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TRADE IN BUSINESS SERVICES IN GENERAL EQUILIBRIUM

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ABSTRACT

Trade in business services has been attracting attention from academic researchers, policy makers, and business journalists. While there are many anecdotes, there has been little in the way of formal theory applied to this issue. In this paper, we adapt a general model of fragmentation of production activities to try to capture the specific features of business services. Following a general discussion, we calibrate a numerical general-equilibrium simulation model to a situation in which both trade and foreign investment in services are initially banned to technically infeasible. We then compute three counter-factual scenarios: one in which trade but not investment in services is feasible or allowed, one in which investment but not trade is allowed, and one in which both trade and investment in services are allowed.

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1. Introduction

A great deal has been written about the outsourcing and offshoring of services over the last few years.¹ Much concern in the high-income countries has been focused on the offshoring of white-collar services, particularly to countries like India. It was one thing when low to moderately skilled manufacturing jobs were gradually lost to lower-income countries over the last two decades, but somehow the potential competition for and loss of white-collar jobs seems just as threatening.

Not much has been written about this phenomenon at the theory level, however. Possibly, no new theory is needed, and the new trade in services is just a particular case of our more general models. But at very least, a more detailed development of this “particular case” seems warranted given the empirical and policy attention it has received. The purpose of this paper is thus to inquire how theory might be adapted and developed to shed light on the new offshoring of white-collar services. Particular attention will be paid to small open high-skilled economies, and how they might be affected by increased trade in skilled services.

Defining services has always proved difficult and ambiguous, and I will instead simply indicate a range of activities that I have in mind. The policy debate in particular is not about things like transportation, tourism, or trade in capital. It is about business services provided to firms or in some cases directly to the purchasing firms’ customers. These range from call centers and technical support, to business-process outsourcing (henceforth BPO), to software services

¹Terminology has not yet been standardized. “Outsourcing” is unfortunately often used to refer both to moving an activity overseas (even to an owned subsidiary) and to moving an activity outside of the firm to a (local) independent contractor. I will use “offshoring” to refer to moving an activity overseas and “outsourcing” to refer to moving an activity outside the ownership boundaries of the firm. Moving an activity to a foreign subsidiary is thus offshoring but not outsourcing.

such as programming to higher-end services including software design and medical services (e.g., reading and interpreting X-rays and MRI scans).

My starting point will be that increased trade in services is due to changes in communications and information technology that allow for the geographic fragmentation of a formally integrated multi-stage production process. These services have always been produced by firms, but they have traditionally been produced in-house or at least in-country (outsourced but not offshored). The ability to fragment production means that individual stages may be located in countries where cost and other conditions are most advantageous.

I think that there are really two separate questions here. The first is what sorts of activities can be offshored? This is not as easy as simply classifying them by skill intensity, for example. Evidence indicates that activity characteristics like codifiability, routinization, and the lack of need for face-to-face interaction are of great importance. This needs some thought and analysis. I have not seen any attempt to incorporate these features in a formal model, and it is important to do so to the extent that they are repeatedly emphasized in the international business literature.

The second is what activities would a firm in a high-income country choose to offshore among those which are feasible to offshore? A trade economist's first reaction on this is to think about activities differing in factor intensities and locations differing in factor prices. Cost is minimized by locating activities where the factors they use intensively are cheap. A second reaction, derived from the theory of the multinational enterprise, is that activities (in the presence of scale economies) will be located where the market is large (Markusen, 1984, 2002).

These factors seem to work well for manufacturing, but they are somewhat less clear for

white-collar services. In particular, we seem to have the problem that some skilled workers in information technology, for example, are cheap where they are scarce. Data and specific examples (e.g., Indian computer programmers) of this phenomenon are found in several of the articles in Brainard and Collins (2006). Second, the offshoring is often not to serve the local market, but to serve the firm's back home.

I begin my analysis with a description of what I feel are crucial empirical characteristics of the (newly traded) white-collar business services that need to be captured in theoretical models in section 2. Then I turn to the task of proposing such a model in section 3. There I develop a two-country model (us versus the rest of the world) which tries to incorporate some of the features from the "wish list" of section 2. Two types of fragmentation, both initially infeasible, are considered. First, service production can be geographically fragmented from final goods production which uses the services as intermediates. Second, services themselves can be fragmented into an upstream headquarters activity and a downstream production activity.

The findings of the model are relatively optimistic for small, skilled-labor-abundant countries in an increasingly integrated world. At some basic level, increased ability to fragment production and trade services frees small economies of constraints. Fragmentation allows firms in the high-skilled, small economy (henceforth North) crucial access to cheaper production of less skilled phases of production, which increases the competitiveness of North final goods producers, allowing an expansion that maintains or drives up demand for skilled labor. Second, I assume scale economies and firm-level production differentiation in services, and so access to foreign service providers for domestic final-goods producers and access to foreign producers by domestic service firms increases real productivity in North. The larger the range of services

available, the higher the productivity of final goods producers or alternatively, the lower the price index for a composite service input.

