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Outsourcing and the US Labour Market

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1. INTRODUCTION

THE need for a rigorous and clear analysis of cross-border trade in arm's-length services – which can be considered GATS Mode 1[1] services trade and is often referred to as outsourcing – has risen in proportion to the plethora of media interest in the topic. This is especially true for studies on services outsourcing from the USA, which has experienced consistent public outcry over the last decade in the wake of claims that tens of thousands of American jobs have been lost due to firms outsourcing their back office operations, and other lower wage services, to countries like India and China.

However, several studies (Blinder, 2006, 2007; Jensen and Kletzer, 2006, 2007) argue that not all services can be traded, and thus not all jobs are at risk of being adversely affected by services outsourcing. Services that require personal contact, such as hairdressing and waiting tables, can never be traded. However, workers employed in activities that do not require in-person interaction and that can be carried out electronically are more likely to be affected by services outsourcing. Blinder (2007) estimates the upper bound on how much US labour can be displaced by services imports to be 29 per cent of all US employment. Greater outsourcing could thus have far-reaching effects on US labour, reducing employment and wages, and eventually affecting many occupational groups that are currently untouched by outsourcing, but that may

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[1] Defined in General Agreement on Trade in Services Articles I.2 (a) and XXVIII (b) as 'the production, distribution, marketing, sale, and delivery of a service by a service supplier from the territory of one Member to the territory of any other Member' (GATS, 2006).

be affected as technology increases the range of service activities that can be traded.

These understandable concerns over job losses due to services outsourcing often engender a political response that would move to restrict outsourcing. Drezner (2004) notes that between 2002 and 2004, more than 20 state legislatures introduced bills designed to prohibit several forms of outsourcing. While developing countries account for only 15 per cent of US Mode 1 services imports, the US services market is an important destination for many of these exporters. For example, the USA demands 45 per cent of India's services exports (equivalent to 9 per cent of all exports), even though only 1.5 per cent of US services imports are of Indian origin (Dimaranan, 2006). Some studies even argue that the export-led growth of services has allowed for India to bypass the traditional development paradigm of developing agricultural and manufacturing industries before an export-oriented services sector (Bhatnagar, 2003; Stough et al., 2005). Thus restrictions to outsourcing may have far-reaching consequences for the developing countries from which the USA imports its Mode 1 services.

This paper thus addresses the important question: how sensitive would the wages of different occupational groups and US production be to increases in Mode 1 services imports, if these imports increased such that they displaced the maximum possible share of US workers?

2. THE POTENTIAL FOR OUTSOURCING IN THE US LABOUR MARKET

Fuelling public interest and anxiety about services outsourcing, the popular media has provided estimates from a variety of private sector consulting groups (McCarthy, 2002; Gentle, 2003), which cogently depict the threat of millions of job losses through outsourcing. However, Mankiw and Swagel (2006) argue that these disturbingly large predictions have led the public to overestimate the economic impact of outsourcing. The paper uses the mass layoff data of Brown (2004) to point out that out-of-country relocations were responsible for only 1.6 per cent of job separations in mass layoffs between the first quarter of 2004 and the second quarter of 2006.

Blinder (2006) points out that much of the current concern is not just about what jobs are being threatened by services outsourcing in the present, but rather, what jobs can be potentially displaced as the set of activities that can be outsourced expands. Autor et al. (2003) and Irwin (2006) support this idea, finding that the types of activities – and the workers doing those activities – that can or are outsourced, changes as technology evolves, affecting workers across a range of skill levels. For example, with better information communication technology, the activities of US-based telemarketers and financial analysts

could be accomplished by India-based marketers and analysts, even though the jobs may require vastly different skills. It is technological advancements that will determine what activities, and therefore which workers, may be affected by outsourcing.

Blinder (2006) and Blinder et al. (2006) argue that regardless of what the technological advancements are, the 'tradability' of an activity will hinge on whether the service needs to be impersonally delivered or personally delivered. A personally delivered service would be one that requires the physical presence of the service provider, such as a busboy or a masseuse. In contrast, an impersonally delivered service is an activity that does not require a physical presence, such as telemarketing or technical support from a call centre.

Along this line of reasoning, Bardhan and Kroll (2003) estimate that 11 per cent of US jobs in 2001 are potentially outsourceable, by deciding on the tradability of a job based on whether it requires face-to-face interaction and involves an activity that can be restructured to be delivered via telecommunications. In a similar vein, armed with the personally delivered versus impersonally delivered dichotomy, Blinder (2006) makes an *ad hoc* list of activities that are likely to be displaced by services outsourcing and broadly estimates that 30–40 per cent of US jobs that were present in 2004 can be potentially displaced by outsourcing. The key word here is 'potential', as Blinder (2006) includes occupations that may become tradable at some point in the future, but that are not capable of being traded now.

For example, the services of art gallery directors are currently not traded internationally, since directors of artistic facilities need to be present on-site to manage the facility and its staff. However, the management and creative leadership that are characteristic of a gallery director could certainly be provided remotely if the quality of the communication technology was high enough that there would be no loss of service quality from the physical remoteness of the director.

Building off the personal–impersonal characteristics of occupations, Blinder (2007) provides a more refined estimate of how much employment can potentially be outsourced in the next two decades. That paper categorically states that its focus is on employment that is potentially outsourceable, as opposed to actually outsourced. Based on occupation descriptions, the study constructs a tradability index for the occupations, ranking the ease or difficulty of trading the activity of that occupation, and provides a subjective estimate that between 22 and 29 per cent of 2004 US employment can potentially be outsourced within the next decade or two. The paper also dispels the conventional wisdom that occupations that are sensitive to outsourcing are low-skill jobs, by finding that there is no correlation between the skill level of an occupation – whether measured by either wages or by education – and its tradability index.

Jensen and Kletzer (2006) use spatial clusters to estimate the maximum possible employment displacement attributable to services outsourcing. The study reasons that if service providers are spatially clustered (i.e. in close geographic proximity), then the industries involved must be tradable within the USA. If they were distributed over a wide geographic area, then they would not be tradable. The reasoning continues that if the activities and occupations of those industries are tradable within the USA, then they must also be potentially tradable internationally.[2] Jensen and Kletzer (2006) thus estimate that up to 28 per cent of all US employment is potentially tradable, although some occupational groups have higher shares of tradable employment than others.

Jensen and Kletzer (2007) then apply a task-content approach, to provide new estimates of the proportion of employment in each occupational group that may be potentially tradable. Surprisingly, the geographic concentration approach's estimate of 28 per cent of all employment being potentially outsourceable is very close to the new approach's estimate of 27 per cent of all employment being in the most potentially tradable group.

Looking at the issue from another perspective, Baldwin (2009) notes that despite being recognised as a high-profile services exporter, the USA actually has a positive trade balance in services, exporting more services from the rest of the world than it receives, where the activities under discussion involve services like computing or other business services. Baldwin (2009) uses data from Amiti and Wei (2005) to show that there are trends of both increasing services imports and exports for the USA, with a positive services trade balance rising between 1980 and 2003. If the trends continue then the impact of US services exports on other countries are also likely to increase. The impact of US services exports – dubbed 'in-sourcing' – on other countries would ultimately depend on whether US services are substitutable with activities by domestic workers in other countries (as is assumed later in this paper), or whether they are complementary, e.g. US managers leading Indian or Chinese software engineers or call centres. If US exports are substitutes, then non-US workers will be displaced by the US services – in a manner similar to what is perceived to be the effect of imported services in the USA. If US exports are complements, then it may prove to be beneficial to the complementary workers, raising their demand involved in providing those services domestically, in a mirror image of the US experience. However, the relationship between US services and workers in other countries is yet to be well captured in the literature, and is also beyond the scope of this study.

[2] This is based on the intuition, validated by Helpman and Krugman (1985) that goods that are traded tend to be geographically concentrated, in order to capitalise on increasing returns to scale and access to inputs such as natural resources, among other reasons.

