The New Economy, Globalization and Regional Trade Agreements

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The New Economy, Globalization and Regional Trade Agreements

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ABSTRACT

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This paper examines the linkages between globalization, regional trade agreements, and the New Economy growth paradigm. The 'New Economy' is characterized as a technological transformation driven by a General Purpose Technologies (or GPT's) based on widespread application within an economy of computers, information and telecommunications technology (ICT). Within the GPT framework the 'New Economy' is thought to have originated within the United States where the middle phase of a major technological transition is underway induced by the convergence of computers and IT. A major issue is how the technological changes which have given rise to the U.S. based New Economy will be transmitted globally through trade and factor movements. The paper is uses two trade theory models to examine the trade and factor price impact of the New Economy transition on regional trade areas consisting of small countries which are manufacturing exporters. Questions examined include (a) How will this economic boom which thus far has been concentrated both by sector and on particular occupations such as IT workers impact on these type of regional trade areas; (b) How does trade liberalization and regional trading agreements impact upon income distribution and pattern of New Economy activity globally? (c) Will globalization or localization tend to be promoted as the New Economy diffuses internationally; and (d) Do small open economies which have traditionally been manufacturing exports stand to gain or lose the most as the New Economy matures and diffuses?

Keywords: globalization, new economy, regional trade agreements, IT

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1. Introduction

The past decade has seen a surge of research in three related but distinct areas. The phenomena of globalization as measured by increased trade and investment, the impact of skill-biased technological change on developed country wage distributions, and most recently the 'New Economy' phenomena in the United States. The latter is thought by some to be the current and most prominent example of a large scale and temporally concentrated shift in the entire technological system based on innovations in information technology. The introduction of steam and railways in the last century, electrification early in this century, and later Fordism or mass production methods would be examples, as is the current ICT revolution of a general purpose technology (or GPT). This topic has been explored intensively at the Canadian Institute for Advanced Research, and the recent volume edited by Elhanan Helpman (1998) covers the topic in detail.1 This paper explores the implications of the 'New Economy' hypothesis for those economies that participate in preferential regional trade agreements (PRTA) but are also manufacturing exporters to the major industrial country markets in Europe, North America and Japan of which the ASEAN economies are the major example.

The promises of a new 'golden age' of high productivity growth in the United States has attracted an enormous amount of attention over the last few years to the New Economy hypothesis. Some large international organizations such as the OECD(1999) have enthusiastically endorsed the ICT vision of the New Economy. The recent evidence is certainly impressive in the case of the U.S. economy. Average labour productivity grew at an annualized rate of 2.15 percent from 1995 through the first quarter of 1999, after growing at just over 1 percent from 1972 to 1995. Does this herald the return to the golden age of productivity growth witnessed in the 1950 to 1970 period, in which productivity grew at a rate in excess of 2.5 percent? If so the impact would be remarkable both on the real incomes of workers and on the ability of government to fund program spending. Greenwood and Jovanovic(1999) have argued using stock market data that the New Economy is largely about ICT. Within the business

1 The introduction of GPTs is characterized by long lags between the date of introduction and ultimate productivity gains. There is also considerable initial uncertainty as to the ultimate effect of a new GPT. Growth based on a new GPT is to be contrasted with technological innovation which is thought to be continuous and incremental in nature. The ICT revolution based on computerization and low-cost electronic networks which are used in all sectors of the economy are better described by the GPT concept than the incremental approach to technological change.
press there has been a virtual deluge of material on the New Economy hypothesis. Academics have been somewhat more reticent. Moreover there are doubters, and their arguments are impressive. Robert Gordon (1999) of Northwestern University notes that the entire pickup is predicated on one remarkable fact — the significant drop in computer prices over the last few years. Growth in U.S. computer manufacturing proceeded at an astounding rate of 42 percent over the 1995Q4–1999Q1 period. This sector alone managed to raise the aggregate U.S. growth rate even though computer manufacturing accounts for just 1.2 percent of total output in the United States. Productivity growth in non-computer manufacturing (durables and non-durables) actually declined during 1995–99 relative to 1972–95.

Nevertheless the U.S. expansion and productivity growth has been remarkable. It raises the obvious question as to whether the New Economy will diffuse internationally, and if so the implications for both trade, investment and incomes. The familiar concerns about wage inequality and globalization has been partially overcome by the New Economy growth optimism. It seems clear however that the firmly established trends and forces giving rise to both globalization and growth in wage inequality in the industrial countries have not disappeared. How they will interact with the forces driving the New Economy remains to be seen. Of particular note are the potential impacts on wages. Thus far in the US the income benefits of the New Economy have fallen on those occupations who were strategically placed to benefit from the ICT revolution--IT workers in particular. There remains an active debate as to how widely the productivity gains will be shared. In the US debate however the role of trade has generally been dismissed and interactions between trade and the New Economy drivers have been ignored. For the economies of interest in this paper exactly the opposite is the case. How trade interacts with the major technology drivers are likely to figure prominently in the distributional impact of the New Economy.

