he/she produces at the normalized price of 1. To purchase the other good he/she must pay p_k^j. The budget constraint for a servicer is determined in the following manner. He/she collects $p_x^y s$ units of x from an x producer and will carry s of these units to trade with y. Thus the servicer's consumption of x is $(p_y^x - 1)s$. When the servicer meets the y producer he/she exchanges s units of x for $p_y^x s$ units of y. The servicer must return with s units of y to the x producer, thus consumption of y is $(p_y^x - 1)s$.

Equilibrium

When agents maximize their utility subject to these budget constraints, we obtain the following indirect utility function

$$v(p_x^j, p_y^j, I) \quad \text{for all agents.}$$

where I is the income of the agent. We assume free mobility of labour across

the three sectors within any given country.

A competitive equilibrium is a labour allocation vector $L(L_{xi}, L_{yi}, L_{si})$ for each agent i, and a consumption vector for each agent i such that the utility of all agents are equal

$$V(1, p_y^x, 1) = V(p_x^y, 1, 1) = V(1, 1, (p_x^y - 1)s + (p_y^x - 1)s) \quad ;$$

the commodity market clears

$$L_x x_i = L_x = L_x x(1, p_y^x, 1) + L_y x(p_x^y, 1, 1) + L_s x(1, 1, (p_x^y - 1)s + (p_y^x - 1)s)$$

$$L_y y_i = L_y = L_x y(1, p_y^x, 1) + L_y y(p_x^y, 1, 1) + L_s y(1, 1, (p_x^y - 1)s + (p_y^x - 1)s)$$

and the factor market clears

$$L_x + L_y + L_s = n$$

where $x_i = y_i = 1$ by assumption and $x(p_x^j, p_y^j, I)$ is the demand function of an agent in sector j. Thus

$x(1, p_y^x, 1)$ is an x producers' demand for x

$x(p_x^y, 1, 1)$ is a y producers' demand for x

$y(1, 1, 2(R-1)s)$ is a servicers' demand for y.

etc.etc.

PART II

Suppose for simplicity that u is symmetric in x,y => $p_x^y = p_y^x = R$

in equilibrium. Thus

$$V(1,R,1) = V(1,1,2(R-1)s).$$ (7)

Taking total derivatives

$$V_2 \, dR = V_3[2sdR + 2(R-1)ds]$$

where V_i is the partial derivative with respect to the ith argument of V.

Rearranging

$$\frac{dR}{ds} = \frac{2(R-1)V_3}{V_2 - 2V_3 s}.$$ (8)

Now we note that $V_2 \leq 0$, $V_3 \geq 0$ and $R > 1$, and that as the cost of

transportation diminishes,

$$\underset{s \to \infty}{\text{Lt.}} R = 1,$$

i.e., if there were no cost to transportion R would be 1 in this model.

Therefore

$$\frac{dR}{ds} < 0$$

This implies that an improvement in the service technology means that the welfare of all agents improves.

Proof:

For the x and y producers

$$\frac{dV}{ds} = V_1(R,1,1) \frac{dR}{ds} = V_2(1,R,1) \frac{dR}{ds} \qquad (9)$$

and since

$$V_1 = V_2 \leq 0 \Rightarrow \frac{dV}{ds} \geq 0 .$$

For the servicers

$$\frac{dV}{ds}(1,1,2(R-1)s) = 2 V_3\{(R-1) + s \frac{dR}{ds} \} \qquad (10)$$

$$= \frac{2 V_3 V_2 (R-1)}{V_2 - 2V_3 s} \geq 0 . \qquad (11)$$

Next we wish to focus on the allocation of L to the various sectors. Recall that the economy-wide constraints are

$$L_x x_i = L_x = x(1,R,1)L_x + x(R,1,1)L_y + x(1,1,2(R-1)s)L_s \qquad (12)$$

$$L_y y_i = L_y = y(1,R,1)L_y + y(R,1,1)L_y + y(1,1,2(R-1)s)L_s \qquad (13)$$

$$n = L_x + L_y + L_s \ .$$ (14)

Now since we have assumed that U is symmetrical we have

$$x(1,R,1) = y(R,1,1),$$

$$x(R,1,1) = y(1,R,1),$$

and $\quad x(1,1,2(R-1)s) = y(1,1,2(R-1)s).$

Solving for L_s we get

$$L_s = \frac{n}{1 + \dfrac{2x(1,1,2(R-1)s)}{1 - x(1,R,1) - x(R,1,1)}} \ .$$ (15)

Therefore

$$\frac{dL_s}{ds} = n \left\{ \frac{1}{1 + \dfrac{2\ x(1,1,2(R-1)s)}{1 - x(1,R,1) - x(R,1,1)}} \right\}^2$$ (16)

$$\left\{ \frac{1}{1 - x(1,R,1) - x(R,1,1)} \right\}$$

$$\left\{ \frac{2\ x(1,1,2(R-1)s)}{1 - x(1,R,1) - x(R,1,1)} \left[-\frac{\partial x(1,R,1)}{\partial s} - \frac{\partial x(R,1,1)}{\partial s} \right] - 4 \frac{\partial x(1,1,2(R-1)s)}{\partial(R-1)s} \left[R-1 + \frac{sdR}{ds} \right] \right\} \ .$$

Signing this:

$$\frac{dL_s}{ds} = \{ \geq 0 \} \{ > 0 \} \{ ? \}$$

Note:

$$\frac{\partial x(1,R,1)}{\partial R} \geq 0 \qquad \text{if x is a substitute for y}$$

$$\frac{\partial x(R,1,1)}{\partial R} \leq 0 \qquad \text{if x is not a giffen good}$$

and

$$\frac{\partial x(1,1,2(R-1)s}{\partial (R-1)s} \geq 0 \qquad \text{as long as x is not an inferior good .}$$

Thus the sign of $\frac{dL_s}{ds}$ will be ambiguous and will depend on the magnitude of

these three derivatives. This is to be expected. The improvement in the

service technology means that trade is now relatively cheaper, leading to an

increase in the total number of trades. However the number of agents required

to carry out this new higher level is indeterminate. The fall in price R can

lead to more of both goods being allotted to the service sector in equilibrium

and thus to more agents entering the service sector.

We can see from the graph (Figure 1) that the elasticity of substitution

of goods x and y will determine how the L_s function behaves under CES

technology. When $\sigma = 0$, i.e., the consumption technology is Leontief, the

two goods are completely independent and thus even as $s \to 0$ L_s rises.

Agents expend as much energy as possible in an attempt to get the other good.