Aside from the estimates of the scope of services outsourcing's impact on the US labour market, and Baldwin's (2009) point about potential in-sourcing, one of the key ideas to take away from Jensen and Kletzer (2006, 2007) and Blinder (2007) is that the set of US occupations that may (or may not) be affected by outsourcing is constantly changing. There may be a time in the future when all possible outsourcing-sensitive will have been affected. For now, however, it appears that empirical analyses – such as those reviewed in Section 3 – that make *a priori* predictions of the impact of greater services outsourcing on the US economy based on *ex post* labour market data may represent lower bound approximations, being unable to capture the future impacts of outsourcing on newly tradable occupations.

3. EMPIRICAL ANALYSES

Outsourcing, from the USA and from Europe, has been the focus of a large body of the empirical literature. However, the best place to begin reviewing this empirical work is not with the services literature, but rather with research on materials offshoring from the early 1980s, which is similar to the current services outsourcing phenomenon. Like services outsourcing, the fragmentation of production processes gave rise to a booming trade in intermediate merchandise inputs.[3]

Feenstra and Hanson (1996) suggest that intermediate material inputs imports have positive effects on the wage share of skilled workers in the USA. Turning to other labour groups, Hijzen et al. (2005) examined the UK's manufacturing industry between 1982 and 1996, and found that materials offshoring had a strong negative impact on the demand for unskilled labour. In a similar manner, Strauss-Kahn (2003) demonstrated for France that increasing shares of imported intermediate inputs in manufacturing production reduced demand for unskilled workers by as much as 15 per cent between 1977 and 1985, and by 25 per cent between 1985 and 1993. This result is supported by Geishecker and Gorg (2008a), which analysed German workers across three skill categories found that high-skilled workers experienced increased wages due to fragmentation and trade in intermediate inputs. At the same time, the study found evidence that the intermediate inputs trade reduced the real wage for workers in the lowest skill categories.

[3] This is synonymous with the terms *vertical specialisation* (Hummels et al., 2001) and *slicing up the value chain* (Krugman, 1995) describing the breaking of a single production process into separable production processes that can occur in physically distinct stages, where the products of the *fragmented* production processes are intermediate inputs.

Hummels et al. (2009) used a unique matched worker–firm dataset from Denmark to examine the impact of offshoring on both wages and employment. The study finds that exogenous increases in outsourcing reduce wages and increase the probability of worker–firm separation. The study also finds that the increasing imports of intermediate inputs from high-income countries will lower wages for high-skill workers while raising wages for low-skill workers, with the reverse occurring when inputs are sourced from low-income countries.

Focusing specifically on services outsourcing from the USA and the UK, Amiti and Wei (2005, 2009) find that the claim that outsourcing dramatically reduces job growth is heavily exaggerated. Using the British Household Panel Survey, Geishecker and Gorg (2008b) provide evidence that services outsourcing has contributed to a widening of the wage gap between skilled and unskilled workers in the UK. Finally, examining both the manufacturing and services industries through a general equilibrium estimation framework, Canals (2007) finds that the trade in intermediate inputs explains up to 36 per cent of the changes in the skilled–unskilled wage gap for the period 1980–99 in the USA.

The empirical literature thus supports the idea that increases in imported intermediate inputs – both services and manufacturing inputs – has historically been beneficial for higher skilled workers, increasing their wages, relative to those of less-skilled workers. This literature does not analyse the impact of increases in services outsourcing on the labour market for more recent years, a timeframe that has seen rapid increases in services imports as well as large changes in the labour market and wider economy. The relevance of these studies' conclusions to the contemporary context thus remains untested.

Also, the methodologies of these analyses are not ideal for capturing the future impacts of outsourcing on and through specific tradable occupations, because it is difficult to analyse potentially tradable occupations using *ex post* data on the set of occupations that are currently tradable, because these two sets may be different.

4. THEORETICAL FOUNDATIONS

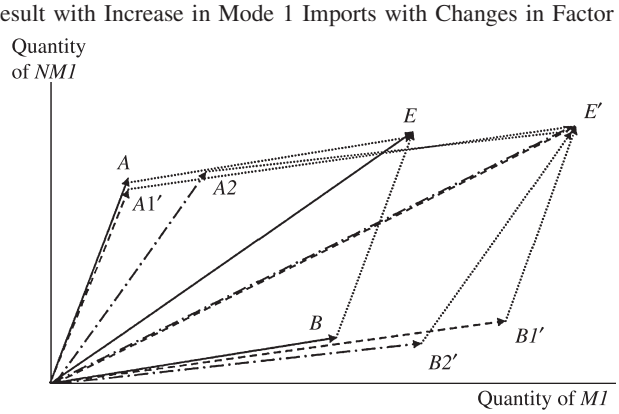
Outsourcing has been described earlier in this paper as the trade in Mode 1 services, where the traded services are used as intermediate inputs in production. Bhagwati et al. (2004) described the current services trade phenomenon as being qualitatively different from goods trade because the services currently being traded were previously non-tradable. It is only after various technological innovations that non-tradables have become tradable, through the vertical fragmentation of production.

Fragmentation in a classical Heckscher–Ohlin (H–O) model thus presents itself as a natural starting point to understand some of the basic mechanisms by which vertical specialisation has led to the trade in services. However, Deardorff (2001) has shown that results from simple H–O models of fragmentation do not hold when subject to generalisation, since the impact of fragmentation on relative factor prices is sensitive to the factor intensities of the fragments as well as the original production technology. More importantly, when fragmentation fails to cause factor price equalisation, there is no guarantee that the factor prices will move closer together as the theory would predict in simple cases. Kohler (2001) emphasises the weakness of the H–O model in determining factor price effects when considering many goods, many factors or many countries.

Moving away from the H–O framework, Feenstra (2004) provides a simple model of trade in intermediate inputs that demonstrates that the trade in intermediate inputs has an effect that is observationally equivalent to a factor-biased technical change. This insight can be reinterpreted to provide another perspective on the impact of increasing Mode 1 services imports, and can be illustrated by considering an economy that produces two final goods (*X* and *Y*) using Mode 1 imports (*M1*) and an aggregate factor that comprises all other inputs (*NM1*). By definition, Mode 1 imports are not produced by the economy in question and given a fixed level of imports can be assumed to be equivalent to a factor endowment. Industry *X* uses non-Mode 1 factors (*NM1*) intensively, while industry *Y* uses *M1* intensively.

Now, if more Mode 1 services were imported into this economy, then the endowment of *M1* would increase while the economy's endowment of *NM1* remained unchanged. Assuming that there is no change in technologies, the

FIGURE 1
Rybcynzski Result with Increase in Mode 1 Imports with Changes in Factor Use Intensities



Rybcynzski theorem tells us that the industry that uses *M1* more intensively would expand, while the other industry would shrink.

However, if there is a factor-biased technological change in all industries, such that the relative demand for *NM1* declines and both industries use *M1* more intensively, then the simple Rybcynzski effect will not be enough to predict the changes in output and factor use as shown by the Lerner diagram in Figure 1.

The two vectors, *OA* and *OB*, represent the initial factor requirements to produce a unit of each output. The lengths of the vectors are determined by the factor endowment of the economy, and represent industry outputs. The area between these two vectors is the cone of diversification, so called because it represents the area within which the endowment point must lie to allow for strictly positive outputs from each industry. The initial endowment point is at *E*, and the industries produce output up to points *A* and *B*.

An increase in Mode 1 services imports – and the subsequent shift of the endowment point to *E′* – can lead to two possible scenarios. The first is where the *NM1*-intensive industry shrinks, from *A* to *A1′*, using *M1* more intensively and less *NM1* than before. In this case, the *M1*-intensive industry expands its output by using more of both inputs. The second scenario is where the *NM1*-intensive industry expands, by using more of both inputs, while the *M1*-intensive industry expands but uses less *NM1*. However, which scenario will play out and for what industries in the real world in the event of an increase in Mode 1 imports are questions that cannot be answered through simple theoretical constructs such as this, and must be answered empirically.