The paper uses two benchmark models of international trade, both familiar to international trade economists, in order to examine these questions. Of particular interest is the potential impact of the New Economy GPT on pre-existing free trade agreements for groupings outside of the United States. Examples would include ASEAN, Mercosur, the Australia-New Zealand CER agreement, and of course the EU and NAFTA. In all of these cases these regional trade agreements have led to liberalized trade in goods but not necessarily on services or investment. There is a large and active debate on the impact of regional trade agreements--in particular whether they have on average been economically beneficial or not. See for example World Bank(2000), Kreuger(1997), and Laird(1999). A distinctive characteristic of the New
Economy technologies is their potential impact on the production and distribution of what are traditionally service activities, many largely non-traded. Examples include financial services, accounting, marketing and distribution, engineering services, media, telecommunications and transport services. Partial liberalization in these areas has been attempted in most of the regional FTA's with mixed success. It is widely claimed that the next stage of liberalization is all about services, both at the regional and multilateral levels.\(^2\) The New Economy impacts on this next stage by raising the potential efficiency gains and costs that liberalization brings. Moreover the actual success of the New Economy in these other regions will be either enhanced or slowed by the trade policy response in these sectors. Catherine Mann el. al. (2000) have recently highlighted some of the policy issues for developing country RPTA's specifically with respect to e-commerce and the Internet. It is clear we are in the early days of what will be active trade policy debate.

There is yet another dimension to this debate. The emergence of the New Economy in North American has signaled a shift in the available sources of new economic growth. A comparative advantage explanation of growth might suggest that the U.S. will take the lead in New Economy service exports and the follower countries will shift into the areas the U.S. has traditionally exported in such as capital goods equipment. Alternatively if trade is based on scale economies, product differentiation and specialization then the global diffusion of 'New Economy' might mean greater two-way trade and a parallel development in specialized service exports from all regions. For middle income trade groupings such as ASEAN the appropriate policy response may hinge on which of these two trade theory paradigms is appropriate. Part of the policy debate is the extent to which there is, or is not, a bias against the development of New Economy activities in small open economies whose own service markets suffer from limitations of size.

Many of the services in the New Economy are thought to characterized by localization economies—that is physical proximity of buyers and sellers is a necessary feature for these to develop. In a large economy, or even a large city state, these would usually be non-traded services. The same is true in isolated small economies. However the emergence of the ICT-GPT means that it may be possible to integrate these service markets across a number of regionally linked small economies when the constraints of distance are not prohibitive. For example in the case of all the RPTA's mentioned above one could imagine that the countries involved are sufficiently close to one another that an ICT-GPT would allow for trade among the member

\(^2\) The next WTO round was intended to deal with multilateral service liberalization with a possible extension of the GATS agreement. The Seattle 'failure' has cast considerable doubt on this process.
countries in these services, but it might not allow for genuinely global trade as is the case in most goods markets where storage and durability of the goods is possible. For these reasons the New Economy may have greater policy impact on regional trade than on global trade. This in turn raises the prospect that RPTA's may play a more important role in future liberalization than was the case prior to the emergence of the New Economy.

Two international trade models of factor returns and virtual service market integration within an existing regional free trade area are developed. The RPTA is assume to consist of a number of small price taking open economies that export manufactured goods and import a generic or traditional service good like transport or other business service. The first is a Hecksher-Ohlin model in which all markets are competitive and trade is determined by factor endowments. The New Economy arrives in the form of a new communications network—an Internet—which allows for virtual regional integration of a subset of the regional service markets. One type of service is assumed to be subject to strong localization effects, and thus trade can only occur subject to constraints of technology on repeated interactions between buyers and sellers. An Internet, by opening up trade in regional services subject to localization, changes the relative demands for IT workers and the extent of trade in the New Economy services. The H-O framework is lacking in its ability to explicitly handle the product differentiation, network and scale effects that trade on electronic networks is thought to be subject to. These issues are addressed in a modification of the model of factor returns with an Internet on business services developed in Harris(1997)(1994), applied here to the case of regionally based economic integration. Both models are 'stripped down' and ignore a number of issues, such as consumption externalities in network use, investment by firms and individuals in adapting to the network, and the dynamic consequences of obsolescence. The models also bury any details on the supply side of the Internet.

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3 The 'Internet' also allows for global linkages in the areas of computerized manufacturing for example. The general presumption of these models is that effect will either be similar across all economies such as to leave basic trade patterns unaffected.

4 For an overview of the policy implications of e-commerce see Harris and Globerman(1997).
3. A Hecksher-Ohlin Model of Regional Trade and Virtual Service Market Integration

In this section a modified form of Hecksher-Ohlin model of trade is used to consider the impact of a virtual economic integration of the regional service markets on a pre-existing RPTA which covers trade in goods. That is we assume that initially there is free trade among the member countries in goods but trade in some services is not technologically feasible. Moreover the RPTA is 'small' in the usual sense of being a price taker in the market for manufactured goods. There is no established model in the international trade literature of either service trade, or of Internet commerce. The neoclassical model of a small open economy is amended such as to deal with some of these issues. Given the importance of this theory for most economists who think about such as issues this can be regarded as a 'first pass' attempt on developing some intuition as to the impact of the New Economy on RPTA's.