FIGURE 1
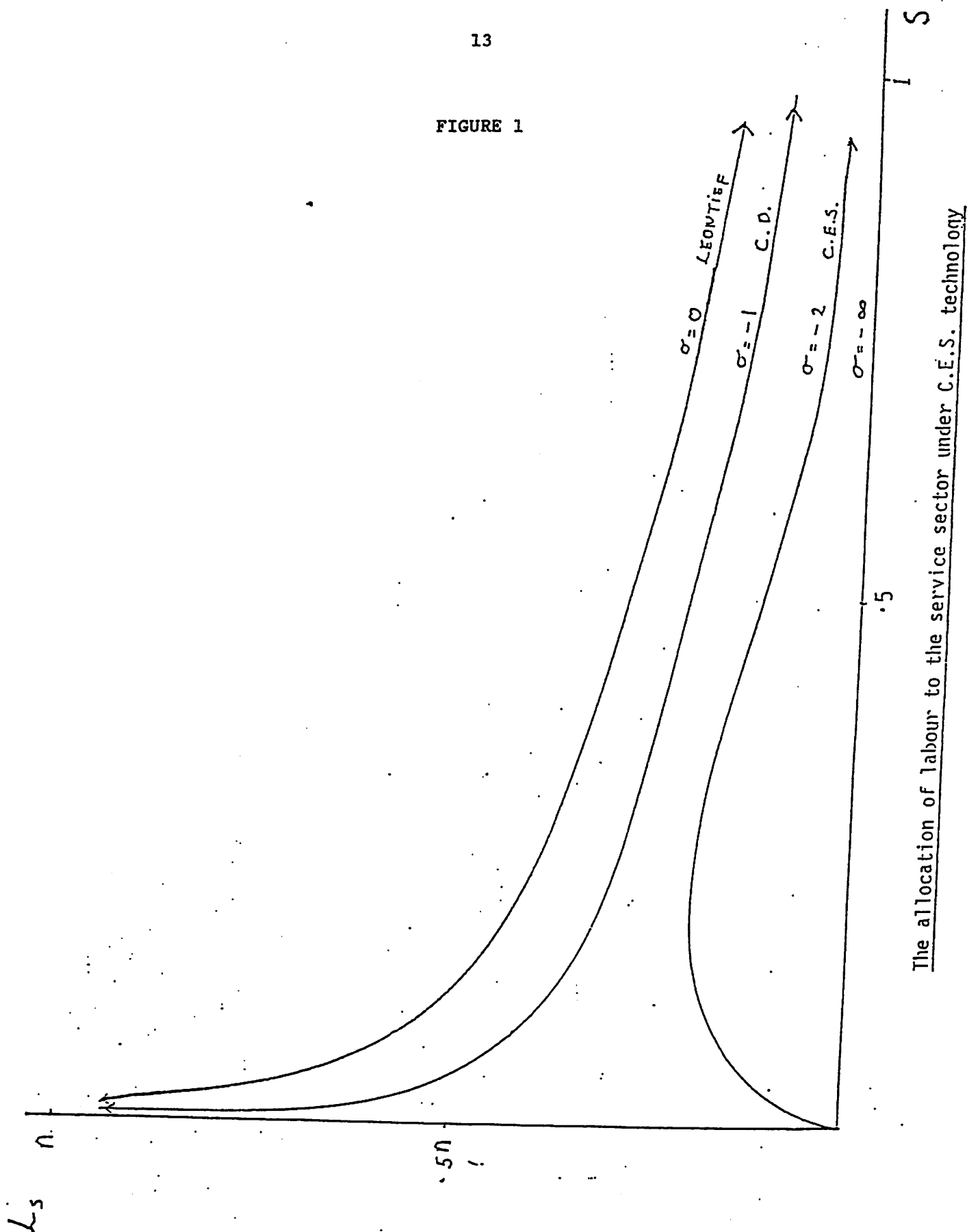
The allocation of labour to the service sector under C.E.S. technology

The same happens when $\sigma = -1$, i.e., the technology is Cobb–Douglas. It should be noted here that since neither Cobb–Douglas nor Leontief indifference curves touch the axis that either agents revert to autarky for large values of R (low values of s) or else we need strong degrees of returns to scale for the individual for L_s to approach n as s approaches 0. In particular autarkic production must be on the boundary of the positive quadrant. Of course these restrictions must apply to all utility functions to some degree if agents are not to revert to autarky as s approaches 0.

At the other end of the scale is the case where both goods are complete substitutes in terms of utility. Then $\sigma = \infty$ and $L_s = 0$ always since there is no incentive to trade. In this case the good produced is just as good as any other good we might be able to purchase. In between these extremes there will be L_s functions similar to the case where $\sigma = -2$. Here L_s rises initially as the service technology improves before reaching a maximum and then approaching 0 asymtotically like the others.

Further since $L_s = n - (L_x + L_y) = n - 2L_x$ (by symmetry),

$$\frac{dL_s}{ds} \lessgtr 0 \text{ implies that } \frac{dL_x}{ds} \text{ and } \frac{dL_y}{ds} \text{ also have ambiguous signs and hence } \frac{dx}{ds} \text{ and } \frac{dy}{ds}$$

can be positive or negative.

This is an important result of the analysis. In much empirical work writers have expressed concern at the fall of the productive sector's share of GNP relative to that of the service sector in Western economies. However this model suggests that a fall in the output of final goods is quite possible with an improvement in the service technology. The fact that servicing is now relatively cheaper means that agents can obtain goods produced by others at a lower cost causing an increase in the desire to trade. This increased demand

for mediation services may exceed the capacity of existing servicers even with their improved capabilities. Consequently agents may leave the productive sector and enter the service sector. Further in the new equilibrium the total share of the service sector in the consumption of the final goods will rise. However the fact that all agents, and those in the productive sectors in particular, have better access to the range of final goods more than compensates for the fall in the output of final goods and all agents are better off. Thus in spite of the fact that technology has been improving in all sectors, a sufficient condition for the current trend in developed economies to be consistent with this model is that service technology has been developing faster than productive technology. We will see later that this is by no means necessary and that technological advancements in the productive sector can also lead to a larger service sector.

There are several other arguments which could be put forward to reinforce the results of this model. For example if there are increasing returns to scale to the firm in production then improved service technology would allow producers to locate in one large plant rather than in small ones close to population centres. In this example one would expect both the output of final goods and services to increase, with services sector perhaps growing proportionately more.