I believe that some progress is made with respect to tying together country characteristics, such as size and skilled-labor abundance, with technology characteristics such as factor intensities across activities, scale economies complementarities, trade costs, and investment (or fragmentation) costs. Somewhat less progress is made on other issues, especially the notions of codifiability and routinization, and thus on the problem of what activities is it *feasible* to offshore. I simply *assume* that service production requires an upstream, skilled-labor intensive activity that is the core of the firm. Then there is a routinized, downstream, less-skilled-labor-intensive activity that may (or may not) be geographically fragmented away from the headquarters. In a second theoretical section, I try to capture some of these ideas by introducing two classes of skilled workers: entrepreneurs or managers, and more routine skilled workers. The jobs of the latter are the downstream jobs that can be outsourced, and hence these are the workers who are vulnerable to offshoring. In some experiments, the wages of the entrepreneurs and the skilled workers change in opposite directions.

I can offer some loose speculation about what the analysis suggests for the future of a small, high-skilled economy. It seems possible that what will happen in services will resemble what has happened in manufacturing over the last two decades. In particular, it may be that middle-skilled activities, ones that can be codified and routinized, will tend to migrate to offshore locations like India. Higher skilled activities and ones that require judgement, discretionary actions, and/or face-to-face interactions will like stay and expand in the high-income countries. This suggest difficulties for middle-skilled white-collar workers, particularly

those with specific skills in codifiable and routinized activities. This has some analogy to the loss of relatively routine production and assembly jobs over the last two decades in North America and Europe. Other policy implications of the theory are briefly discussed: within the context of the model, for example, foreign market access for the small-country's firms is crucial.

2. Empirical Characteristics of Offshoring of White Collar Services to Capture in Theory Models

There are a few things missing in most conventional trade models for our purposes. Most models used for theoretical, policy and empirical analysis tend to focus on a fixed number of tradable goods and services and border barriers that raise the cost of trade. Often missing in particular are: (1) the potential for trading new things, (2) the possibility of reversals in the direction of trade, (3) the modeling and importance of barriers to establishing foreign subsidiaries as opposed to simply border barriers to trade, (4) the possibility that factors of production can be cheap in countries where they are very scarce.

With respect to this last point, the simplest off-the-shelf two-good, two-factor Heckscher-Ohlin model is not going to offer insights as to why relatively skilled-labor-intensive services are being offshored to very skilled-labor-scarce countries. One of the most important tasks of theory, in my opinion, is to develop richer, but empirically-plausible models as to why this phenomenon is taking place. Yet it is not necessarily the case that the factor-proportions approach to trade has to be abandoned, just that it must be enriched to include multiple goods and/or factors, scale economies, complementarities, or other factors to explain the skilled-wage / skill-abundance puzzle.

Reversals in the direction of trade is another phenomenon that traditional models are

poorly equipped to handle. Trade in white-collar services is not new. The modern theory of the multinational has emphasized that parents are exporters of white-collar services, including management and engineering consulting, marketing, finance and so forth to their subsidiaries. One thing that is relatively new and which has generated much of the current interest is the reversal in the direction of trade that we are seeing. In some ways this is closely related to the previous point. Many traditional modeling frameworks, relying on marginal comparative-statics analysis, are ill equipped to tackle this type of problem (Markusen, 2002).

Here is a wish list of characteristics we might like to have in theoretical models of offshoring of white-collar services. Much of this is a revision and extension of a similar section in Markusen (2006), since the focus and objectives of the present conference are quite similar to those of the 2005 Brookings Trade Forum

- (A) Expansion of trade at the extensive margin: new things traded due to innovations in communications and technology or institutions (e.g., legal restrictions).

This poses a number of challenges to theory, especially the fact that we are talking about non-marginal changes and discrete movements of something being non-traded to potentially lots of trade. Traditional comparative-statics analysis is of little use: it focuses on marginal changes in activities which are already in use in the benchmark.

- (B) Vertical fragmentation of production: the new traded services tend to be intermediates, may be upstream, downstream, or not part of a sequence.

Traded white-collar services often have a number of important characteristics that cannot be captured in the simplest off-the-shelf models which assume a set of final goods. One is that they may be firm-specific rather than bought and sold on arm's-length markets. Another is that they may form part of a particular production sequence, such as being a well-defined upstream

(design) or downstream (after sales service) component of overall production.

(C) Location-specific and other complementarities

A third is that there may be crucial complementarities among different elements of the production chain, such as between skilled labor and telecommunications equipment and infrastructure. In some cases, it may be the case that services must be produced in the same location as where they are used in downstream or upstream manufacturing activities. I am coining the term “location-specific complementarities” to describe this. This doesn’t mean that services, or at least the downstream end product, cannot be traded. But it does suggest that a national presence may be required; that is, a firm has to open a local office or branch in a foreign country in order to service that country. These considerations may also imply another type of complementarity, that between liberalization in services and increase trade in goods (Markusen, 1983).

(D) Firms or specifically owners of knowledge-based assets may offshore skilled-labor intensive activities that are complements to these assets

A plausible worry is that skilled workers in the high-income countries are being hurt, while their companies are profiting from offshoring. This cannot be dismissed and requires investigation. To me, it calls for at least a three-factor model, or alternatively one in which firms possess specific factors or other assets which are complements to skilled labor. An example mentioned above is software engineers as complements to telecommunications equipment and network infrastructure, in which the third factor is physical capital. Or it could be that software engineers are complementary with managerial sophistication, organization infrastructure, and marketing channels. The complementary input is knowledge-based assets.