A Model:

There are three commodities and three factors. Commodities indexed \( n \) and \( s \) are services, while commodity \( m \) is a manufactured export good. The primary factors consists of capital, basic labour, and a particular type of labour input hereafter called IT labour or just 'IT inputs'. The latter can be thought of as those workers and capital services whose demand is highly complementary with the New Economy innovations. This factor is also used in the production non-traded services pre New Economy arrival. The presumption here is that the skill levels embodies in this input are very high and necessary to implement activities complementary to New Economy innovation. Supplies of both factors are inelastic. Service \( s \) is a generic internationally traded intermediate service input as well as a final service good such as transport services, or import-export distribution services. Service \( n \) is a final good assumed to be initially non-traded but is subject to the New Economy innovations. A good example would be accounting, which is produced for local use (localization) by combining the generic international service good \( s \) with ICT inputs. A strong factor intensity assumption is made in that neither unskilled labour nor capital are used in the production of the initially non-traded service \( n \). These services are explicitly thought of as New Economy services which are intensive in the use human capital and new technology. They do however require other basic services as an intermediate input. Service \( s \), the generic traded intermediate service, is produced using unskilled labour and other non-traded factor input (call it capital). Good \( m \) is the basic manufactured good produced using labour and
capital, but not ICT workers. Factors are mobile between industries (sectors) but not between countries. The 3 factors in each region are in fixed inelastic supply; ICT inputs, S, labour L and capital K.

The RPTA consists of a number of identical small countries each endowed with the three factors and facing exogenous world prices in the two traded commodities—manufactured goods and generic intermediate services. Prior to virtual integration there is (free) trade in s and m. Service n must be produced and delivered locally prior to virtual integration. The analysis examines the long run impact of the GPT arrival by using comparative static analysis. As is common however in the H-O literature it is assumed there is diversification with the economy in that both commodities s and m are produced in equilibrium under regional free trade.

Let v, w and r the factor prices of S, L and K respectively. It is convenient to take service good s, the generic traded service, as the numeraire good in the system (p_s=1). With constant returns to scale and competition the price equal average cost conditions are

\[ \begin{align*}
    p_n &= c_n(p_s, v) \\
    p_s &= c_s(r, w) \\
    p_m &= \frac{c_m(r, w)}{a}
\end{align*} \]

These conditions must hold in diversified equilibrium with factor market clearing. With free trade in goods s and m external shocks are transmitted through changes in the prices of s or m. Labour saving technological progress comes through changes in the manufacturing specific Hicks-neutral technology parameter a. The literature on wages and globalization has focused on whether, within the developing countries, shifts in p_m or a have been responsible for the decline in real wages. A increase in a increases the productivity of all factors in labour intensive manufacturing. Define the 'effective price' of good m as

\[ p_m^e = p_m a \]

By the Stolper Samuelson theorem, given the block decomposition structure of the factor price side of the model (3.1), changes in either the price of manufactured goods or an increase in the

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\footnote{The latter is a simplifying assumption. Most of the results derived will also hold if the share of ICT labour in manufacturing is sufficiently small relative to its share in the non-traded service sector.}

\footnote{Slaughter(1998) provides a survey of this large literature. Note that in this paper we are using a sector specific definition of skill biased technological change.}
TFP level in manufacturing will reduce the returns to the intensive factor in manufacturing, which is assumed assume to be unskilled labour in line with the work on trade and globalization.\(^7\)

For given international prices the model has a block decomposition structure. Factor market clearing for \(L\) and \(K\) determine the output of goods \(s\) and \(m\), and the factor prices \(w\) and \(r\) are determined by the price equal cost conditions. It remains to determine the equilibrium in the market for service \(n\).

Let \(Y_m(P)\) and \(Y_s(P)\) denote the output of goods \(s\) and \(m\) in the economy where \(P=(p_s, p_m)\). The model is closed by introducing the demand side and determining the market clearing price for the New Economy service \(n\) produced via the localization process. In each country has a representative consumer whose tastes are described by a utility function \(U(C_n, C_s, C_m)\) or equivalently an expenditure function \(E(p_n, p_s, p_m, U)\).

The supply of \(n\) is determined by the profit maximizing behavior of producers of \(n\) who solve the maximization problem

\[
V_n = \max_Z p_n F_n(Z, S) - p_s Z. \tag{3.3}
\]

\(Z\) is the total input of the generic service good used in the production of the New Economy service, \(F\) is the production function for \(n\) and \(V_n\) is the restricted profit function for the \(n\) sector.