PART III

Different Sectoral Services and Asymmetric Production

Different Sectoral Services

Suppose now that the technologies associated with trading x and y were

different from one another. How will this affect equilibrium? Consider the case where U is symmetric in its arguments. We would expect that the different service technologies will affect the prices agents are willing to pay and indeed we can formulate our model to reflect this. However equilibrium requires that $V(1,p_y^x,1) = V(p_x^y,1,1)$. Given our symmetry assumptions this implies that $p_x^y = p_y^x = R$ must continue to hold in equilibrium. This implies that

$$x(R,1,1) = y(1,R,1)$$

i.e., the amount of traded goods actually arriving at each producer/consumer is the same. Further $L_x = L_y$. The total amount of y to be carried is

$$L_x \, y(1,R,1)$$

and the total amount of x to be carried is

$$L_y \, x(R,1,1) \quad .$$

Thus if $s_x > s_y$

$$L_s \, s_x > L_s \, s_y \geq L_x \, y(1,R,1) = L_y \, x(R,1,1) \quad . \tag{17}$$

That is, if $s_x > s_y$ there is excess capacity in carrying x and this superior technology is not utilized. Thus while the income of a servicer is nominally $(R-1)s_x + (R-1)s_y$ the additional service capacity in servicing x

is not employed. This is because while initially the tendency is for a servicer to try and carry more x and to trade it for profit it will not be able to bring back sufficient y to pay for it. Thus with $p_y^x = p_x^y$, x agents will not supply any more than $p_y^x s_y$ to any servicer. Therefore

$$\frac{dR}{ds_x} = \frac{dV}{ds_x} = 0 \tag{18}$$

$$\frac{dR}{ds_y} = \frac{2(R-1)V_3}{V_2 - 2V_3 s_y} \equiv \frac{dR}{ds} \tag{19}$$

and $\quad \frac{dV}{ds_y} = \frac{2(R-1)V_2 V_3}{V_2 - 2V_3 s_y} \equiv \frac{dV}{ds} \quad . \tag{20}$

The effect of a change in s_y, given that $s_x > s_y$, is equivalent to a change in s since the improvement in s_y permits the employment of some of the superior s_x technology.

Somewhat different results are obtained if it is assumed that servicers service only one good, that is, they are either x servicers or y servicers. If we are to have equivalent technology to the single-servicer case then each agent could make two trips with goods and return empty. They would then get their own supplies of the good they do not service by costlessly trading with a servicer of the opposite type. As we show in Ryan (1986b) however this adds an extra restriction on the payment to servicers which complicates the model in a fundamental way and thus the whole nature of equilibrium is altered. In this case if $s_x > s_y$ the number of servicers in the x service sector falls, allowing them to be reallocated across all other sectors. However relative prices in each production/consumption sector would change

equiproportionally. Thus now an improvement in either sector increases welfare but excess space capacity (trucks returning empty) still exists.

Asymmetric Production

In this section we wish to consider the preceding single country model model where output is not symmetrical in the x and y sectors. This is similar to the case where the service technology differs between sectors. However it allows us to introduce the possibility of servicers trading on their own behalf and to see the consequences of the symmetrical utility assumption. Suppose now that agents in the x sector can produce $f \geq 1$ units of x each and that agents in the y sector can produce $g \geq 1$ units of y.

The individual budget constraints for the agents in the x and y sectors are

$$f = x + p_y^x \, Y \tag{21}$$

$$g = p_x^y \, X + y \tag{22}$$

The budget constraint for agents in the service sector is now more complicated. To see this, first consider the conditions necessary for equilibrium in the x and y sectors.

Equilibrium requires that

$$V(1, p_y^x, f) = V(p_x^y, 1, g) \tag{23}$$

Depending upon the nature of the utility function we may write

$$p_y^x = \phi(f,g,p_x^y) \tag{24}$$

where

$$\phi_f > 0, \qquad \phi_g < 0, \qquad \phi_{p_x^y} > 0 \qquad . \tag{25}$$

Letting $R = p_x^y$, and if we restrict the servicer to servicing goods for producer/consumers only, then a servicer's consumption bundle is

$$x^s = (\phi(f,g,R) - 1)s \quad ,$$

$$y^s = (R-1)s \quad .$$

Suppose now we relax this restriction and allow the servicer to adjust his/her consumption bundle to the prevailing prices. If the servicer delivers s units of y to x she/he will receive $\phi(f,g,R)s$ units of x in return.

The servicer can then choose to consume

$$(\phi(f,g,R) - \alpha_1)s$$

units of X, where $\alpha_1 \leq 1$, as long as $\alpha_1 s$ (the amount of x he delivers to y) is such that $\alpha_1 Rs \geq s$.

Thus the maximum x a servicer can consume is

$$(\phi(f,g,R) - \frac{1}{R})s$$

which implies that $y = 0$.

Similarly the maximum amount of y a servicer can consume is

$$(R - \frac{1}{\phi(f,g,R)})s$$

in which case $x = 0$. Thus a servicer can trade for x and y at prices R and $\frac{1}{\phi(f,g,R)}$ respectively.

Recalling the case where the production of x and y were symmetrical we see that this retrading presents no problem, given our assumption of a symmetrical utility function. To see this consider Figure 2. The bundle that the servicer can trade lies on the 45° line. Thus with prices R for x and $\frac{1}{R}$ for y the purchase of further units of x or y cannot yield higher utility.

When output is not symmetrical, this is no longer the case. This can be seen by considering Figure 3. When the servicer is restricted to carrying bundles that producers/consumers wish to trade, servicers receive the bundle $A = \{(\phi-1)s, (R-1)s\}$. However if the servicer is permitted to trade for
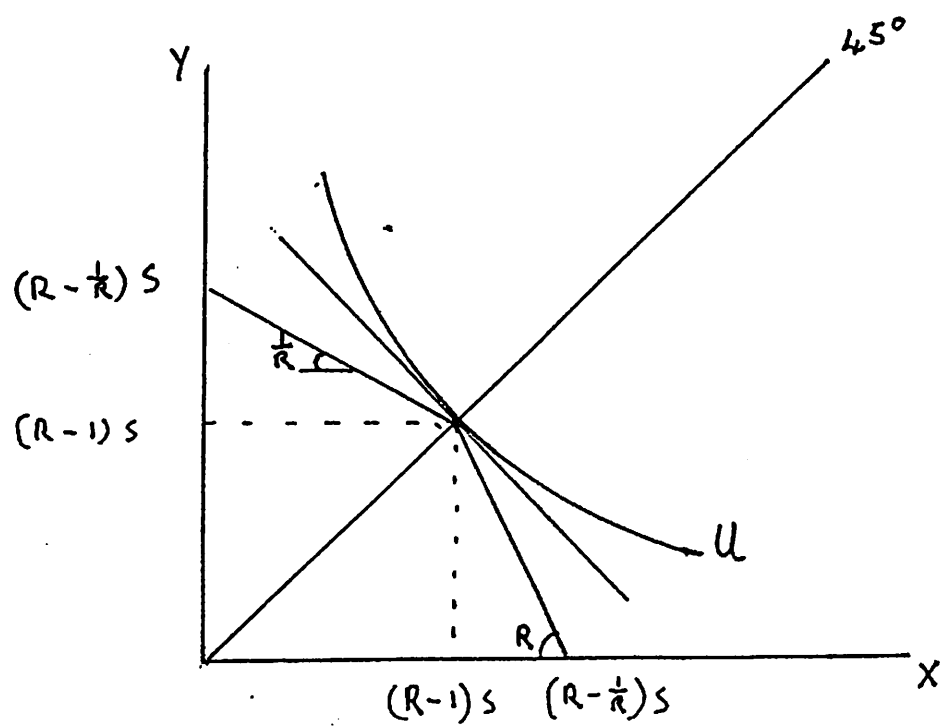
$(R-\frac{1}{R})S$