Without services trade, you can train an engineer in India, but there is no demand for his

or her skills: there is nothing useful to do. The necessary complementary physical or knowledge capital is missing. The implication is that, in the absence of offshoring, these skilled workers are cheap even though they are relatively scarce in comparison with the country with the complementary factors. Offshoring allowing trade in the third factor (or services of knowledge-based assets) causes that factor (or its services) to move to the skilled-labor-scarce country to combine with cheap skilled labor there. This set up obviously has the elements of a story in which skilled labor is harmed in the high-income country, while owners of the complementary physical or knowledge-based assets benefit.

(E) Agglomeration of complementary intermediate services

Related to but somewhat distinct from point (C) is the issue of whether or not the intermediate business services themselves are more productive when located near to each other, as opposed to just being located near the final user which was the focus of (C). It might be beneficial for a user firm to be located near to both a firm specializing in networking hardware and one specializing in the networking software, but it may also be beneficial for the latter firms to be located near one another. This could be modeled using an input-output structure among the service firms, as in Venables (1996). This is going to be somewhat beyond the scope of this paper, but it does raise some concerns for small economies. In particular, it raises the possibility of multiple equilibria and that whatever location gets a head start remains ahead. There is a potentially large market failure here that could call for strong government support for creating a local agglomeration (e.g., the business park concept).

3. A model of services and service-trade liberalization

The preceding section indicates the need for a modeling approach that is more sophisticated than many standard trade models and, in particular, an approach that allows for large discrete changes in the things that can be traded. In this section, I will specify a theoretical approach, which can be coded into a numerical simulation model, that attempts to capture many of the ideas outlined in the previous section.

Suppose we begin with a simple two-final-good, two-factor, two-county Heckscher-Ohlin model and then allow one good to geographically fragment into two separate production activities, one in each country. Further, one of those two activities, denoted services (S) may be allowed to geographically fragment into a more skilled-labor-intensive “headquarters” activity and a less-skilled-labor-intensive “office” activity.

If we assume free trade in goods, just considering free versus prohibitive fragmentation costs in services means that we do not need to specify which is the upstream and which is the downstream activity. For a much more comprehensive treatment of this case, see Markusen and Venables (2005). Here are the principal features of the model.

- (1) Two factors of production: skilled (H) and unskilled (L) labor
- (2) Two final goods, three production activities
 - AG - unskilled-labor intensive agriculture (no offense to farmers)
 - MAN - skilled-labor intensive manufacturing, can fragment into
 - VA value added by skilled and unskilled labor
 - SER services
- (3) SER - can fragment into

HQ headquarters, may serve several offices

OF office, produces the deliverable for the client

- (4) Two competitive, constant returns economies
- North - high-skilled abundant
- South - low-skilled abundant
- (5) There are three generic “types” of services firms, each of which may be located in either country, hence there are six firm types in total
- N - national firms, provide services to domestic manufacturers, may possibly be allowed to “export” to other country
- M - multinational firms, have physical production presence in both countries, essentially a “horizontal” multinational
- V - vertical firm, with headquarters in one country, a single office located in the other, may possibly be allowed to export back to the home country.
- (6) - There are “trade costs” for M and V firms supplying services abroad (skilled workers have to fly abroad in one direction or the other).
- (7) - There are firm-level scale economies arising from jointness of knowledge-based assets: fixed costs for an M firm are less than double the fixed costs of N or V firms.
- (6) - Services are differentiated or “specialized”, each produced with increasing returns to scale. A wider range of available services increases real productivity for final manufacturers, or lowers their price index for

composite services.

To expand on the last point a bit, it is assumed that one unit each of two different services is more beneficial to X firms than two units of only one of the services. Using two specialized lawyers for a day (e.g., one taxation and one contracts specialist) is better than having two days from a general-purpose lawyer than does both. But fixed costs limit the degree of specialization and diversity than can exist in equilibrium for a small country, and thus access to the larger world market is always productive.

The model and the two types of fragmentation are illustrated in Figure 1. Consumption comes from the final goods agriculture and manufacturing. Manufacturing is composed of “value added” (direct contributions of skilled and unskilled labor) and services. It *may* be possible to do these in different locations, implying that trade in services is feasible. Services consist of a headquarters and an office. It *may* be possible to do these in different locations, implying that foreign investment in services is feasible.

We are interested in four equilibria, referred to as “regimes”. Some regimes may not be technologically feasible or profitable, or they may not be allowed by regulation. The four are as follows:

- NN - No trade, no foreign investment (i.e., no M or V firms) allowed
- TN - Trade in services (exports by N firms) allowed, no investment allowed
- NI - No trade in services feasible or allowed, but investment feasible/allowed.
- TI - Trade and investment in services both allowed

We can think of TN as allowing geographic fragmentation between services and manufacturing, but not allowing fragmentation within a service into headquarters and office. Under NI trade

but not investment is feasible/allowed. Regime TI allows both to occur. TN permits what WTO terminology refers to as Mode 1 trade in services: cross border trade that does not involve an investment and involves minimal movement of persons. NI and TI permit what is called Mode 3, the establishment of a commercial presence (typically by a foreign direct investment) abroad. NI could occur, for example, if there are no government restrictions, but face-to-face contact is required so that investment via a foreign office is possible but exports of services are infeasible.