The wages of IT labour, which are specific to the \(n\) sector are given by Hotelling's Lemma as

\[
\frac{\partial V_n}{\partial S} = \frac{\partial V_n}{\partial S}. \tag{3.4}
\]

GNP, and thus national income, is defined as by

\[
GNP = V_n + p_s Y_s(P) + p_m Y_m(P). \tag{3.5}
\]

The price of the \(n\) services \(p_n\) must adjust such that the market for that good clears locally; that is local prices and the level of utility must satisfy (using Shepherd's Lemma)

\[
C_n = E_1(p_n, P, U) = \frac{\partial V_n}{\partial p_n} \tag{3.6}
\]

\[E(p_n, P, U) = GNP\]

Globalization Effects--Pre-new Economy:

In this section we examine how globalization defined as either a reduction in the price of manufacturing exports and/or as skill biased technical change affects trade and factor returns prior

\(^7\) Slaughter and Swagel(1997) and Murphy et. al. (1999) for a discussion of these issues.
to the New Economy. The model has the structure that the returns to IT inputs are generated by
the demand generated by localization of generic service goods. In fact the model can be
simplified by assuming that for consumption purposes service good n is consumed but not service
s--i.e. all final consumption services must be assumption be localized. Because of the non-traded
nature of these localization services provided by IT inputs there will not be factor price
equalization across economies in the diversified equilibrium on v--i.e. returns to IT workers will
differ depending on the supplies of IT workers. Given identical technology and regional free trade
however returns to capital and labour will be equalized within the RPTA. The effects of
globalization on the returns to IT workers are driven primarily by a transmission process running
from changes in the price of generic services, p_s to the price of localized services and then v. This
will involve both the factor market clearing condition for S and the price-cost condition for
localized goods. Thus both differences in tastes across regions for localized services, and
differences in the supply of IT workers will impact on the wages of IT workers.

A decrease in the price of manufactured goods, p_m that leaves p_s unchanged will leave the
supply of n unchanged. A decrease in p_m however will shift demand toward manufacturing and
away from services creating an excess supply of localized services. This results in a decline in
their price p_n and consequently in the wages of IT workers. Hence

The trade impact of globalization, pre-New Economy, which occurs through a reduction
in the relative price of exported manufactured goods will result in a fall in the relative
price of localized services and a fall in the returns to both IT workers and unskilled
labour measured in terms of the numeraire good.

In this model the trade benefits of globalization pre-New Economy fall largely on capital. Both
classes of labour inputs, ICT skilled and unskilled will tend to lose measured against traded goods
consumption although it is possible unskilled labour could benefit in terms of the non-traded
service consumption.

Now consider skill biased technological change defined as an increase in productivity in
the manufacturing sector a, which is usually assumed to reduce the returns to labour, w in this
model via the usual Stolper-Samuelson effect. From the block decomposition of the factor price
side there is no Stolper-Samuelson effect on the wages of IT workers as the price of the traded
service s is unaffected by the change in a. But on the demand side of the model there is an impact
via the income effect on GNP. The increased efficiency of labour and capital in manufacturing
leads to an increase in GNP and thus an increase in the demand for both non-traded services and
manufactured goods. Similar to a demand boom in the Salter model of the real exchange rate this
produces an increase in the relative price of non-traded localized services $p_n$, and an increase in the specific factor to that sector—the wages of IT workers.

*Skill biased technological change which occurs pre-New Economy, but which leaves the terms of trade unchanged, will increase the relative price of localized services and increase the wages of IT workers while decreasing the wages to unskilled labour.*

Note that this effect will tend to be larger the more income elastic is the demand for non-traded services. If technological change is largely of the 'skill biased' type then we should observe rising service prices and the returns to skilled labour.

An important issue is whether the real return to IT labour goes up in terms of the good they produce; i.e. does $v$ rise by more or less (in percentage terms) than $p_n$. Assuming the price of $s$ does not change it is immediate from (3.1) that $v$ will rise by less than the increase in the price of $n$. Thus the 'real increase' must be qualified—even IT workers' labour loses in terms of the non-traded service they produce.

The trade volume effects of globalization are straightforward from conventional analysis. A fall in the price of manufactured goods will reduce the production and exports of manufactured goods. Skill biased technological change on the other hand increases the supply and exports of manufactured goods. Globalization trends in this model, pre-New Economy arrival, have different implications depending on their source for both trade and wage patterns in small country manufacturing exporters.

**The New Economy GPT-Virtual Service Market Integration**

We now turn to the impact of 'virtual integration' as discussed in Harris(1995)(1999). In the neoclassical trade model however this is modeled in a very simple way. The arrival of the New Economy in the form of ICT technology is assumed to provide a technological means by which trade amongst the members of the RPTA in the localized service goods can occur. To simplify matters we abstract from the production of the Internet technology or the dynamics that it is likely to give rise to. Imagine that a generic and universal type of public electronic network makes possible the trade in the localized service good $n$ such as accounting services. Now the gap between reality and the model gets a bit large here. The New Economy's arrival is defined solely as a one time permanent change in the ability to trade within the region previously non-traded goods. The direct productivity impact of the GPT on manufacturing and traditional services is assumed to be negligible.
In the context of the traditional trade model this type of virtual integration which allows international exchange of services is economically equivalent to a type of factor market mobility. In line with Mundell’s famous analysis of factor mobility imagine a world where any person endowed with IT skills could sell their services in any market. In this case the mobility of the services of IT workers together with free trade in s and m would eliminate differences across countries of localized service prices. One might imagine therefore that the ICT innovations of the New Economy actually allow for the exchange of the services of labour which are used intensively in the localized service activity, rather than the service activity itself. In a way this reflects the reality that with ICT it is meaningless to say where the service is produced and consumed. Either I visit my accountant over the Web or he visits me--they are both equivalent.