$(R-1)S$

$\frac{1}{R}$

U

$45°$

R

$(R-1)S$ $(R-\frac{1}{R})S$

Y

X

Figure 2.

$45°$

$\frac{1}{\phi}$
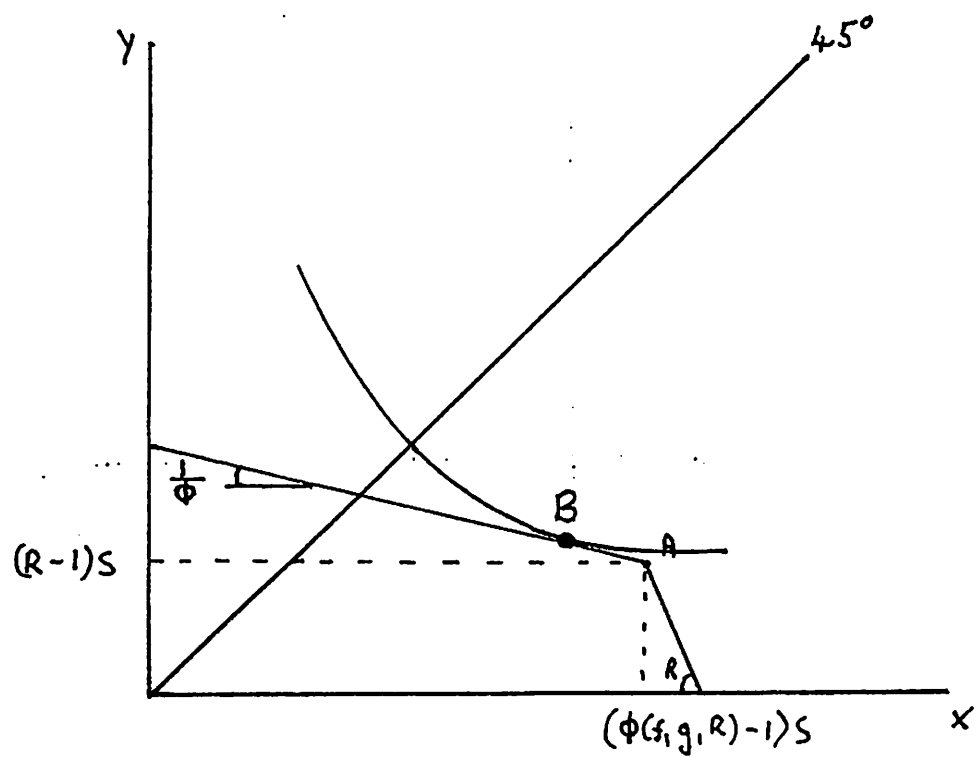
B

A

$(R-1)S$

R

$(\phi(f,g,R)-1)S$

Y

X

Figure 3. $f > g$

more y at the price $\phi(f,g,R)$ or x at the price R, then their consumption
bundle can be altered to increase utility, e.g., point B.

Given our assumption of a symmetrical utility function and the fact that
in the absence of servicer trading $R \geq 1$ (= 1 in the limit as $s \to \infty$), agents
will never want to purchase more x. Consequently a servicer's budget
constraint is given by the line from A to the y axis. More formally, the
servicer's problem (for $f > g$) is

$$\text{Max}_{x,y} \quad u(x,y) \tag{26}$$

$$\text{s.t.} \quad x + \phi(f,g,R)y = [(\phi(f,g,R) + 1)R - 2]s \tag{27}$$

$$\text{and} \quad x \leq (\phi(f,g,R) - 1)s \tag{28}$$

$$y \geq (R - 1)s \tag{29}$$

where $\phi(f,g,R)$ and R are taken as given. For $f > g$, equilibrium requires
that

$$\frac{U_1}{U_2} - \frac{1}{\phi(f,g,R)} \geq 0 \tag{30}$$

$$\lambda_2 \geq 0 \tag{31}$$

$$\text{and} \quad \left(\frac{U_1}{U_2} - \frac{1}{\phi(f,g,R)} \right) \lambda_2 = 0 \tag{32}$$

where λ_2 is the Lagrange Multiplier on the second constraint. Note the third constraint is implied by the other two. The equivalent conditions for $g > f$ are

$$R - \frac{U_1}{U_2} \geq 0 \tag{33}$$

$$\lambda_2 \geq 0 \tag{34}$$

and

$$\left(R - \frac{U_1}{U_2}\right)\lambda_2 = 0 \ . \tag{35}$$

We may rewrite this problem as follows. A servicer maximizes

$$U((\phi\alpha-1)s_1, \ (R-\alpha)s) \tag{36}$$

with respect to α

$$s.t. \quad \alpha \leq 1 \ .$$

First order conditions imply

$$U_1 \phi - U_2 = 0 \tag{37}$$

If the conditions for the implicit function theorem are met then we may write

$$\alpha = \alpha(f,g,R,s) \tag{38}$$

Thus general equilibrium requires that

$$V(1,\phi(f,g,R),f) = V(R,1,g)$$

$$= U[1,\phi(f,g,R)\alpha(f,g,R,s)-1)s, (R-\alpha(f,g,R,s))s_1] \tag{66}$$

Assuming these functions are continuous and differentiable, total differentiation implies that

$$V_2\phi_R \; dR + (V_2 \; \phi_f + V_3)df + V_2 \; \phi_g \; dg$$

$$= V_1 \; dR + V_3 \; dg$$

$$= [U_1(\phi_R\alpha + \phi\alpha_R)s + U_2(1 - \alpha_R)s]dR$$

$$+ [U_1\phi_f\alpha s + U_1\phi\alpha_f s - U_2\alpha_f s]df$$

$$+ [U_1\phi_g\alpha s + U_1\phi\alpha_g s - U_2\alpha_g s]dg$$

$$+ [U_1(\phi\alpha-1) + U_2(R-\alpha) + U_1\phi\alpha_s - U_2\alpha_s]ds \quad .$$