Purely analytical approaches by themselves are thus unable to address the primary research question posed in this paper. Rather, it requires the application of a quantitative methodology, as was demonstrated in Markusen (2006), which used simple stylised computable general equilibrium (CGE) simulation models to illustrate a variety of theoretical perspectives on outsourcing. However, the models in that study had neither adequate dimensionality nor sufficient data specificity to answer the questions posed here.

5. METHODOLOGY

In the spirit of Markusen (2006), this paper also uses a comparative static CGE simulation model, but it is additionally supported by detailed labour market data to examine how different segments of the US labour market are affected in a Ricardo–Viner (sector-specific factors) model, with Mode 1 service imports into the USA increasing enough to displace all potentially tradable employment. This approach overcomes the challenge of determining

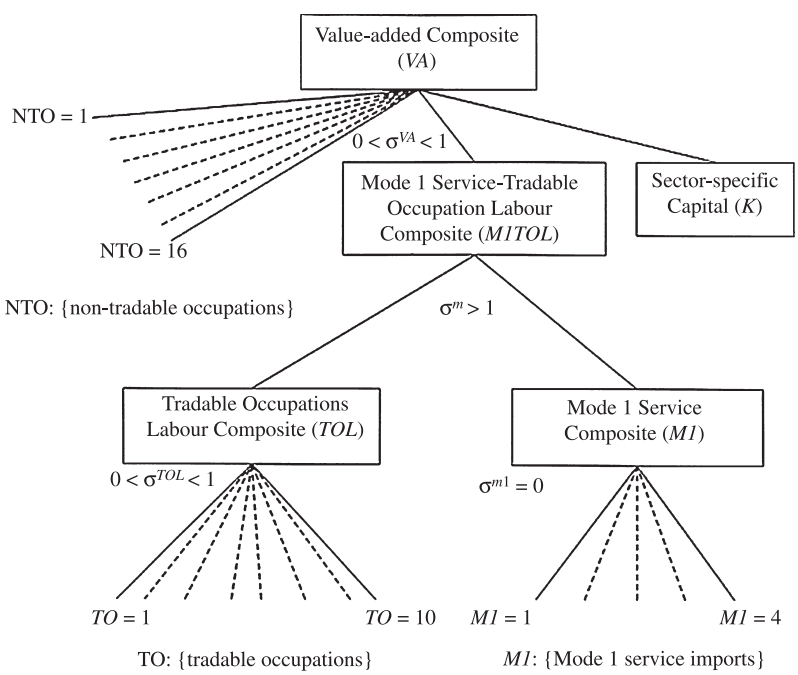
generalised analytical solutions by obtaining numerical results to address the primary research question.

a. The Model

The comparative static general equilibrium model is an Arrow–Debreu-type model that employs a specific factors approach, and is set up as a mixed complementarity problem using the Mathematical Programming System for General Equilibrium (MPSGE) framework of Rutherford (1999). The behavioural equations are of the nested CES and CET variety, all goods are tradable and homogeneous across regions and trade links exist between all countries for all goods. Armington and Dixiteneous–Stiglitz demand for variety are explicitly avoided due to their tendency to place heavy weight on current patterns of bilateral trade.

At the topmost level of the production function, a composite of intermediate inputs and a value-added composite are related through Leontief fixed proportions technology. The intermediate inputs themselves are simply combined in fixed proportions to produce the intermediate inputs composite. The formation of the value-added composite is a bit more complicated, however.

FIGURE 2
Value-added Composite Nest in CES Production Function



As Figure 2 shows, the value-added composite uses sector-specific capital, a variety of different labour types that are classified as non-tradable, and a Mode 1 service–tradable labour composite. Some occupational groups are in activities that can be substituted by a Mode 1 services import, and are thus at risk of being displaced. These occupations are tradable, while those that cannot be replaced are non-tradable, with the nesting structure of the model reflecting this. These non-tradable occupational groups are related to the other inputs in this nest through elasticity of substitution (σ^{VA}) less than one, implying that they are very weak substitutes.

The Mode 1 imported service–tradable occupation labour (*M1TOL*) composite is in turn composed of two other composite inputs. One composite is the Mode 1 services composite, which is made up of imported services brought together in fixed proportions. The other composite, the tradable labour composite, combines the different labour groups that can be identified from the literature as being 'tradable' or substitutable with Mode 1 services imports: tradable occupations. The tradable occupations labour (*TOL*) types have a very low substitutability among themselves, with the within-nest elasticity of substitution being less than one. This low substitutability captures the idea that each occupation is involved in a distinct activity that cannot be substituted easily by another occupational group.

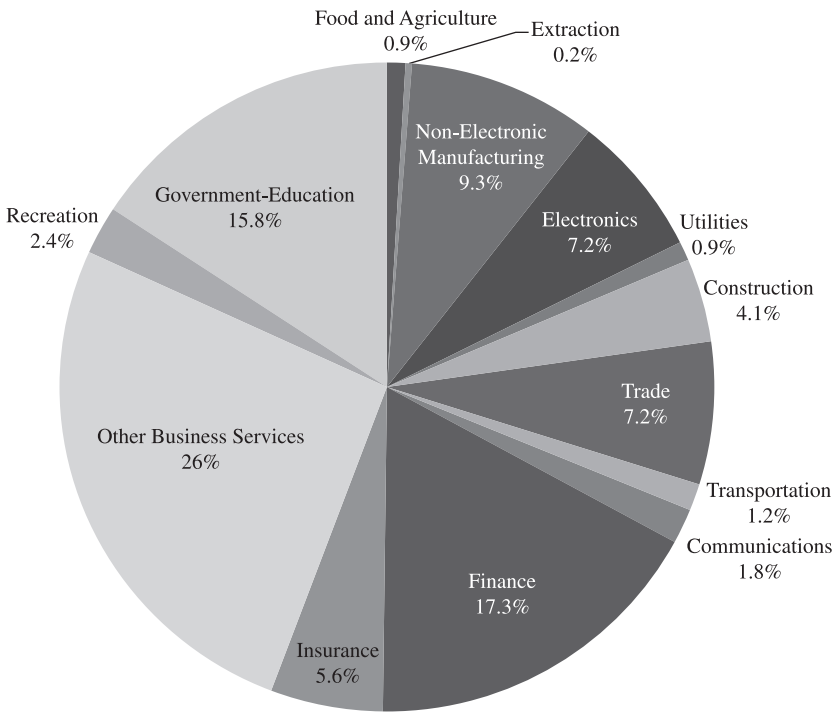
The *TOL* composite and the Mode 1 services composite (*M1*) are related through an elasticity of substitution, σ^{m}, that is greater than one. This nesting structure captures the key idea that a combination of Mode 1 services can substitute for the activities of a grouping of occupations.

For example, an imported back office operation that is made up of imported communications, data processing and accounting services replaces not just the US-based accountant that would have done the accounting, but the in-house clerical, IT and legal support that would have been used. Neither tradable nor non-tradable labour can be directly traded internationally in this framework, and so all labour is domestic, by construction. Furthermore, the total supply of labour in each occupational group[4] is fixed, implying that workers cannot change occupations. Workers in a given occupational group can, however, change industries. That is, labour is completely mobile between industries, and thus wages of workers in a given occupational group equated across industries, but may vary across occupations within the same industry.

On the demand side, the model has a representative household for each region. Mode 1 services are traded through a one-to-one 'production' relationship whereby domestically produced services in one country are transformed

[4] In our model, tradable and non-tradable variations of an occupational group are distinct and fixed. That is, an accountant who does not interact with clients face-to-face and is classified as tradable cannot become tradable and begin interacting face-to-face.

FIGURE 3
Distribution of Labour in Tradable Occupations by US Industry



Source: Authors' estimates from Dimaranan (2006) and Bureau of Labor Statistics (2008).

into Mode 1 services for another country. The resulting model is able to facilitate analyses of increased services imports by improving the technology that transforms domestically produced services from the rest of the world into Mode 1 imports into the USA.

b. The Data

The GTAP database (Dimaranan, 2006) and the 2006 Occupational Employment and Wage Estimates (OEWE) from the Bureau of Labor Statistics (2008) are used to build the supporting database. The GTAP database provides input–output production data, and trade and investment data, and is aggregated to 14 industries and two countries relevant for this analysis. The database is also rebalanced to remove tariff, subsidy and tax data following Malcolm (1998).