Virtual regional integration increases the size of localized service markets for all services producers. To capture this in the model assume the RPTA face a large third region (Rest-of-World). The ROW is assumed to be sufficiently large that the prices of goods s and m exogenous to the integrating regions. Virtual integration is equivalent in this model to the complete integration of the market for the New Economy service and the factor market for S. This results in a convergence amongst all member countries regions of the prices of service n, and the returns to IT labour. Given our other assumptions we thus have a case where complete factor price equalization is achieved after virtual integration via a complete integration of the services market. Localization has gone from the national level to the level of the RPTA. This is the case we shall consider in detail.

The effects of this integration hinge upon the structure of the initial equilibrium. The initial situation can be described as one in which relative factor abundance plays a large role. Imagine two countries which are identical in all respects except one region is more well endowed with S than the other. Call them A and B with \( S_A > S_B \). What is the nature of the initial equilibrium in these two countries prior to virtual integration. There are no good ways to collapse a 3 factor model into 2 but the use of relative supply and demand diagrams is be useful. Let \( X \) denote a composite factor of Land K, and \( x \) the price of this composite factor. For given \( P=(p_s,p_m) \) we know that \( x \) is given and we can define the relative supply and demand curves of S to X, with \( S/X \) on the horizontal axis and \( m/x \) on the vertical axis. For a single country these are
depicted in figure 1. The relative supply curve is vertical. Under our assumptions country A is abundant in IT labour and therefore will have a higher initial wage $v$ than country B. Integration of the two regions effectively produces a new region with a relative supply curve labeled $I$ where

$$ I = \frac{S_A + S_B}{X_A + X_B}. $$

The relative demand curve with homothetic and identical tastes is the same before and after integration.

As is common in these type of models the new equilibrium with free trade in $n$, which is equivalent to free trade in $S$, results in an IT wage which lies between the two 'autarkic' wages. Traditional comparative advantage analysis thus tells us that

*Virtual integration of service markets results in a rise in the wage of IT workers, and a rise in the price of localized services in the country which is relatively abundant in IT labour.*

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8 These curves and their comparisons between countries will only work if tastes are homothetic and identical across countries.
Figure 1
Convergence of Factor Price with Virtual Service Market Integration
It is straightforward to extend these results to the pattern of trade and the gains from trade.

*New Economy virtual integration of service markets results in the country which is abundant in IT inputs becoming a net exporter of those services to other member countries within the RPTA. Those countries which are abundant in K and L relative to S will tend to increase their exports of manufactured goods and increase their imports of New Economy services.*

*All member countries of the RPTA gain from virtual integration.*

Virtual integration will change the quantitative impact of both globalization and skill biased technical change on the wages and trade patterns. However the basic transmission process remains the same except that the new economy service good is now only non-traded vis-a-vis the rest of the world. A major deficiency of this model however is that the New Economy brings no real income gains unless there are factor endowment differences across countries. The incremental gains from service trade are the only New Economy gains in this model.

The prior existence of the RPTA is crucial to these results in particular the proposition that all countries benefit from the resulting service market integration the New Economy gives rise to. Classic customs union theory has some straightforward implications in this model. If countries which are not currently members of a RPTA contemplate the formation one post-New Economy, the cost benefit calculation of the arrangement can change due to shifts in trade diversion costs. Trade diversion costs could rise in those cases where the imports subject to trade diversion rise as a consequence of the increased trade volumes induced by trade in New Economy services. Countries which become exporters of New Economy services within a potential RPTA are likely to be importers of manufactured goods produced by other member countries. If those goods were initially subject to tariffs but where purchased at a lower price from non-member sources, allowing duty free access may give rise to trade diversion costs. Somewhat ironically it will be those countries who stand the most to gain in terms of regional New Economy exports that are the most likely candidates to lose from the trade diverting effects of an RPTA.