Invoking the envelope theorem we can write

$$\frac{dR}{ds} = \frac{U_1(\phi\alpha-1) + U_2(R-\alpha)}{V_1 - U_1\alpha\phi_R s - U_2 s} \leq 0 \tag{39}$$

$$\frac{dR}{df} = \frac{U_1\phi_f\alpha s}{V_1 - U_1\alpha\phi_R s - U_2 s} \leq 0 \tag{40}$$

$$\frac{dR}{dg} = \frac{U_1\phi_g\alpha s - V_3}{V_1 - U_1\alpha\phi_R s - U_2 s} \geq 0 \tag{41}$$

Further

$$\frac{dV}{ds} = V_1 \frac{dR}{ds} \geq 0 \tag{42}$$

$$\frac{dV}{df} = V_1 \frac{dR}{df} \geq 0 \tag{43}$$

$$\frac{dV}{dg} = V_1 \frac{dR}{dg} + V_3 \geq 0 \tag{44}$$

If $\alpha < 1$ then servicers are operating at less than full capacity in one direction. They service αs of a producer/consumer's good (e.g., x) and $(1-\alpha)s$ units of their own payment of x initially. However on the return journey they will service only αs units of the y producer's good. Thus an improvement in service technology will lead to an increase in the total number of trades. However some of this trading may now be on behalf of servicers rather than producers/consumers. Further the presence of a differential trading technology may not be as damaging here as it was in the

case of the symmetric production technology. In particular if $\alpha s_x \leq s_y < s_x$ equilibrium will not be affected. If $\alpha s_x > s_y$ then welfare is bounded by the lower y trading technology.

International Trade

In Ryan (1986b) we show that the standard trade propositions in relation to comparative advantage and gains from trade hold for a two-country trade model. There are however some interesting features to the two-country equilibrium. One is that a country specializing in services would, in general engage in a discriminating game between x and y producers. This work is considered initially in Ryan (1985) and is the subject of on-going analysis. In this paper however we wish to highlight another interesting outcome.

Consider a two-country world where servicers from either country can service producers/consumers from the other. Further suppose that country A has a comparative advantage in the production of x and country B has a comparative advantage in the production of y. Service technology is identical in both countries. Under autarky equilibrium in country A is given by

$$V(1,\phi^A(f^A,R^A),1) = V(R^A,1,1)$$

$$= U((\phi^A\alpha^A - 1)s, (R^A - \alpha^A)s) \qquad (45)$$

and equilibrium in country B is given by

$$V(1,R^B,1) = V(\phi^B(g^B,R^B),1,g^B)$$

$$= U((R^B - \alpha^B)s, (\phi^B\alpha - 1)s) \qquad (46)$$

where ϕ^j is the price of the good in which country j has a comparative advantage

R^j is the price of the other good in country j

$f^A > 1$ is the output of an x producer in country A

$g^B > 1$ is the output of a y producer in country B

and $g^A = f^B = 1$ is the output of a y producer/x producer in countries A and B respectively.

If $f^A = g^B$

then

$$R^A = R^B \qquad \phi^A = \phi^B$$

and

$$\phi^A > R^B ; \qquad \phi^B > R^A .$$

That is, the price an x producer is prepared to pay for a unit of y in A is greater than an x producer is prepared to pay in B in autarky and the price a y producer is prepared to pay for a unit of x in B is greater than a y producer is prepared to pay in A. If trade is then permitted, services will want to pick up x in country A and trade with y producers in country B. The new equilibrium is given by

$$V(1, \phi^F(f^A, g^B, R^F), f^A) = V(R^F, 1, g^B)$$

$$= U((\phi^F(f^A, g^B, R^F)\alpha - 1)s, (R^F - \alpha)s) \qquad (47)$$

where ϕ^F is the new world price of x and R^F the new world price of y. Note we are assuming agents in A specialize in x and servicing, agents in B

specialize in y and servicing, and $L_x^A < n^a$, $L_y^B < n^B$. This is possible given our assumptions.

Unlike conventional trade models there are two possible sources of gains from trade here. The first is from the improved world output that we usually see. The second is that since $(F^A - g^B) < (f^A - 1) = (g^B - 1)$, the world is now less asymmetrical. Consequently there is less trading on behalf of producers/consumers. Consequently the move to free trade not only captures the benefit of better final good production but also has an "as if" improvement in service technology associated with it.

REFERENCES

Bhagwati, J.N. (1984), "Splintering and Disembodiment of Services and

Developing Nations," The World Economy 7, 133-143.

Boyd, J. and E. Prescott (1985), "Financial Intermediary - Coalitions,"

Working Paper 272, Federal Reserve Bank of Minneapolis Research

Department.

Deardorff, A. (1985), "Comparative Advantage and International Trade and

Investment in Services," in Robert M. Stern (ed.), Trade and Investment

in Services: Canada/U.S. Perspectives (Toronto: Ontario Economic

Council) 39-71.

Diamond, D. (1984), "Financial Intermediation and Delegated Monitoring,"

Review of Economic Studies 51, 393-414.

Dobell, R., J. McRae, and M. Desbois (1984), "The Service Sector in the

Canadian Economy: Government Policies for Future Development," Centre

for Public Sector Studies, University of Victoria.

Foley, D.K. (1970), "Economic Equilibrium with Costly Marketing," Journal of

Economic Theory 2, 276-291.

Hahn, F.H. (1971), "Equilibrium with Transactions Costs," Econometrica 39,

417-440.

Heller, W.P. (1972), "Transactions with Set-Up Costs," Journal of Economic

Theory 4, 465-478.

Kurz, M. (1974), "Equilibrium with Transactions Costs and Money in a Single

Market Exchange Economy," Journal of Economic Theory 7, 418-452.

Melvin, J.R. (1985), "The Regional Economic Consequences of Tariffs and

Domestic Transportation Costs," Canadian Journal of Economics 18,

237-257.

Melvin, J.R., and J.R. Markusen (1986), "Trade in Services and Services in Trade: An Overview of the Theoretical Issues," University of Western Ontario.

Rubenstein and Wollinsky (1985), "Middlemen," Hebrew University Working Paper Series.