The value of labour in production in the GTAP database is split using the OEWE data for 2006, where the OEWE data comprise data for the USA on employment and mean annual wage by occupation and industry. These data are

aggregated to provide the value of labour by occupational groups measured at the two-digit SOC level and the 14 industries that the GTAP database has been aggregated to. The new occupational classification reflects each two-digit category's tradability, where a tradable occupation is a part of the set of occupations that can be substituted by imported Mode 1 services.

About a third of all US workers are in tradable occupations, with the workers involved in Management, Business and tradable Administrative Support representing the largest shares of *TOL*. More than a quarter of these tradable occupation workers are employed in the Other Business Services sector (Figure 3). Large numbers of *TOL* are also employed by the Finance, Insurance, Government-Education, Non-Electronic Manufacturing, Electronics and Trade sectors. Despite employing more than half of all workers that are in tradable occupations, the sectors that produce US Mode 1 services exports – Other Business Services, Insurance, Finance and Communications – are responsible for less than 20 per cent of total US output.

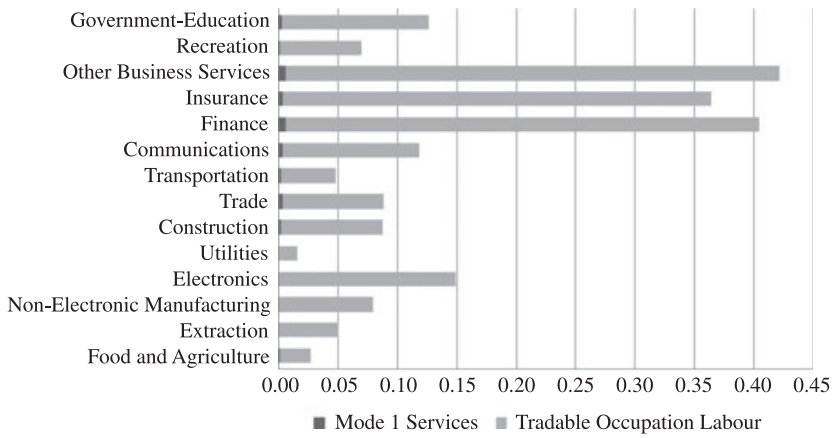
For a complete picture of the importance of Mode 1 services and tradable occupations to various industries, we also consider the industries' intensities of use of the *M1TOL*. Figure 4 shows that the Other Business Services, Insurance and Finance sectors – the sectors with the highest input–output intensities of this composite – have intensities greater than a third. The Electronics, Communications and Government-Education sectors are also important users of the *M1TOL* composite, with input–output ratios greater than 0.1. Increased imports of Mode 1 services can then be expected to have a greater impact on industries with higher shares of *TOL* (seen in Figure 3) and with higher imported services–tradable labour composite intensities of use (seen in Figure 4).

c. The Analysis

Within this analytical framework, where *TOL* and Mode 1 services are substitutable, every unit of Mode 1 services imported into the USA is characterised as 'displacing' an equivalent number of workers in tradable occupations, although the displaced workers must ultimately be re-employed under the fixed employment assumption. Measuring the extent of displacement as the ratio of the quantity of Mode 1 services imports to the quantity of total labour, the data reveal that current Mode 1 services import into the USA displace 0.8 per cent of all labour, or 2.5 per cent of *TOL*.[5] This current level of displacement appears to be very low when compared with Blinder's (2007) estimate that up

[5] Quantities in the MPSGE framework are more precisely defined as units of the commodity or factor that can be purchased for one dollar in the benchmark database. This is possible because all prices are normalised to one in the benchmark data, although prices and quantities can change through the simulation.

FIGURE 4
Intensities of Use of Mode 1 Services and Tradable Occupation Labour by Industry



Note:
The dark section of the bar indicates the intensity of Mode 1 services use, while the lighter section indicates the intensity of tradable occupations labour use.

Source: Authors' estimates from Dimaranan (2006) and Bureau of Labor Statistics (2008).

to 29 per cent of US labour is potentially outsourceable over the next two decades. If up to 29 per cent of labour is to be displaced by Mode 1 imports over the next 20 years, then 7.25 per cent of all labour should be displaced within five years, assuming a constant rate of displacement.

A five-year time horizon is a useful timeframe for the comparative static framework used in this analysis. If periods longer than five years are considered then changes in human capital investment and its subsequent impact on the occupational distribution of labour would have to be considered. Given the relative immaturity of the outsourcing literature vis-à-vis predicting how the composition of human capital might adjust to changes in outsourcing, this analysis avoids the theoretical complications that a longer-run analysis would entail. Little change in the occupational distribution of US labour is expected over a five-year period, and the modelling framework assumes that workers are fixed in their occupations. However, in reality, workers of varying skill are somewhat mobile across occupations. As such, the differentials in wage impacts across occupations are higher than under an assumption of partial mobility, and can be considered an upper bound on possible wage impacts of outsourcing.

Using the model and database described above, the impact on the USA of the displacement ratio increasing to 7.25 per cent is thus examined. This is achieved by considering cost-reducing technological improvements in the Mode 1 services trade into the USA, such that the quantities of Mode 1 services

imports increase enough to raise the displacement ratio from 0.8 per cent to 7.25 per cent. While maintaining the same shares of each service type in the total quantity of imported Mode 1 services, the flow of service imports increases by 721 per cent from the benchmark level. The analysis does not assume any changes in services sector productivity or changes in the technology of US exports of services. As a comparative static perturbation of services imports only the framework thus allows us to focus on the impacts attributable to just changes in services imports, without the added complexity of decomposing changes attributable to other economic shocks.

The impact of this increase in Mode 1 services imports on the US economy can be understood by focusing on three specific mechanisms. The first mechanism is the impact of increased Mode 1 services trade on within-industry production of the imported services–tradable labour composite (*M1TOL*), explained through effective elasticities of substitution and the supporting cost shares. The second mechanism is the impact of changes in the demand for the *TOL* composite on individual tradable occupations. The third mechanism is the impact of changes in the services–labour composite on other factors of production and overall industry output.

(i) Effective elasticities of substitution and tradable occupations

The first mechanism by which outsourcing affects US labour markets determines the impact that increases in Mode 1 services will have on the production of these services–*TOL* composite (*M1TOL*). The services–labour composite in any given industry is a qualitatively different input from the composite used in another industry. This is because the mix of Mode 1 services and *TOL* used to produce their respective composites – *M1* and *TOL* – vary across industries. These composites in turn are used in varying combinations across industries to produce the services–labour composite (*M1TOL*).[6]

For analytical purposes, the $M1TOL_j$ composite producing nests can be conceptualised as separate sub-industries. Within these sub-industries, the input intensities vary even though the elasticity of substitution between the Mode 1 services composite ($M1_j$) and the tradable occupations labour composite (TOL_j) are identical across industries. The relative prices[7] of $M1_j$ and TOL_j also vary across $M1TOL_j$, since they are composites of other inputs. Changes in their composite prices will thus be cost-share weighted changes in the prices of their constituent inputs. The technological change that increases the imports of Mode 1 imports into the US economy will thus have differential effects on the services–labour composite in different industries depending on the changes in

[6] Henceforth, *M1*, *TOL* and *M1TOL* will be denoted with subscript *j*, where *j* is the parent industry (e.g. Finance, Construction, etc.) using them.

[7] The numéraire in this model was taken to be the price of capital goods in the rest of the world.

relative factor intensities and the relative input prices of the $M1_j$ and TOL_j composites.