Figure 2 gives an example of the service provision by one firm, located in the North. The top box is a manufacturing firm located in the North and the bottom an manufacturing firm located in the South. The domestic service firm has a headquarters in North (middle box of the diagram). It may have a domestic office in North which provides services to Northern firms (this is always allowed). That Northern office may provide services to Southern manufacturing firms, if trade in services (Mode 1) is allowed. The Northern firm may also establish a Southern office if investment in services is allowed (Mode 3). It can then provide services to local firms under regimes NI or TI. It can also provide exports services back to the Northern manufacturing firms under TI, but not under NI.

This completes the general description of the model. One crucial feature of the model is choice of factor intensities for the different activities. I have experimented with this a lot, and there are some differences in results of course. But many of the choices that seem “reasonable” tend to yield similar results. In this paper, I will concentrate on a particular case which I find reasonable after reading a great deal of literature on offshoring of white-collar services, especially papers in the Brookings Trade Forum 2005 (2006). Here is my ranking of factor intensities (H/L intensity ratios), with the most skilled-labor intensive at the top, and the least-

skilled-labor intensive at the bottom. Numbers are the values used in the numerical simulation model to follow, with the overall “world” endowment normalized to 1.0

Fixed costs of service firm headquarters	4.4
Value added in manufacturing (direct use of H and L)	2.2
Overall manufacturing (value added plus intermediate services)	1.9
Overall service provision (headquarters plus office)	1.5
Service office (office)	1.1
World factor endowment ratio	1.0
Agriculture	0.5

My choice for a base case is that all activities in manufacturing and services are more skilled-labor intensive than the world endowment ratio at the calibration point (discussed below). Integrated or overall manufacturing is a bit more skilled-labor intensive than integrated services production. But the two components of services production lie on at the extremes of the manufacturing-sector intensities. Headquarters is the most skilled-labor intensive and office activity is the least among the manufacturing-sector activities. I suppose that I am thinking about something like business-process outsourcing, one of the most common forms of offshored while-collar services. The high-end activity is quite sophisticated, whereas the downstream processing centers are only moderately skilled-labor intensive.

The second step is to calibrate a numerical model use to solve for these equilibria. I do this by assuming that the countries are identical, and that foreign production (type M and V firms) is not allowed, and that trade in services by N firms is prohibitively costly. This is then a benchmark equilibrium in which there is no geographic fragmentation of service production.

Services are supplied solely to manufacturers in the same country. Units are chosen such that the number of national firms in each country is equal to one, and production of manufacturers and production of services in each country is equal to one. There is no trade in services allowed and, since the countries are identical, there is no trade in manufacturers either in this benchmark. Thus all trade quantities are zero in the calibrated equilibrium.

The focus of this conference is on small, skilled-labor abundant economies. Thus I will focus here on simulation results where North is smaller than South. Simulation results are reported in Tables 1 and 2. In the first of these, Table 1, North is skilled-labor abundant, having an endowment ratio H/L of 2.78, where the world as a whole has a ratio of one. North has a 0.16 share of total world income. The first block of rows gives the number of service firms active in equilibrium in North, the second block gives production quantities for manufacturing and services, the third block gives trade flows, and the final block gives factor prices and welfare.

Before looking at the specific results, let me try to summarize the intuition. Despite the very different nature of the three liberalization experiments, skilled labor in North benefits significantly, unskilled labor has a smaller loss, and aggregate welfare of the North rises in all cases. (1) in TN where headquarters and office are bound together, liberalization allows North to access the wide range of South services (by imports). This leads to a substitution from services to manufacturing, the latter being more skilled-labor intensive overall than services, and so raises the return to skilled labor. (2) in the NI scenario, horizontal multinational services firms replace the national firms. There is a large increase in the number of service firms headquartered in North, but a small fall in final (office) service production, and this again pulls up the wage of skilled labor in North. (3) in the full TI liberalization scenario, there is even a larger increase in

the number of services firms headquartered in North, both horizontal and vertical. But there is a big fall in final service production, as much of this is offshored to the subsidiaries of the North firms. Final X production rises and this, combined with the large increase in headquarters, gives a big boost to the skilled wage in the North.

The first column of Table 1 computes a general-equilibrium for regime NN with no trade or investment in services allowed. Factor prices and welfare are renormalized to one in the initial equilibrium. There are national firms in both countries; their numbers are similar (South not shown), reflecting the fact that country North's small size is offset by its greater skilled-labor abundance. Manufacturing production and service production are also similar across the two countries (recall that these production quantities would all equal one when the countries are identical). Country North is a net exporter of manufacturing.

The intermediate liberalization case TN, where trade but not investment in services is liberalized, is shown in the second column of Table 1. There is a significant fall in the number of service firms headquartered in North, and North becomes more specialized in manufacturing and less in services. Instead, North benefits from being able to import differentiated services from South, which increases productivity in final manufacturing production.