The neo-classical model of trade in goods and factors has some implications for the New Economy impact on RPTA’s. It does not however cover two important aspects of service trade which could be potentially extremely important. Network externalities, product specialization and economies of scale. We now turn to these.
4. Economies of Specialization and Scale

In this section a monopolistic competition model of international trade is used to examine similar questions to those posed in section 3. In this well known theory trade is driven by scale and product differentiation. With economies of scale and specialization in business services regional service market integration, and the impacts of globalization and the New Economy, take on a number of different features than in the traditional competitive Heckscher-Ohlin model. Trade in business service is facilitated by the introduction of a New Economy communications network linking all regions in the RPTA. New Economy business services in this model (unlike the last) are treated solely as an intermediate input. In the initial situation which is pre New Economy there are two factors of production-- IT inputs and unskilled labour. IT inputs are necessarily used in the service sector and initially all business services are non-traded. IT labour inputs really stands as a proxy for a composite factor input which is endowed with the skills and capital necessary to use ICT technology. Pre New Economy we can think of this labour as simply skilled labour and capital which can be used in either services or manufacturing production. After the arrival of the New Economy the IT inputs can be thought of as explicitly using their New Economy skills to facilitate intra-regional Internet transactions. In this model, as in the last, virtual service market integration results in a convergence of service prices and the returns to IT labour in all member countries of the RPTA, together with increased trade volumes in business services. One case considers at virtual integration of a two countries RPTA, but with asymmetries in country size.

Intra-regional trade

The RPTA consists of R geographically distinct regions(or cities), each of which trades two final goods and uses two factors, IT inputs and labour. The small customs union assumption of the last section is retained here. External prices are set in the Rest-of-World and integration among the regions does not change the terms of trade. Both IT labour and unskilled labour, S and L, is assumed to be immobile across regions. There are two traded goods produced in each region. One good will be referred to as the m good (also denoted as sector 2), or manufacturing good; production of this good uses both IT and unskilled labour. Unskilled labour is a factor input specific to manufacturing--thus we think of this sector as a catch-all for traditional traded goods industries. The m sector is a competitive constant returns industry with a production function

\[ Y_m = F(L, S_m). \] (4.1)
There is a second industry, indexed t, which will be referred to as the T-sector, or technology sector, which is competitive constant returns and uses only business services as inputs. Given an n-vector \( z \) of business services the output \( Y_t \) of the T-sector is given by

\[
Y_t = \left( \sum_{i=1}^{n} z_i^{\rho} \right)^{1/\rho} \tag{4.2}
\]

The third sector is Business Services indexed with a b (or the New Economy sector), which has a monopolistically competitive market structure of many firms each producing a differentiated business service inputs using as the only input, IT skilled labour. The production function in (4.2) has the property that as input differentiation increases productivity in the T sector increases. This effect is external to the firms using and supplying business services and thus is a genuine type of externality. A constraint perhaps implicit in (4.2) in that every pair of service providers must interact in order to supply a T-producer and thus have positive demand only if they can communicate with other service providers to the T-sector. This is initially possible only with a country. The arrival of the New Economy will allow this interaction to occur internationally.

The Production function for service good i (fixed and variable cost using only IT inputs) is given by

\[
z_i = \begin{cases} 
\frac{1}{\beta} s_i \cdots f > 0 \\ 0 \text{ otherwise} \end{cases} \tag{4.3}
\]

where \( s_i \) is the variable input of IT labour to service input i and \( f \) is a fixed input of IT labour which is independent of the scale of output. Note that IT labour is used directly in business services, but only indirectly in the T sector as it is used to produce an intermediate input, business services.\(^9\)

Consider a single member country with an endowment of unskilled labour \( L \) and IT inputs.. Both m and t goods are sold at fixed world prices \( p_t \) and \( p_m \). The price of service input i is \( q_i \). The symmetric monopolistic competition equilibrium (MCE) has n business services produced in quantities \( z_i = z \) and prices \( q_i = q \). As price equals unit cost in the constant returns T sector

\[
p_t = c_i = q n^\lambda \tag{4.4}
\]

\(^9\) This specification follows that of Ethier(1979).
The wage paid IT inputs in services will be referred to as \( v \). Under the assumption of a symmetric monopolistic competition equilibrium in Business Services the price mark-up rule in the representative service firm is

\[
q = \frac{1}{\rho}\beta v \quad 4.5
\]

since IT labour is the only variable input to services, substituting in (4.4) we have that

\[
p_t = \frac{1}{\rho}\beta v n^\lambda . \quad 4.6
\]

Solving for service sector wages as a function of the price of \( T \) and degree of input differentiation gives

\[
\log v_b = \log(\rho p_t / \beta) - \lambda \log n . \quad 4.7
\]

Equation (4.7) gives the value of the average product of IT labour in the service/technology sector and is increasing in the level of service input differentiation. Since it is also the case that under monopolistic competition with free entry there is a zero profit equilibrium in which the number of service varieties, \( n \), adjusts such that price equals average cost on each service input. Using the mark-up rule and price equal average cost we solve for equilibrium scale \( z \) in the representative service sector

\[
z = \frac{f}{\beta} \frac{\rho}{1 - \rho} .
\]

Total IT labour requirements in the service sector \( b \) is given by \( S_b = nf + n\beta z \). Solving for the number of service varieties as a function of the IT labour used in services

\[
n = \frac{S_b}{f} (1 - \rho) . \quad 4.8
\]

Note that \( n \) is linear in the quantity of IT labour used in the service sector\(^{10} \). Substituting for \( n \) in the equation for \( v \) we have \(^{11} \)

\[
\log v_b = k - \lambda S_b - \lambda f
\]

\(^{10} \) Note that for this model to make sense \( n \) must be greater than 1 which places a lower bound on \( S_b \). The diagrams are drawn on a scale such that this problem is ignored so the productivity curves for sector 2 are zero for \( n=0 \). If \( f \) were very large then productivity in services would only be positive for some positive finite value of \( S_b \) sufficient to cover more than the fixed cost of setting up at least one firm.