The technological shock that increases the Mode 1 services imports into the USA reduces the prices of the four Mode 1 services that constitute the Mode 1 services composite ($M1_j$) – Other Business Services, Insurance, Finance and Communications. The composite price of $M1_j$ relative to the composite price of TOL_j is found to fall by similar magnitudes across all industries, with an average decline of 75 per cent. The elasticity of substitution between $M1_j$ and TOL_j, σ^m, is the same across all industries by construction. So, given the same elasticities across industries, the changes in relative prices together with the benchmark factor use intensities of $M1_j$ and TOL_j will be useful in explaining how the value of *TOL* as a share of the values of the services–labour composite changes as a result of the change in prices.

Figure 5 describes what would have happened to the services–labour sub-industry ($M1TOL_A$) in an industry A if the quantity of the composite input had been held constant. In the benchmark, the isocost curve, c_A, is tangent to the isoquant $f(M1TOL_A)$, the slope of which represents the price of $M1_A$ (the Mode 1 services composite) relative to the price of TOL_A (the *TOL* composite). As the relative price of $M1_A$ fell, if the quantity of $M1TOL_A$ remained constant, then the within-nest elasticity σ^m and the change in the relative prices would determine the change in the input bundle from X_A to Y_A, where more $M1_A$ and less TOL_A was used.

However, the quantity of $M1TOL_j$ produced by each industry is found to increase, with some sub-industries expanding by using more of $M1_j$ as well as TOL_j, while others expand by just using more $M1_j$. Figure 6 illustrates the interaction of relative factor prices and input quantities in an industry where the $M1TOL_j$ expansion results in less TOL_j being used. For this industry type B, the initial input use before the endowment change is at X_B, where the isoquant $f(M1TOL_B)$ is tangent to the benchmark value isocost line c_B. When the relative price of $M1_B$ changes by the same amount described in Figure 5, the new isocost curve, c'_B is found to have the same slope as c'_A from Figure 5, but shifted outwards to be tangent to the new isoquant at Y_B. At this new equilibrium less TOL_B and more $M1_B$ are used, and $M1TOL_B$ output is higher than before.

Figure 7 demonstrates similar mechanisms at work for another representative industry C, where the $M1TOL_C$ expansion occurs through the greater use of both $M1_C$ and TOL_C. Once again the relative price of $M1_C$ declines by the same amount as in Figures 5 and 6. However, the new isocost curve, c'_C, is tangent to the isoquant $f(M1TOL_C)'$ at point Y_C, where more of both inputs are used and with output higher than before.

This is due to the smaller benchmark effective elasticity of substitution (Keller, 1979) between $M1_j$ and TOL_j (η_j^{M1TOL}). In a nested CES framework,

FIGURE 5
Changes in Use of Mode 1 Services and Tradable Occupations Labour in Production of Composite Intermediate ($M1TOL_A$) with Quantity of Composite Remaining Constant and Relative Input Price Changing

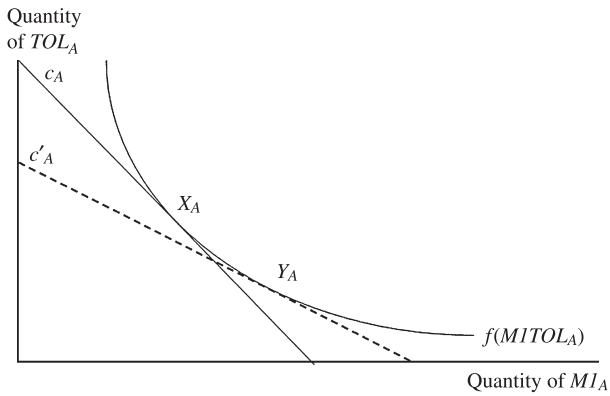
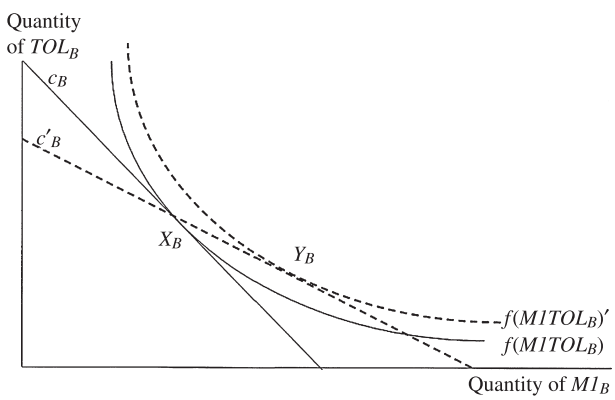


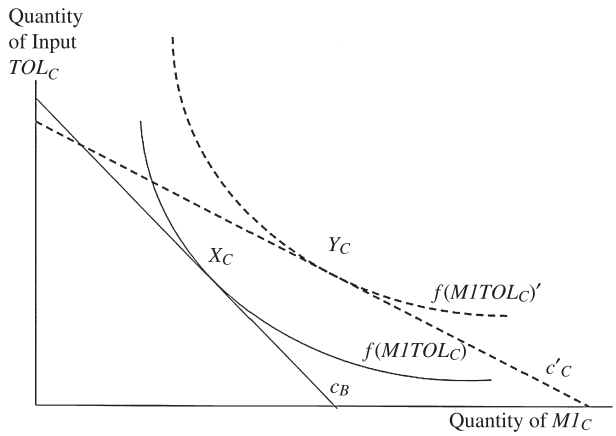
FIGURE 6
Factor Use and Output Changes in Mode 1 Services–Tradable Occupations Labour Composite ($M1TOL_B$) where Less Tradable Occupations Labour is Used after Fall in Relative Input Price



when a composite input is held constant, the substitution possibilities between the various components of the composite – in this case TOL_j and $M1_j$ – are limited. When the level of industry output is held constant, however, it allows for substitutions between different aggregate inputs as those aggregate inputs also change their quantity,[8] increasing substitutability between lower-level inputs. The overall level of substitution between any two input components

[8] See Burniaux and Truong (2002) for a deeper discussion of the differences between price elasticities and effective elasticities in CES frameworks.

FIGURE 7
Factor Use and Output Changes in Mode 1 Services–Tradable Occupations Labour Composite ($M1TOL_C$) where More of All Inputs are used after Fall in Relative Input Price



within a particular nest may thus be much larger than the magnitude of the within-nest substitution elasticities. This is the case here, with the effective elasticities of substitution between $M1_j$ and TOL_j (η_j^{M1TOL}) being much larger than the value of the within-nest σ^m specified in the model.

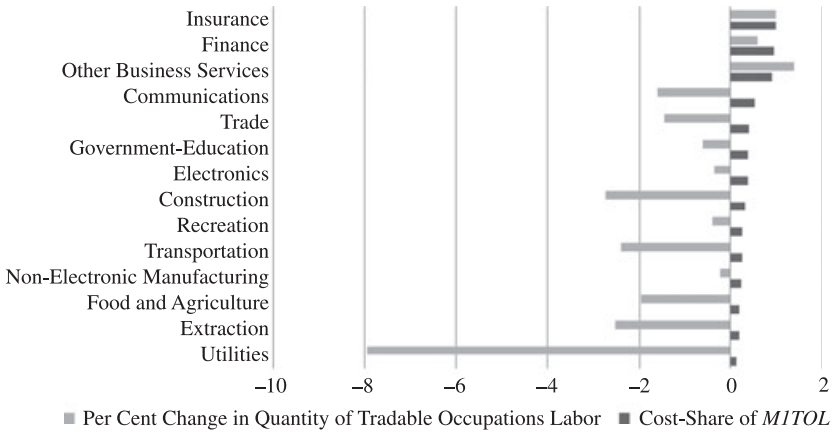
So, smaller η_j^{M1TOL} would lead to greater outward shifts of the new isocost curve, and greater use of TOL_j. Conversely, the larger the effective elasticity, the smaller the increase in TOL_j will be. Keller (1979) provides additional insight into what drives this result by examining the specific formula for η_j^{M1TOL}:

$$\eta_j^{M1TOL} = \sigma^m * \frac{1}{\theta_j^{M1TOL}} - \sigma^{VA}\left[\frac{1}{\theta_j^{M1TOL}} - \frac{1}{\theta_j^{VA}}\right]. \quad (1)$$

θ_j^{M1TOL} is the cost share of the $M1TOL_j$ in the production costs of j, while θ_j^{VA} is the cost share of the entire value-added nest in that industry. As can be seen, the size of the effective elasticity is influenced heavily by the cost share of the composite of the lowest nest being considered, in this case of $M1TOL_j$. So, as θ_j^{M1TOL} gets larger, the greater the outward shift of the isocost curve and the more TOL_j is used. The smaller that the cost share becomes, the smaller the increase (or greater decline) in TOL_j use becomes. That is, there is an inverse relationship between the size of $\theta_j^{M1TOL}$and the quantity of TOL_j used.