Ryan, C. (1985), "Trade Games in a Spatially Separated World," mimeo, University of Western Ontario.

Ryan, C. (1986a), "Intermediation in the Presence of Fixed and Mobile Factors," mimeo, University of Western Ontario.

Ryan, C. (1986b), "Trade and Mediation Services," mimeo, University of Western Ontario.

Starr, R.M. (1970), "Equilibrium and Demand for Media of Exchange in a Pure Exchange Economy with Transactions Costs," Cowles Foundation Discussion Paper No. 300, Yale University.

Stern, R.M. (1985), "Global Dimensions and Determinants of International Trade and Investment in Services," in R.M. Stern (ed.), Trade and Investment in Services: Canada/U.S. Perspectives (Toronto: Ontario Economic Council).

Swan, N.M. (1985), "The Service Sector: Engine of Growth," Canadian Public Policy XI Supplement, 344–50.

Williamson, S.D. (1986a), "Costly Monitoring, Financial Intermediation and Equilibrium Credit Rationing," Journal of Monetary Economics 18, 159–176.

Williamson, S.D. (1986n), "Increasing Returns to Scale in Financial Intermediation and the Non-Neutrality of Government Policy," Review of Economic Studies LIII, 863–875.

8401C   Harrison, Glenn W. and Manning, Richard. BEST APPROXIMATE AGGREGATION OF INPUT-OUTPUT SYSTEMS.

8402C   Parkin, Michael. CORE INFLATION: A REVIEW ESSAY.

8403C   Blomqvist, Åke, and McMahon, Gary. SIMULATING COMMERICAL POLICY IN A SMALL, OPEN DUAL ECONOMY WITH URBAN UNEMPLOYMENT: A GENERAL EQUILIBRIUM APPROACH.

8404C   Wonnacott, Ronald. THE THEORY OF TRADE DISCRIMINATION: THE MIRROR IMAGE OF VINERIAN PREFERENCE THEORY?

8405C   Whalley, John. IMPACTS OF A 50% TARIFF REDUCTION IN AN EIGHT-REGION GLOBAL TRADE MODEL.

8406C   Harrison, Glenn W. A GENERAL EQUILIBRIUM ANALYSIS OF TARIFF REDUCTIONS.

8407C   Horstmann, Ignatius and Markusen, James R. STRATEGIC INVESTMENTS AND THE DEVELOPMENT OF MULTINATIONALS.

8408C   Gregory, Allan W. and McCurdy, Thomas H. TESTING THE UNBIASEDNESS HYPOTHESIS IN THE FORWARD FOREIGN EXCHANGE MARKET: A SPECIFICATION ANALYSIS.

8409C   Jones, Ronald W. and Kierzkowski, Henryk. NEIGHBORHOOD PRODUCTION STRUCTURES WITH APPLICATIONS TO THE THEORY OF INTERNATIONAL TRADE.

8410C   Weller, Paul and Yano, Makoto. THE ROLE OF FUTURES MARKETS IN INTERNATIONAL TRADE: A GENERAL EQUILIBRIUM APPROACH.

8411C   Brecher, Richard A. and Bhagwati, Jagdish N. VOLUNTARY EXPORT RESTRICTIONS VERSUS IMPORT RESTRICTIONS: A WELFARE-THEORETIC COMPARISON.

8412C   Ethier, Wilfred J. ILLEGAL IMMIGRATION.

8413C   Eaton, Jonathon and Gene M. Grossman. OPTIMAL TRADE AND INDUSTRIAL POLICY UNDER OLIGOPOLY.

8414C   Wooton, Ian. PREFERENTIAL TRADING AGREEMENTS - A 3xn MODEL.

8415C   Parkin, Michael. DISCRIMINATING BETWEEN KEYNESIAN AND CLASSICAL THEORIES OF THE BUSINESS CYCLE: JAPAN 1967-1982

8416C   Deardorff, Alan V. FIRless FIRwoes: HOW PREFERENCES CAN INTERFERE WITH THE THEOREMS OF INTERNATIONAL TRADE.

8417C   Greenwood, Jeremy. NONTRADED GOODS, THE TRADE BALANCE, AND THE BALANCE OF PAYMENTS.

8418C   Blomqvist, Ake and Sharif Mohammad. CONTROLS, CORRUPTION, AND COMPETITIVE RENT-SEEKING IN LDCs.

8419C   Grossman, Herschel I. POLICY, RATIONAL EXPECTATIONS, AND POSITIVE ECONOMIC ANALYSIS.

8420C   Garber, Peter M. and Robert G. King. DEEP STRUCTURAL EXCAVATION? A CRITIQUE OF EULER EQUATION METHODS.

8421C   Barro, Robert J. THE BEHAVIOR OF U.S. DEFICITS.

8422C   Persson, Torsten and Lars E.O. Svensson. INTERNATIONAL BORROWING AND TIME-CONSISTENT FISCAL POLICY.

8423C   Obstfeld Maurice. CAPITAL CONTROLS, THE DUAL EXCHANGE RATE, AND DEVALUATION.

8424C   Kuhn, Peter. UNION PRODUCTIVITY EFFECTS AND ECONOMIC EFFICIENCY.

8425C   Hamilton, Bob and John Whalley. TAX TREATMENT OF HOUSING IN A DYNAMIC SEQUENCED GENERAL EQUILIBRIUM MODEL.

8426C   Hamilton, Bob, Sharif Mohammad, and John Whalley. RENT SEEKING AND THE NORTH-SOUTH TERMS OF TRADE.

8427C   Adams, Charles and Jeremy Greenwood. DUAL EXCHANGE RATE SYSTEMS AND CAPITAL CONTROLS: AN INVESTIGATION.

8428   Loh, Choon Cheong and Michael R. Veall. A NOTE ON SOCIAL SECURITY AND PRIVATE SAVINGS IN SINGAPORE.

8429   Whalley, John. REGRESSION OR PROGRESSION: THE TAXING QUESTION OF INCIDENCE ANALYSIS.

8430   Kuhn, Peter. WAGES, EFFORT, AND INCENTIVE-COMPATIBILITY IN LIFE-CYCLE EMPLOYMENT CONTRACTS.

8431   Greenwood, Jeremy and Kent P. Kimbrough. AN INVESTIGATION IN THE THEORY OF FOREIGN EXCHANGE CONTROLS.

8432   Greenwood, Jeremy and Kent P. Kimbrough. CAPITAL CONTROLS AND THE INTERNATIONAL TRANSMISSION OF FISCAL POLICY.

8433   Nguyen, Trien Trien and John Whalley. EQUILIBRIUM UNDER PRICE CONTROLS WITH ENDOGENOUS TRANSACTIONS COSTS.

8434   Adams, Charles and Russell S. Boyer. EFFICIENCY AND A SIMPLE MODEL OF EXCHANGE RATE DETERMINATION.

8435   Kuhn, Peter. UNIONS, ENTREPRENEURSHIP, AND EFFICIENCY.

8436   Hercowitz, Zvi and Efraim Sadka. ON OPTIMAL CURRENCY SUBSTITUTION POLICY AND PUBLIC FINANCE.

8437   Lenjosek, Gordon and John Whalley. POLICY EVALUATION IN A SMALL OPEN PRICE TAKING ECONOMY: CANADIAN ENERGY POLICIES.