The substitution of manufacturing for final service production benefits skilled labor in North, which has a real income increase of 21 percent. Unskilled labor loses 7 percent, but North as a whole get an aggregate welfare gain of 6 percent.

The third column of Table 1 gives the NI scenario in which it is not feasible to trade services (mode 1 not feasible or allowed), but foreign investment (mode 3) is feasible. This could be due, for example, for the need for face-to-face contact between the service firm and the

manufacturing firm. Now there is a regime switch to horizontal firms in both countries, each having an office in both countries. The number of firms headquartered in North rise significantly relative to the base (NN) case: the small domestic market is no longer a constraint for North service firms. Production of both services and final manufacturers are not very different from the base case. Changes in factor prices and total welfare in North are very similar to those in scenario NI, despite the very different patterns of production and trade in the two cases.

The right-hand column of Table 1 shows the full liberalization scenario TI. Now the regime shifts to a combination of horizontal and vertical service firms in the North, with the latter dominating. The North is once again more specialized in manufacturing production and less in final (office) services than in the NN equilibrium. North remains a net exporter of X and imports some services from the South affiliates of North firms. This is the type of offshoring (but not outsourcing) often discussed in the business press: location of in-house service production in the foreign country used to serve the home market.

North is now the dominant location for the headquarters of service firms, though not production (office activities). This gives a further boost to manufacturing production and a big boost to the return to skilled labor. The latter now rises by 32 percent over the benchmark NN equilibrium. Unskilled labor now has a bigger loss, and aggregate welfare gains for North remain at 6 percent.

I believe that the results in Table 1 emphasize a couple of points. The first is being able to draw on foreign sources for intermediate inputs in a world of scale economies, product differentiation, and complementarities. In the first transition, from NN to TN, North draws on

foreign “varieties”, making it much more competitive in manufacturing production, which is itself very skilled-labor intensive by assumption. Both production and exports of manufacturing from North increase substantially. The ability to draw on the full range of foreign services lowers the aggregate price index for services in North and hence increases competitiveness in manufacturing.

Second, integration allows for foreign market access for domestic service firms, and allows them the advantage of specializing in the very skilled-labor-intensive headquarters activity only. In the TN case as just noted, there are a small number of service firms headquartered in North. But with full liberalization (TI), almost all service firms are headquartered in North. Foreign market access for these firms, giving them the ability to actually produce in South where the demand for services is concentrated, makes a world of difference. Most of that foreign production of services by North type V and M firms goes to manufacturing production in country South with only a small proportion being exported back to North. The best jobs not only stay in North, they significantly increase in number, leading to a large increase in the real return to North skilled labor.

4. Fragmentation and specialization in headquarter services

The model outlined above has a couple of limitations that are likely important in the context of service trade/investment liberalization. One is that it is generally the case that, in equilibrium, a small, skilled-labor abundant country will have a lower wage for skilled labor than a large, skilled-labor scarce country. But part of the puzzle that is leading us to work on this trade is precisely that the latter countries seem to have much lower wages for workers with equivalent

skills. There are many stories and indeed hard evidence that some computer-industry workers are paid much less in India than workers with equal skills in the US or Europe. So why is skilled labor expensive where it is abundant? Of course, one simple answer is that they are not equally skilled, and US/European workers are either better or the firms they work for are better at extracting output.

The other empirical idea that has not been addressed here is the notion of some tasks being more tradable than others, especially those that are routine and codifiable. Workers may be equally skilled in the two activities, but those who work on routine tasks may be more vulnerable in the face of globalization than the non-routine workers.

In this section, I present an extension to my basic model which tries to hit these two birds with one stone. I am going to assume that there are in fact two types of skilled workers. One type we continue to denote by H, and these will be routine workers who can work at a geographic distance from the firm's headquarters. The second type is denoted by E (as in entrepreneur), upper level workers who are involved in tasks that are fundamental to the firm. Furthermore, we will assume that the E workers are "upstream": they produce the firm-specific assets or alternatively they are used in the fixed costs of firm creation, the headquarters activity. H workers are "downstream" in the office activity, involved in producing the actual firm output like computer code, call centers, business processing and so forth. To keep things fairly simple, H workers are also used in manufacturing (or more correctly value added) and agriculture production. E workers are only used in service industry headquarters activities, and are vital to supporting domestic service firms in equilibrium (for all types N, M, and V). Horizontal type M firms are assumed to need E workers from both countries, but mostly from the home country.

For H workers in North working in a national firm, for example, their jobs can be “offshored” by the E workers switching the firm to a M or V type, hiring foreign H workers to replace the domestic ones. Thus H workers are vulnerable to having their jobs offshored, but of course the domestic E workers must themselves compete against foreign firms.

Suppose that our small North is not only skilled labor abundant, now referring to the total of H and E workers relative to unskilled workers, but also has a higher proportion of E workers in the total of H + E. The important thing to note in this context is that, when trade and especially foreign investment are not allowed, E and H workers are bound together in producing services: they are location-specific complements, meaning that they must not only be used together, but in the same location. Under our assumptions about factor endowments across the two countries, it is now the case that North will be better positioned for headquarters of type N services firms. However, service delivery is H-worker intensive, and the consequence of this is that country North will have higher wages for H workers than South. This is the result we need to capture the empirical fact that skilled workers (H type) are cheaper where they are more scarce, in South.