The results illustrate this in Figure 8. The relationship between the benchmark cost shares of $M1TOL_j$ and the changes in TOL_j use is apparent, with the two variables sharing a correlation coefficient of 0.67. After outsourcing

FIGURE 8
Comparison of Change in Tradable Occupations Labour and Benchmark Cost Share of $M1TOL_j$ after Mode 1 Services Imports Increase by 721 Per Cent



Note:
Values normalised to values in Insurance for comparison purposes.

Source: Authors' results.

increases, the TOL_j use is found to increase in Other Business Services, Insurance and Finance and declines in all other industries. The three industries in question have the largest benchmark cost shares of the *M1TOL* composite and hence also have the smallest effective elasticities of substitution. They are the only industries to increase their use of tradable labour.

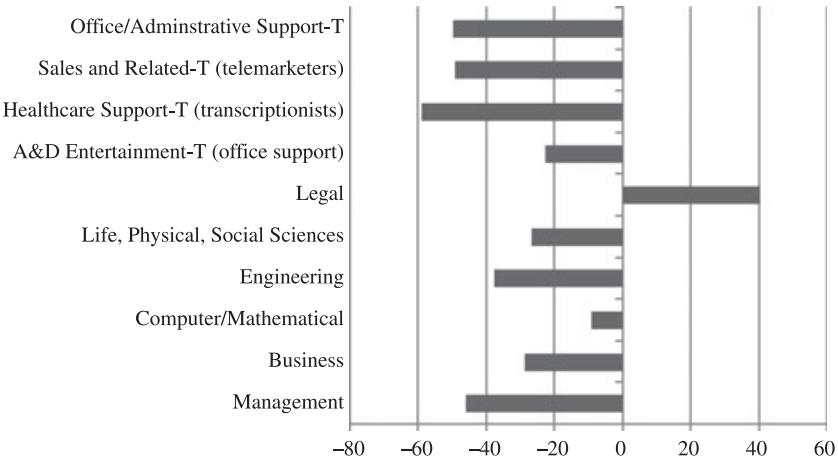
(ii) Changes in demand for tradable occupations labour

The increase in Mode 1 services imports into the USA have thus been shown to increase the use of the $M1TOL_j$ across all industries by using more Mode 1 services. However, with the exception of Other Business Services, Insurance and Finance, US industries reduce their demand for TOL_j due to their heavy substitution towards Mode 1 services. Subsequently, these industries reduce their demand for *TOL*.

The declining demand for *TOL* in these industries pushes down the wages of the tradable occupations that are used in those industries. At the same time, Other Business Services, Insurance and Finance – intensive TOL_j users in the benchmark – increase their demand for TOL_j, and subsequently for the *TOL* that comprise that composite.

The wages are seen to decline in nine of the 10 occupational groups that are classified as being tradable, with the magnitudes of the declines ranging from 9 per cent for tradable Computer-Mathematical occupations (SOC group 15) to 60 per cent for Healthcare Support (part of SOC group 31, transcriptionists). In

FIGURE 9
Per Cent Change in Wages of Tradable Occupations Labour after Increase in Mode 1 Services Imports by 721 Per Cent



Notes:
The occupational groups with a 'T' are those that have two-digit SOC category counterparts in the non-tradable occupations set. The wage changes have been deflated by the change in the US CPI.

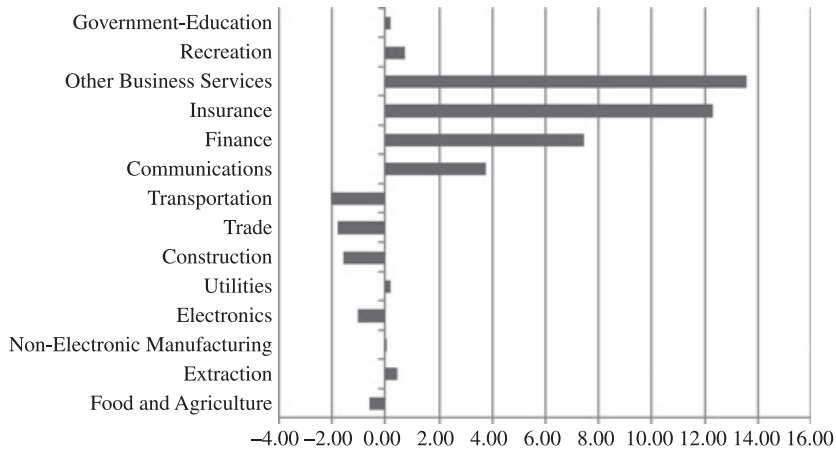
Source: Authors' results.

contrast, Legal occupations workers experience a wage increase of 40 per cent (Figure 9).

This is because the vast majority of workers in Legal occupations are employed by legal firms and law offices, whose economic activities are defined in the input–output framework of the supporting database and model as falling within the Other Business Services sector. Three-quarters of all workers in Legal occupations are employed in the Other Business Services sector, and include legal professionals like trial lawyers. Legal occupations used by other industries would involve professionals like tax-law experts or in-house legal advisors whose activities would not require identification with a law office or firm.

The effective elasticities of substitution between different tradable occupations in the various industries are found to be large and negative, indicating their complementarity with each other. So, when the demand for one tradable occupation falls, the demand for all of the other tradable occupations is also pushed downward, and vice versa. So, when the demand for labour in tradable occupations falls in most industries and pushes down their wages, there is also a downward pressure on the demand and wages of Legal workers. However, due to the complementarity of tradable occupations with each other, when Other Business Services, Insurance and Finance expand their output (Figure 10) and increase their demand for *TOL*, there is an upward push on their

FIGURE 10
Changes in Output of US Industries after Mode 1 Services Imports Increase by 721 Per Cent



Source: Authors' simulations.

wages. For most tradable occupations, the upward push of this increased demand is insufficient to yield an increase in their wages.

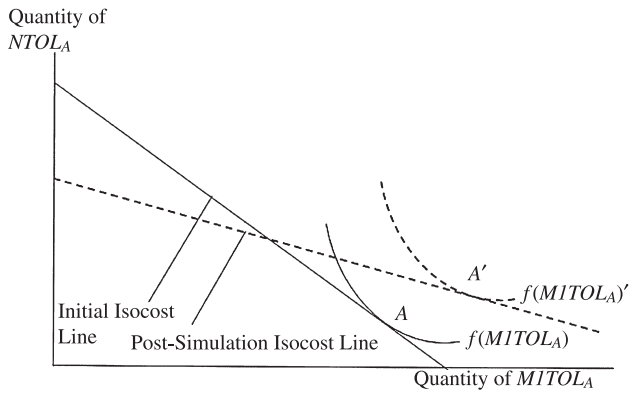
However, more than 70 per cent of Legal workers are in Other Business Services, which experiences the greatest output expansion in this simulation analysis. The downward push on their wages exerted by the sectors with declining demand for Legal workers is thus overwhelmed by the increased demand in the expanding sectors, especially in Other Business Services. The sectoral redistribution of Legal workers can be viewed simply as lawyers moving away from industries other than Other Business Services where they may have been legal consultants or advisors, towards law firms and offices where they may function as litigators.