8438   Aschauer, David and Jeremy Greenwood. MACROECONOMIC EFFECTS OF FISCAL POLICY.

8439C   Hercowitz, Zvi. ON THE DETERMINATION OF THE EXTERNAL DEBT: THE CASE OF ISRAEL.

8440C   Stern, Robert M. GLOBAL DIMENSIONS AND DETERMINANTS OF INTERNATIONAL TRADE AND INVESTMENT IN SERVICES.

8441C   Deardorff, Alan V. COMPARATIVE ADVANTAGE AND INTERNATIONAL TRADE AND INVESTMENT IN SERVICES.

8442C   Daly, Donald J. TECHNOLOGY TRANSFER AND CANADA'S COMPETITIVE PERFORMANCE.

8443C   Grey, Rodney de C. NEGOTIATING ABOUT TRADE AND INVESTMENT IN SERVICES.

8444C   Grossman, Gene M. and Carl Shapiro. NORMATIVE ISSUES RAISED BY INTERNATIONAL TRADE IN TECHNOLOGY SERVICES.

8445C   Chant, John F. THE CANADIAN TREATMENT OF FOREIGN BANKS: A CASE STUDY IN THE WORKINGS OF THE NATIONAL TREATMENT APPROACH.

8446C   Aronson, Jonathan D. and Peter F. Cowhey. COMPUTER, DATA PROCESSING, AND COMMUNICATION SERVICES.

8447C   Feketakuty, Geza. NEGOTIATING STRATEGIES FOR LIBERALIZING TRADE AND INVESTMENT IN SERVICES.

8448C   Harrison, Glenn, W. and E.E. Rutstrom. THE EFFECT OF MANUFACTURING SECTOR PROTECTION ON ASEAN AND AUSTRALIA: A GENERAL EQUILIBRIUM ANALYSIS.

8501C Greenwood, Jeremy and Kent P. Kimbrough. FOREIGN EXCHANGE CONTROLS IN A BLACK MARKET ECONOMY.

8502C Horstmann, Ignatius and James R. Markusen. UP YOUR AVERAGE COST CURVE: INEFFICIENT ENTRY AND THE NEW PROTECTIONISM.

8503C Gregory, Allan W. TESTING INTEREST RATE PARITY AND RATIONAL EXPECTATIONS FOR CANADA AND THE UNITED STATES.

8504C Kuhn, Peter and Ian Wooton. INTERNATIONAL FACTOR MOVEMENTS IN THE PRESENCE OF A FIXED FACTOR.

8505C Wong, Kar-yiu. GAINS FROM GOODS TRADE AND FACTOR MOBILITY.

8506C Weller, Paul and Makoto Yano. FUTURES MARKETS, REAL INCOME, AND SPOT PRICE VARIABILITY: A GENERAL EQUILIBRIUM APPROACH.

8507C Diewert, W.E. THE EFFECTS OF AN INNOVATION: A TRADE THEORY APPROACH.

8508C Ethier, Wilfred J. FOREIGN DIRECT INVESTMENT AND THE MULTINATIONAL FIRM.

8509C Dinopoulos, Elias. INSIDE THE BLACK BOX: (IN)TANGIBLE ASSETS, INTRA-INDUSTRY INVESTMENT AND TRADE.

8510C Jones, Richard, John Whalley, and Randall Wigle. REGIONAL IMPACTS OF TARIFFS IN CANADA: PRELIMINARY RESULTS FROM A SMALL DIMENSIONAL NUMERICAL GENERAL EQUILIBRIUM MODEL.

8511C Whalley, John. HIDDEN CHALLENGES IN RECENT APPLIED GENERAL EQUILIBRIUM EXERCISES.

8512C Smith, Bruce. SOME COLONIAL EVIDENCE ON TWO THEORIES OF MONEY: MARYLAND AND THE CAROLINAS.

8513C Grossman, S.J., A. Melino, and R.J. Shiller. ESTIMATING THE CONTINUOUS TIME CONSUMPTION BASED ASSET PRICING MODEL.

8514C Romer, Paul R. TAX EFFECTS AND TRANSACTION COSTS FOR SHORT TERM MARKET DISCOUNT BONDS.

8515C McCallum, Bennett T. ON CONSEQUENCES AND CRITICISMS OF MONETARY TARGETING.

8516C Dinopoulos, Elias and Ian Wooton. A NORTH-SOUTH MODEL OF INTERNATIONAL JUSTICE.

8517C Huffman, Gregory W. A DYNAMIC EQUILIBRIUM MODEL OF ASSET PRICES AND TRANSACTION VOLUME.

8518C Huffman, Gregory W. AN ALTERNATIVE VIEW OF OPTIMAL SEIGNIORAGE.

8519C Huffman, Gregory W. ASSET PRICING WITH HETERGENEOUS ASSETS.

8520C Hercowitz, Zvi. THE REAL INTEREST RATE AND AGGREGATE SUPPLY.

8521C Davies, James and Michael Hoy. COMPARING INCOME DISTRIBUTIONS UNDER AVERSION TO DOWNSIDE INEQUALITY.

8522C Nguyen, Trien T. and John Whalley. COEXISTENCE OF EQUILIBRIA ON BLACK AND WHITE MARKETS.

8523C Clarete, Ramon and John Whalley. INTERACTIONS BETWEEN TRADE POLICIES AND DOMESTIC DISTORTIONS: THE PHILIPPINE CASE.

8524C Hamilton, Bob, Sharif Mohammad, and John Whalley. APPLIED GENERAL EQUILIBRIUM ANALYSIS AND PERSPECTIVES ON GROWTH PERFORMANCE.

8525C Huffman, Gregory W. THE LAGGED EFFECTS OF POLICY ON THE PRICE LEVEL.

8526C Laidler, David. FISCAL DEFICITS AND INTERNATIONAL MONETARY INSTITUTIONS.