We can now do the same experiment we did in Table 1. The proportions of total skilled (E+H) to unskilled workers is the same in Table 2, but North has a higher E/H ratio than South. One difference now is that the number of North services firms will not be able to adjust much, since the E workers are only used in service headquarters production by assumption, and so they cannot be drawn in from other parts of the economy. But the increased demand for their services through exports or foreign investment in services is going to give a big boost to their wages. The North H workers, who must now compete with offshore H workers in South, may lose or may

get a small boost through switching to the manufacturing sector.

The first column of Table 2 gives the NN regime. Even though North is small (16% income share), its endowment makes it the center for service firms. Final manufacturing production is similar in the two countries as is final service production (South not shown). Taken together, these results mean a smaller output per service firm in North, which sacrificing some scale economies but allows a greater degree of differentiation. North is the manufacturing exporter. Although we again normalize factor prices and welfare to equal one in the NN base case, the real wage of skilled labor is actually about eighteen percent higher in North. This is the result I wanted to capture: skilled labor is cheap in South where it is scarce.

The introduction of trade but not investment in services in the second column of Table 2 does not actually change the types and numbers of active firms much. There is however some substitution in North away from manufacturing production and toward final service production, with North exporting most of that increased S production. Recall that value added in manufacturing is more skilled-labor intensive than final service production. The consequence of these changes is that there is a redistribution within North away from skilled labor H toward the E workers. The former lose 1 percent while the latter gain 33 percent.

The intuition behind this redistribution is probably that, in the absence of trade in services, the complementary bundling of H and E workers needed for service production and the complementary bundling of services and manufacturing value added supports higher wages for the H workers. When trade in services is permitted, the substitution of more final service production for final manufacturing production lowers the aggregate demand for H workers at the old wage. But the E workers benefit from this change as their expertise is in more demand for

service production. There is a welfare gain of 5 percent for North.

In the second experiment (third column) of Table 2 (NI), we see a shift away from national firm production, with M multinationals dominating in North. There is virtually no change in manufacturing and service production in North. E workers are big gainers in the North as they provide services to both the North and South offices of their firms. But the general efficiency gain also increases the wages of H workers in the North and unskilled workers are small losers. The welfare gain of 3 percent for North is largely coming from the efficiency gains of having a larger variety of services to use in production.

The final experiment in Table 2 liberalizes both service trade and investment (TI). As was the case in Table 1, we now have a mix of horizontal and vertical firms headquartered in North. There is now a shift toward manufacturing and away from final (office) service production relative to the base case. One again, there is a big gain for E workers yet H workers also gain. The losers are again unskilled labor while the country as a whole gains a significant 7 percent.

The results for the wages of H workers in South in Table 2 are interesting and contrast with those in Table 1. In allowing only trade in S, H workers now suffer a very small wage loss and earn only a very modest gain when investment in services is introduced. This is essentially an efficiency gain that overwhelms a relative price change against H workers relative to E workers. When investment in services is not allowed, North suffers from a relatively inefficient service sector passed on in high costs to manufacturing producers due to the lack of service variety. Access to a broader range of services through investment (or to cheaper foreign services by not paying the trade cost) allows essentially an efficiency gain for the small country. This

shows up in the increased final manufacturing production in Table 2 which is associated with an increased demand for skilled H workers. The tends to lift all real factor prices and now H workers are better off. The shift toward more X production, however, now reduces the wages of unskilled workers in North.

Again, I feel that the intuition for the results in Table 2 lie in the fact that, in the absence of trade or investment in services, North is handicapped in not having an efficient production sector for S due to its small size in Table 2 (i.e., lack of efficiency-increasing diversity), which is passed on in higher real costs (higher price index for services) to the manufacturing sector.

5. Summary and conclusions

This paper approaches the phenomenon of increased trade and foreign investment in white-collar services from the point of view of theory. The paper concerns how we want to think about these services and how we might model them.

After developing a list of characteristics that I think a reasonable theory might capture, I develop a two-country general-equilibrium model. This model has one final goods sector, manufacturing, that uses services as intermediates. Intermediates in turn have an upstream “headquarters” activity and a downstream “office” activity. The headquarters activity is assumed the most skilled-labor intensive, followed by value added in manufacturing production, followed by downstream service production, followed by agriculture (the other final goods sector).

In one experiment, manufacturing production is geographically bound together with service production and headquarters and downstream production must similarly occur in the

same location. Two types of fragmentation are possible. First, we allow services to be traded, used as input into manufacturing production in the other country. Second, we allow services themselves to geographically fragment into a headquarters and office location (termed investment in services). A numerical simulation approach compares the no trade no investment scenario (NN) to service trade but not investment feasible/permitted (TN), to trade infeasible but investment feasible (NI), and then to a full liberalization scenario (TI) in which both trade and investment are permitted.

Liberalization, or technical/institutional changes that allow trade and investment in services tend to benefit a small, skilled-labor-abundant economy. There are several sources of these gains.