(iii) Changes in demand for other factors and in industry output

As seen earlier, the increased imports of Mode 1 services results in all industries producing and using more of the *M1TOL* composite, with Other Business Services, Insurance and Finance demanding more tradable labour to produce larger quantities of the composite input. We can now examine the interaction of this composite input with the other factors of production as they determine the changes in the overall industry output, and in the use of the other factors of production.

Before getting to these results, it is necessary to understand the mechanisms by which the services–labour composite ($M1TOL_j$) affects the other factors of production; non-tradable occupations labour and sector-specific capital. To that end let us first consider a simplified framework, where the services–labour

FIGURE 11
Factor Use and Output Changes in Industry that Expands by Using More of all Inputs after Fall in Relative Input Price



composite interacts only with a representative non-tradable occupation labour type ($NTOL_j$). The changes in the price of services–labour composite relative to *NTOL* and the benchmark factor use intensities can now be used to determine how a given industry will adjust output and input combinations when there is an increase in Mode 1 services imports.

We know from the previous sections that the increase in Mode 1 services imports has led to increases in the supply of the services–labour composite ($M1TOL_j$), and decreases in the prices of its constituents. This means that the price of the services–labour composite has also declined across the economy. A decline in the price of the services–labour composite relative to *NTOL* can have one of three effects on an industry, depending on the characteristics of the industry. For an identical decline in the relative price of the services–labour composite ($M1TOL_j$), these three alternative scenarios are depicted in Figures 11–13.

In all three figures, the benchmark isocost curves with identical slopes (i.e. identical relative prices) are tangent to isoquants $f(M1TOL_A)$, $f(M1TOL_B)$ and $f(M1TOL_C)$ corresponding to representative industries *A*, *B* and *C*. Industry *A* uses $M1TOL_j$ the most intensively, while industry *C* uses it the least intensively. Industry *B* uses the composite input more intensively than *C*, but less than *A*.

If the relative price of $M1TOL_j$ declines, with the isocost lines becoming flatter, then each industry experiences an increase in its use of $M1TOL_j$ as well as a substitution between $M1TOL_j$ and $NTOL_j$, with the new isocost line being tangent to the industries' isoquants at A', B' and C'. It can be seen that industry *C* has reduced its use of $NTOL_j$, and shrunk. Industry *B* increased its use of

FIGURE 12
Factor Use and Output Changes in Industry that Expands by Using More of the Mode 1 Services–Tradable Occupations Labour Composite ($M1TOL_j$) after Fall in Relative Input Price

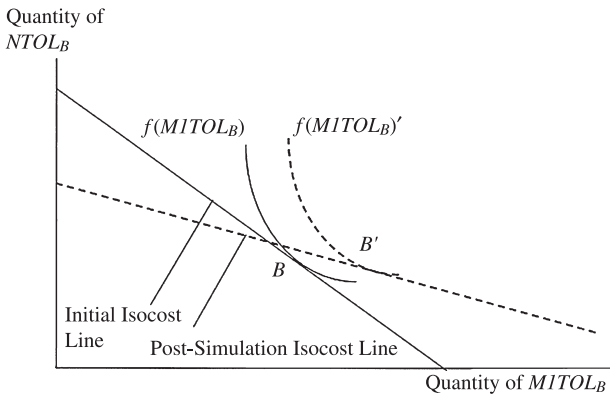
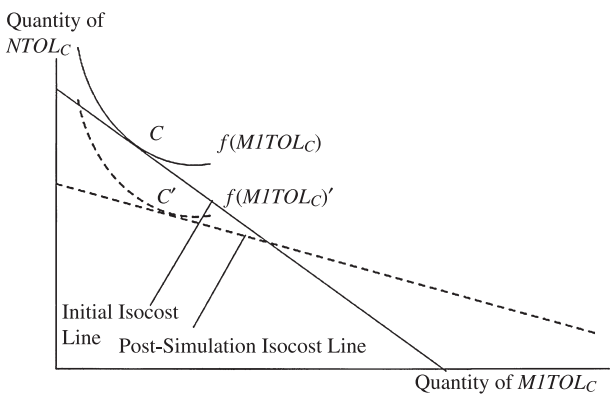


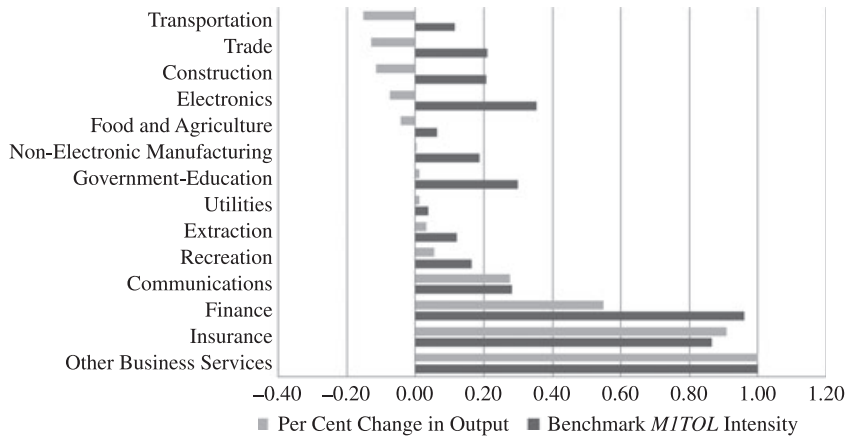
FIGURE 13
Factor Use and Output Changes in Industry that Shrinks after Fall in Relative Input Price



$M1TOL_j$, used less $NTOL_j$ and still expanded. Industry *A* expanded by using more of both inputs.

Even though all three representative industries faced the same change in relative prices, each industry archetype experienced different changes in inputs, and thereby different changes in output. What explains this is each industry's benchmark $M1TOL_j$ use intensity. This is observed by seeing where the isocost curve was initially tangent to each industry's isoquant. Industries with higher benchmark $M1TOL_j$ use-intensities expanded, regardless of whether they used more $NTOL_j$ or not. This can be considered as a Rybcynzski-type effect, where the increase of an $M1TOL_j$ 'endowment' has helped industries that use it intensively to expand.

FIGURE 14
Comparison between Benchmark the Mode 1 Services-Tradable Occupations Labour Composite ($M1TOL_j$) Intensity and Change in Output after Increase in Mode 1 Services Imports by 721 Per Cent



Note:
Values rescaled by normalising to values in Other Business Services for comparison purposes.
Source: Authors' results.

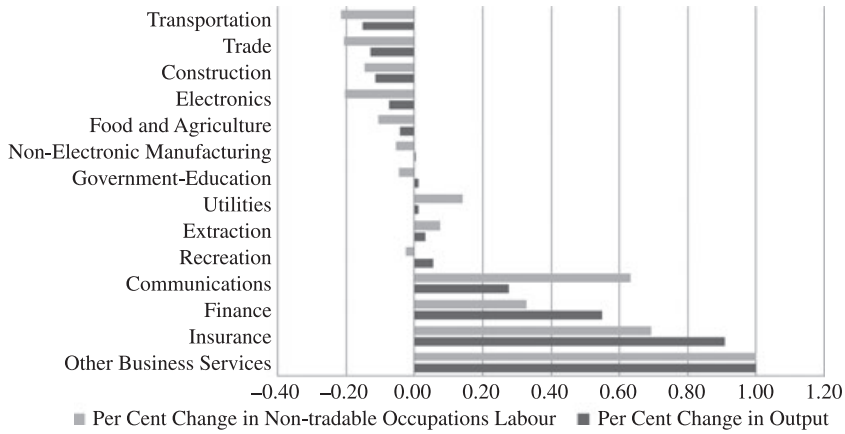
Turning now to the results of the CGE simulation analysis, the prices of the services–labour composite relative to a cost-share weighted composite prices of all non-tradable occupations declines by similar amounts across all industries. With relative input prices declining, the benchmark intensity of use of the services–labour composite can now be seen to determine whether an industry expands, and whether it does so by using more of the other inputs (i.e. non-tradable occupations) or not.