\(^{11} \) \( k \) is a constant equal to \( \log(\rho p_t / \beta) \).
\[ \log v_b = k + \lambda S_b - \lambda f \]

L is a specific factor in sector m so we have wage equal marginal products condition (or price equal unit cost) in that sector

\[
\begin{align*}
v_m &= p_m F_s (L, S_m) \\
w &= p_m F_L (L, S_m)
\end{align*}
\]

Figure 2

Factor market clearing with wages of IT inputs equalized across the m and b sectors is depicted in figure 2 (the traditional specific factors diagram) with the horizontal axis representing the total available supply of IT labour in a country. On the left side a downward sloping value marginal product of IT labour in manufacturing is drawn and on the right, a rising value of average product schedule for IT labour in the business service sector (APb). The equilibrium allocation of skilled labour is determined by intersection of two. An increase in the quantity of IT labour allocated to services, raises the average product of skilled labour in services due to Smithian effect of increasing input specialization (larger n) in the service sector.\(^{12}\)

\[\text{An increase in the total amount of skilled labor will raise the price of skilled labor } v \text{ and reduce the quantity of skilled labor used in the M sector, provided the economy produces both M and T. From the determination of } w \text{ this would necessarily reduce the wage of unskilled labor. The argument hinges upon assuming a diversified equilibrium which requires that the VMP curve in sector m cuts the AP curve in sector b from above. Holding the stock of unskilled labor constant, a region with a larger supply of skilled labor will have a higher degree of specialization in services, a higher skilled wage and a lower unskilled wage. Holding the size of the skilled labor forces equal the market with the larger unskilled labor force will have a lower skilled wage and a higher unskilled wage (assuming a non-specialized equilibrium). The model yields different predictions on the relationship between the factor price ratio } v/w \text{ and factor supply}\]
Globalization, defined as a decrease in the relative price of manufactured goods, shifts the VMP_m curve down which reduces the wage to skilled labour but leads to an increase in the output of the manufacturing sector and a contraction in the business services sector. This is quite unlike the Stolper-Samuelson result of HO model. A skill biased technological change defined as in the last section as a neutral increase in the productivity of traditional manufacturing raises the VMP_m curve. This in turn implies there is a reduction in the wages of IT labour, an increase in the output of manufactured goods and an increase in the wage of unskilled workers. It is clear in this model that neutral productivity changes in basic manufacturing cannot explain falling wages to unskilled labour. One way to rescue the basic wage result is to resort to a factor bias approach although even here the result on unskilled wages is ambiguous. An alternative way to recover a prediction of falling unskilled wages is to assume that the technological change occurs in the business service sector. If changes such as to raise the average product of IT labour in the sector, then the resulting effect is to expand the service sector and lower the wage of unskilled labour manufacturing. This prediction of the model is consistent with the more general observation that globalization has brought not only growing wage inequality but continued growth in the relative size of the service sector.

The arrival of the New Economy and the Internet results in a virtual service market integration within the RPTA. In this model it is assumed that all firms earn long run zero profits. In the initial situation service firms, or more accurately the services they provide, are country specific. Thus due to the nature of their product they both sell their outputs and purchase their inputs in the same national market. With integration of service markets any T-sector firm can purchase a business service input from any other member country. Given the CES service input aggregator (4.2) the T-sector will purchase all available varieties. The number of varieties of business services available in each country is now equal to n=RN assuming symmetry across countries. If all R countries each have exactly the same factor endowment of (L, S), the equilibrium will be one in which wages w and v are equal across all regions. Each country produces the same number of business service varieties and the prices of all services are equalized given the markup factor is the same in all countries. The net effect of this integration is that the value of the average product of labour in services will be much higher than the standard competitive model. In a diversified equilibrium v/w is positively related to S/L. Thus regions with higher proportions of skilled labor will have a larger skill premium.
case of R symmetric countries the average product of IT labour in a representative country services is given by

\[ \log y_b = k + \lambda \log s_b + \lambda \log R - \lambda \log f \]

The effect of the New Economy therefore is to raise the wage to IT labour and thus to reduce the wage of unskilled labour in manufacturing. The service sector expands in all member countries and manufacturing contracts. In addition each country now exports and imports business service inputs among the member countries where this was not previously possible. The arrival of the New Economy leads to an increase in intra-regional service trade. The reduction in manufactured exports is offset by an increase in exports of high technology products to the ROW by all member countries.