(1) offshoring allow service firms to source from abroad the downstream part of service production that is costly at home. This improves their competitiveness in both markets.

(2) access to foreign service providers through trade or investment increases the range of services available to domestic manufacturing producers, increasing their productivity or lowering the cost of the aggregate service intermediate.

(3) access to foreign markets for the domestic services firms makes them more competitive, allowing them to spread their fixed costs over a larger output.

All three of these effects tend to favor skilled labor over unskilled labor. However, while the relative wage of skilled labor rises, the level of the real wage of unskilled labor can rise as well (not true for all scenarios) reflecting the fact that the real productivity gains from effects (2) and (3) above can lift all workers' real wages.

In a second experiment, I divide skilled labor into two types, entrepreneurs (E) or

managers, and more general or routine skilled workers (H). I assume that E workers are only used in the upstream headquarters activity, whereas H workers are used in the downstream activity, in manufacturing and in agricultural production. Domestic service firm requires local E workers, but the downstream tasks performed by the H workers can be done offshore by foreign H workers. Our small, skilled-labor-abundant North has a higher ratio of all skilled to unskilled workers than South and also a higher ratio of E workers to H workers.

For many variables, the results of this experiment are not that different from the experiment with only two types of labor. The big difference is with respect to factor rewards. Liberalization now leads to an increase in the real price of E workers relative to H workers in the small economy. In some scenarios, the real wages of H workers actually fall, due to their having to compete with offshore H workers.

This is exactly the scenario that some researchers and policy analysts have feared. The more routine skilled workers have their wages reduced at the expense of the top level management and other workers. But when North is very small, there are some parameter values such that the efficiency gains dominate the relative wage changes, and all factors in the small, skilled-labor-abundant country can gain from liberalization. But the E workers continue to gain much more.

I think that the intuition behind these results is that the lack of trade and investment in services “bundles” E and H workers together in producing services and manufacturing: they are location-specific complements in fancier jargon. The relative abundance of E workers in North pulls up the return to H workers. Fragmentation means that the E workers can seek out foreign H workers instead (offshore the H workers’ jobs) and so the latter may (but not must) lose.

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Figure 1: Structure of production