8527C Goodfriend, Marvin. MONETARY MYSTIQUE: SECRECY AND CENTRAL BANKING.

8528C Nguyen, Trien T. and John Whalley. GENERAL EQUILIBRIUM ANALYSIS OF PRICE CONTROLS A TWO-SECTOR COMPUTATIONAL APPROACH.

8529C Heckman, James J. and V. Joseph Hotz. AN INVESTIGATION OF THE LABOR MARKET EARNINGS OF PANAMANIAN MALES: EVALUATING SOURCES OF INEQUALITY.

8530C Greenwood, Jeremy and Gregory W. Huffman. A DYNAMIC EQUILIBRIUM MODEL OF INFLATION AND UNEMPLOYMENT.

8531C Freeman, Scott. INSIDE MONEY, MONETARY CONTRACTIONS, AND WELFARE.

8532C Paderanga, Cayetano Jr. and Ian Wooton. A POSITIVE VIEW OF INFANT INDUSTRIES.

8533C St-Hilaire, France and John Whalley. A MICROCONSISTENT DATA SET FOR CANADA FOR USE IN REGIONAL GENERAL EQUILIBRIUM POLICY ANALYSIS.

8534C Whalley, John. OPERATIONALIZING WALRAS: EXPERIENCE WITH RECENT APPLIED GENERAL EQUILIBRIUM TAX MODELS.

8535C Melvin, James R. THE GENERAL NON-EQUIVALENCE OF TARIFFS AND IMPORT QUOTAS.

8601C   Greenwood, Jeremy and R. Preston McAfee. EXTERNALITIES AND ASYMMETRIC INFORMATION.

8602C   Dinopoulos, Elias and Mordechai E. Kreinin. IMPORT QUOTAS AND VERS: A COMPARATIVE ANALYSIS IN A THREE-COUNTRY FRAMEWORK.

8603C   Clarete, Ramon and John Whalley. COMPARING THE MARGINAL WELFARE COSTS OF COMMODITY AND TRADE TAXES.

8604C   Wigle, Randy. CANADIAN TRADE LIBERALIZATION: SCALE ECONOMIES IN A GLOBAL CONTEXT.

8605C   Parkin, Michael. DOMESTIC MONETARY INSTITUTIONS AND FISCAL DEFICITS.

8606C   Dinopoulos, Elias and Ian Wooton. INTERNATIONAL TRADE AND THE ACQUISITION OF SKILLS.

8607C   Kawasaki, Seiichi and John McMillan. THE DESIGN OF CONTRACTS: EVIDENCE FROM JAPANESE SUBCONTRACTING.

8608C   Williamson, Stephen D. LIQUIDITY, BANKING, AND BANK FAILURES.

8609C   Grossman, Gene M. and Carl Shapiro. COUNTERFEIT-PRODUCT TRADE.

8610C   Deardorff, Alan V. WHY DO GOVERNMENTS PREFER NONTARIFF BARRIERS?

8611C   Horstmann, Ignatius and James R. Markusen. LICENSING VERSUS DIRECT INVESTMENT: A MODEL OF INTERNALIZATION BY THE MULTINATIONAL ENTERPRISE.

8612C   Thursby, Jerry G. and Marie C. Thursby. BILATERAL TRADE FLOWS, THE LINDER HYPOTHESIS, AND EXCHANGE RISK.

8613C   Clarete, Ramon and John Whalley. EQUILIBRIUM IN THE PRESENCE OF FOREIGN EXCHANGE PREMIA.

8614C   Wooton, Ian. TOWARDS A COMMON MARKET: FACTOR MOBILITY IN A CUSTOMS UNION.

8615C   St-Hilaire, France and John Whalley. SOME ESTIMATES OF TRADE FLOWS IN BANKING SERVICES.

8616C   Evenson, Robert E. and Cayetano Paderanga Jr. RURAL LABOUR MARKETS, TRANSACTION COST AND FERTILITY.

8617C   Fried, Joel and Peter Howitt. FISCAL DEFICITS, INTERNATIONAL TRADE AND WELFARE.

8618C   Trela, Irene, John Whalley, and Randy Wigle. INTERNATIONAL TRADE IN AGRICULTURE: DOMESTIC POLICIES, TRADE CONFLICTS, AND NEGOTIATING OPTIONS.

8619C   Markusen, James R. and Anthony J. Venables. TRADE POLICY WITH INCREASING RETURNS AND IMPERFECT COMPETITION: CONTRADICTORY RESULTS FROM COMPETING ASSUMPTIONS.

8620C   Hunter, Linda and James R. Markusen. PER-CAPITA INCOME AS A DETERMINANT OF TRADE.

8621C   Jones, Rich and John Whalley. A CANADIAN REGIONAL GENERAL EQUILIBRIUM MODEL AND SOME APPLICATIONS.

8622C   Freeman, Scott, and Gregory W. Huffman. INSIDE MONEY, OUTPUT, AND CAUSALITY.

8623C   Hamilton, Colleen, and John Whalley. DEALING WITH THE NORTH: DEVELOPING COUNTRIES AND GLOBAL TRADE NEGOTIATIONS.

8624C   Williamson, Stephen D. LAISSEZ FAIRE BANKING AND CIRCULATING MEDIA OF EXCHANGE.

8625C   Whalley, John. WHAT HAVE WE LEARNED FROM GENERAL EQUILIBRIUM TAX POLICY MODELS?

8626C   Bhatia, Kul B. SHORT RUN AND LONG RUN IN THE THEORY OF TAX INCIDENCE.

8627C   Jones, Rich, and John Whalley. REGIONAL EFFECTS OF TAXES IN CANADA: AN APPLIED GENERAL EQUILIBRIUM APPROACH.

8628C   Nguyen, Trien T., and John Whalley. GENERAL EQUILIBRIUM WORLD TRADE UNDER BILATERAL QUOTAS.

8629C   Clarete, Ramon L., and James A. Roumasset. THE RELATIVE WELFARE COST OF INDUSTRIAL AND AGRICULTURAL PROTECTION POLICIES USING PHILIPPINE DATA.

8701C   McMillan, John, John Whalley, and Zhu Li Jing. INCENTIVE EFFECTS
         OF PRICE RISES AND PAYMENT-SYSTEM CHANGES ON CHINESE AGRICULTURAL
         PRODUCTIVITY GROWTH.

8702C   Wooton, Ian. CAPITAL, SKILLS, AND INTERNATIONAL TRADE.

8703C   Ryan, Cillian. TRADE IN THE PRESENCE OF ENDOGENOUS INTERMEDIATION
         IN AN ASYMMETRIC WORLD.