The arrival of the New Economy in a symmetric RPTA has the following effects:

- unskilled wages fall
- wages and average productivity of IT inputs rise
- basic manufacturing output and exports to the ROW contract in all member countries
- output and exports of high technology goods to the ROW increase from all member countries
- there is an increase in intra-regional New Economy business service trade

Asymmetric Country Size:

In the recent literature in international trade following Krugman(1992) there has been considerable pessimism about the impact of free trade on smaller regions with scale economies and imperfectly competitive market structures. With trade costs and a mobile factor Krugman showed a small region integrating with a larger region could lose from free trade in his model. Since the New Economy essentially provides another form of factor mobility could the same effect arise in this model? Consider now the case of a two country RPTA but one country is much larger than the other. Let A be the larger country and B be the smaller country. To keep matters simple assume that both have the same L endowment ratios but B has a small endowment of IT labour. Both are ‘small’ in the price taking sense for the t and m goods. Prior to the arrival of the New Economy given that business services are non-traded the average product of IT labour
will be smaller in the smaller country B. IT wages will be lower in B than A and unskilled wages will be higher in the smaller country. To prove this imagine simply increasing the horizontal dimensions of the specific factors diagram in figure 2 while holding the two productivity schedules unchanged. The larger box corresponds to the larger country. Starting from this situation imagine that the New Economy now arrives. Trade in business service inputs is now possible between B and A. The total number of business service inputs in both countries now becomes \( n^* = n_A + n_B \). This raises the productivity schedule of IT labour in both countries but proportionately the effect is larger in the small country. Post New Economy arrival wages of IT labour and service prices are equalized across both A and B. Moreover the small country B has the larger proportionate increase in the output of high technology manufactured goods. Given our assumptions that both A and B have the same endowment of unskilled labour \( L \), the post New Economy outcome is one in which unskilled wages are equalized across countries as is the size of the \( m \) sector in both A and B. This occurs with a fall in unskilled wages in both the small and large country.\(^{13}\)

The conclusion one draws from this is that the smaller country has the most to gain in terms of the aggregate impact of the New Economy. Distributionally these gains are biased toward IT inputs. The unskilled labour, the factor used intensively in manufacturing stands to lose the most. In the larger country similar conclusions follow, but quantitatively the effect is not as large. With respect to trade patterns it is the smaller country which has the larger increase in high technology exports, and as a proportion of total trade intra-regional business service trade is relatively more important for the smaller country.\(^{14}\)

### 5. Conclusion

The paper develops a comparative static analysis of a New Economy ICT GPT in the context of a pre-existing Regional Preferential Trading Area. A number of interesting conclusions with respect to wages, welfare and trade patterns which differ depending upon whether one uses a neoclassical or monopolistic competition-increasing return trade model. In both models fairly

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\(^{13}\) This must be the case since post New Economy IT wages are higher in both countries. Since both have the same \( L \) endowment this can only occur if \( w \) fall in both countries.

\(^{14}\) It is straightforward to extend the results to countries which differ in size as measured by the unskilled labour force holding the IT labour force constant. In this case the results conform more closely to the neoclassical model. But as in the case analyzed above the arrival of the New Economy leads to an expansion of high technology exports, a rise in IT wages, and an increase in intra-regional business service trade.
stark factor intensity assumptions were used as a means for developing sharp conclusions. By allowing for more general assumptions the analytical sharpness of results would be lost. Nevertheless the general thrust of these results are unlikely to be changed provided one assumes the New Economy GPT is heavily biased toward increasing directly, or indirectly, the mobility of those occupations whose skills are complementary with the GPT. On the trade side it is clear that the New Economy raises the potential gains to trade for within region service trade. The distributional effects of the New Economy are expected to be fairly strong, even if trade-creating on average. It is important to note that the models predict that the distributional effects of the GPT can be avoided by failing to extend free trade in goods to free trade in business services. This suggests that the New Economy potential. Finally it is worth noting that as in the analysis of most preferential trading agreement, world free trade would likely dominate.

Empirically at this stage it is too early to tell whether the New Economy has yet had much impact on the existing RPTA’s. There is considerable policy discussion around the international implications of e-commerce and Internet infrastructure provision.¹⁵ It is interesting that the models' results on factor returns conform to what has appeared have been the case in the U.S. thus far. The New Economy led to wage increases precisely in those occupations whose skills were complementary to the new GPT. In particular there have been numerous accounts of the skill shortages in the IT area in North America. One response to this by the US has been a large increase in the allowable immigration of IT professionals. This model suggests similar forces are likely to be seen in smaller countries in terms of the factor markets. An obvious next step would be an extension to a North-South model in which Internet access is asymmetric across regions with different development levels. One could then examine whether virtual integration would tend to promote inequality or global income convergence, across the leader and follower countries. We hope to pursue this in future research.

¹⁵ See the recent book of Catherine Mann et. al. (2000) for a discussion of these issues.
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