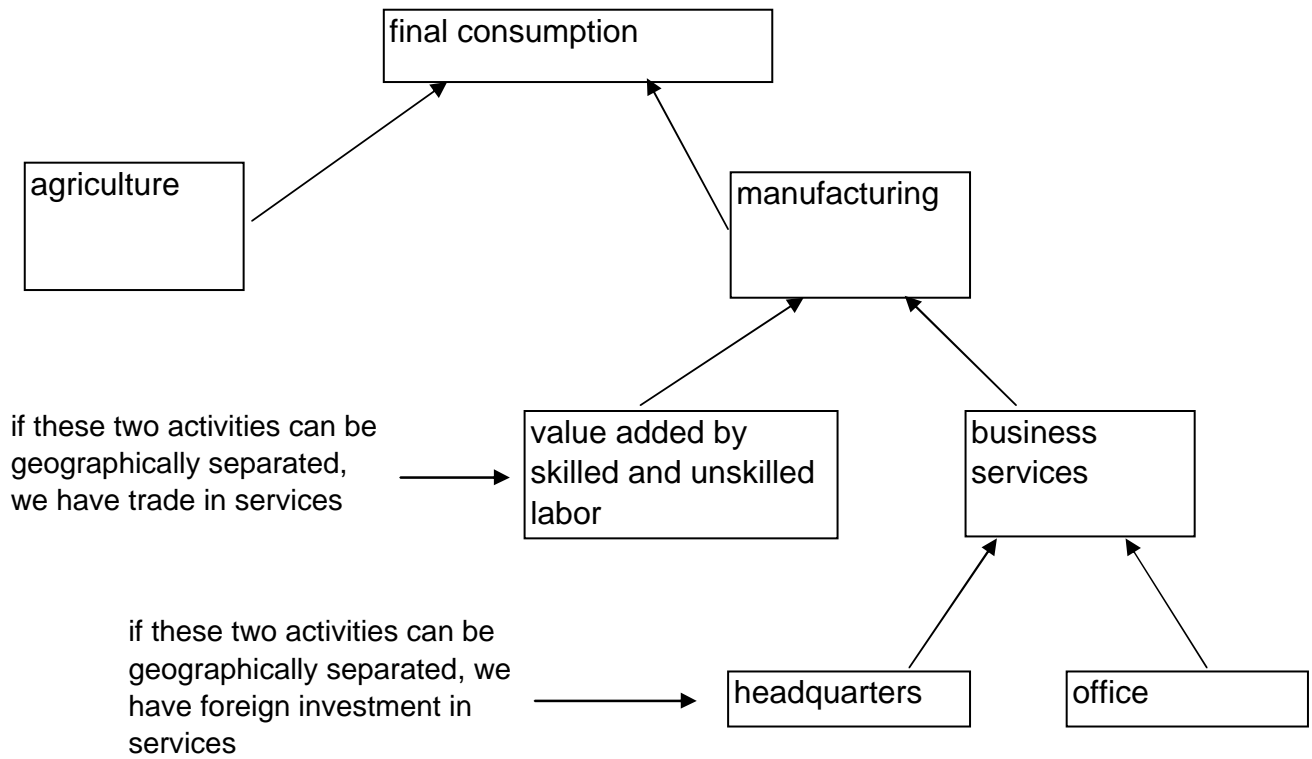


Figure 2: Types of trade in services for a North service firm

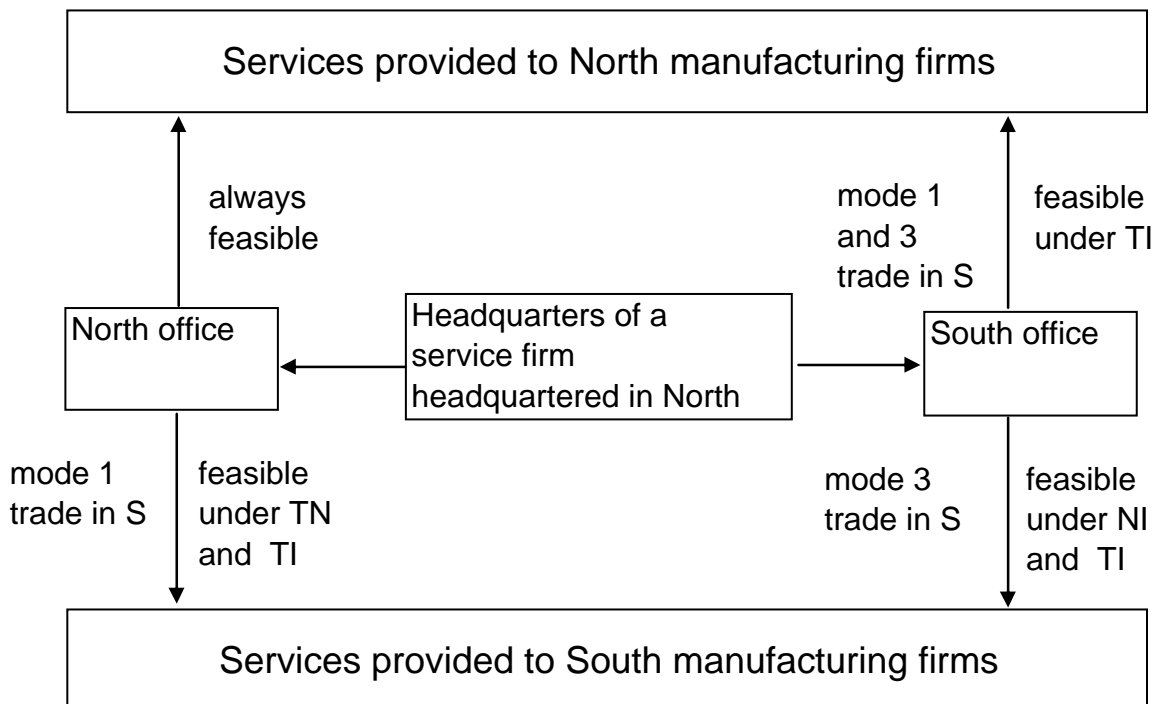


Table 1: North small and skilled-labor abundant, simulation results under different service trade/investment restrictions (two-factor model)

North's H/L ratio = 2.78 North's income share = 0.16	NN	TN	NI		TI		
	level	level	% change	level	% change	level	% change
National firms North	0.81	0.20					
Horizontal firms North				1.43		0.62	
Vertical firms North						1.10	
Total firms headquartered in North	0.81	0.20		1.43		1.72	
X production in North	0.63	1.02	+60	0.65	+3	0.73	+15
Final service production in North	0.63	0.17	-74	0.59	-7	0.36	-44
Exports of X by North	0.32	0.67		0.31		0.39	
Exports of S from North by North firms		0.01					
Exports of S from South by North firms						0.09	
Skilled wage in North	1.00	1.21	+21	1.20	+20	1.32	+32
Unskilled wage in North	1.00	0.93	-7	0.95	-5	0.84	-16
Welfare in North	1.00	1.06	+6	1.06	+6	1.06	+6

Table 2: North small and skilled-labor abundant, simulation results under different service trade/investment restrictions (three-factor model)

North's H/L ratio = 2.78 North's income share = 0.16	NN	TN	NI		TI		
	level	level	% change	level	% change	level	% change
National firms North	1.15	1.18					
Horizontal firms North				1.30		0.72	
Vertical firms North				0.01		0.45	
Total firms headquartered in North	1.15	1.18		1.31		1.17	
X production in North	0.66	0.60	-8	0.68	+4	0.74	+12
Final service production in North	0.61	0.72	+17	0.62	+2	0.51	-17
Exports of X by North	0.33	0.25		0.33		0.37	
Exports of S from North by North firms		0.13					
Exports of S from South by South firms		0.07					
Exports of S from South by North firms						0.04	
Skilled wage in North	1.00	0.99	-1	1.03	+3	1.05	+5
Entre / management wage in North	1.00	1.33	+33	2.21	+121	3.11	+211
Unskilled wage in North	1.00	1.08	+8	0.95	-5	0.93	-7
Welfare in North	1.00	1.05	+5	1.03	+3	1.07	+7