Figure 14 illustrates the direct relationship between an industry's benchmark $M1TOL_j$ intensity and the change in output resulting from the 721 per cent increase in Mode 1 services imports. Industries that used the composite input intensively, expanded, while those that used the input less intensively, grew less or shrank. Also, as the industries expand, their demand for non-tradable labour and capital also rises. Figure 15 illustrates this relationship between the change in the output of an industry and the change in the demand for non-tradable occupations labour. A handful of industries – Food and Agriculture, Construction, Electronics, Trade and Transportation – shrink while the remaining sectors expand, leading overall US output to increase by 1.6 per cent.[9]

The results of Figure 15 imply that the non-tradable occupations that are used intensively in the industries that are shrinking will experience declines in their demand. Wages for labour in occupations that are used in these industries

[9] See Figure 10 for unscaled changes in industry output.

FIGURE 15
Comparison between Change in Industry Output and Change in Demand for Non-tradable Occupations Labour after Increase in Mode 1 Services Imports by 721 Per Cent

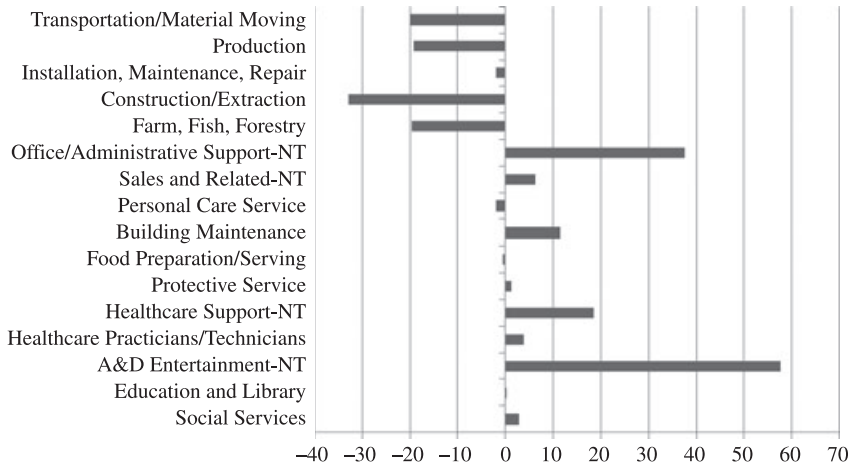


Note:
Values rescaled by normalising to values in Other Business Services for comparison purposes.
Source: Authors' results.

will thus decline, with the hardest-hit occupations being those with larger shares of their workforce in the shrinking sector. For example, 62 per cent of workers in Farm, Fishing and Forestry occupations (SOC group 45) are employed in the Food and Agriculture sector. When that industry shrinks, the demand for these workers is driven down, to reduce their wages by 20 per cent. Another example would be the 82 per cent of workers in Construction and Extraction occupations (SOC group 47) employed by the Construction sector. With the Construction industry shrinking, the wages of workers in these occupations fall by more than 30 per cent.

Conversely, industries that are expanding are demanding more of the non-tradable labour that they use intensively. This is illustrated by the Arts and Design (A&D) Entertainment occupations (SOC group 27, excluding office support). More than a third of all workers in these occupations are employed by the four industries that grow the most – Communications, Insurance, Finance and Other Business Services. Another 24 per cent of all A&D Entertainment workers are in the Recreation sector, which also expands. As these industries expand, they demand more intensively used non-tradable occupations labour, including A&D Entertainment workers, whose wages rise by 57 per cent as a result. Another good example of a non-tradable occupational group, whose demand and wages rise, is the Office-Administrative Support occupation (SOC group 43). This non-tradable occupational group is used most intensively in the same four expanding services industries that the previously mentioned

FIGURE 16
Per Cent Change in Wages of Non-tradable Occupations Labour after Increase in Mode 1 Services Imports by 721 Per Cent



Notes:
The occupational groups with 'NT' are those that have two-digit SOC category counterparts in the tradable occupations set. The wage changes have been deflated by the change in the US CPI.

Source: Authors' results.

non-tradable occupational group benefited from, with the Other Business Services sector alone employing 20 per cent of the total workers in this group. The changes in wages of labour in the other non-tradable occupations can be seen in Figure 16, and can be explained in a similar manner by examining their intensities of use in the expanding and shrinking sectors.

From the declines in the domestic output of certain sectors, and in the wages of occupational groups that are used intensively in those industries, it may be prematurely concluded that the demand for those industries' commodities is also declining. Given that the net output of the USA and aggregate income are both increasing, such a decline in demand would be counter-intuitive. The representative private household's demand for all commodities increases by 1.98 per cent,[10] since the aggregate income of the household is rising. The total income from labour alone increases by US$109.8 billion (or US$95.5 billion after deflating by the change in the CPI). The difference between the quantities of goods demanded by the household and the quantities produced domestically is explained by changes in the trade balance in those commodities.

[10] There is a uniform increase in the demand for all commodities because they are combined to produce the aggregate welfare good, which is demanded by the regional household. The aggregate welfare good is produced through a Leontief function, i.e. a CES function with a zero elasticity of substitution.

For example, since the output of the Food and Agriculture industry and wages of Farm, Fish and Forestry workers are falling, then it may appear as though private households in the USA are demanding less food. However, we know that the US representative private household is demanding almost 2 per cent more of this commodity. This is possible in the face of a shrinking Food and Agriculture sector because the USA reduces the export disposition of that industry's output. In the benchmark data, the USA was a US$14.5 billion net exporter of Food and Agriculture products. After the increase in Mode 1 services imports, this net export value shrank by 82.3 per cent, driven only by changes in its exports, despite a 2.3 per cent increase in its price. A similar story can be told for the Construction sector. The output of the domestic Construction industry shrinks. However, to meet the increasing demand for Construction goods and services, the USA goes from being a net exporter by US$1.6 billion to a net importer by US$25.5 billion.

The expansion of the services sectors – Communications, Finance, Insurance and Other Business Services – by 8.5 per cent, leads to US services exports growing by approximately 278 per cent. This is due not just to expansion of the sectors, but also to a shift in the export disposition of the four industries. Previously, 2.4 per cent of output from the US services industry was exported. After the technological improvement that made it easier for the USA to outsource services, the export disposition of US services industries shifted to 8.4 per cent. It must be noted that this increase in US services exports – and of the sector more generally – is driven by the factor use changes caused by the sudden increase in lower-cost Mode 1 services imports. In this analysis, it was assumed that US services exports did not experience the same improvement in technology that services exporters to the USA did. The impacts of an internationally symmetric technological improvement are unknown, and may be the topic of future work.

Finally, the price of sector-specific capital behaves in a manner similar to the wages of non-tradable labour. The quantity of capital is effectively fixed, and so it is only the rental rates that adjust. Industries that expand demand more capital, with the rental rates rising. In industries that are shrinking, the rental rates of capital fall.

6. POLICY IMPLICATIONS AND FURTHER WORK

As with many international economic forces, the impact of greater outsourcing on the US economy is mixed, with some industries and occupational groups shrinking or experiencing wage declines, while other sectors expand and the wages of some occupational groups rise. However, the impact of outsourcing on the wages of tradable and non-tradable occupations does not completely support Blinder's (2006) intuition that workers in non-tradable occupations will

be unaffected by increased outsourcing while workers in tradable occupations will be displaced by services imports and will experience falling demand and lower wages. The policy recommendation that follows this is that the labour force needs to orient itself more towards non-tradable occupations and less towards tradable occupations.

Certainly, increased outsourcing decreases the demand and wages for most tradable occupations, while workers in many non-tradable occupations experience increases in their wages, benefiting from the positive general equilibrium effects that greater Mode 1 services have on the industries where they are employed intensively. Wage effects are not, however, uniform across the different occupations in the tradable and non-tradable sets, and are not easily predicted.

Contrary to the general wage declines of tradable occupations is the Legal occupation group, which experiences higher demand and wages. At the same time, workers in Production, Construction, Transportation and a few other non-tradable occupations employed intensively in the shrinking manufacturing and agricultural sectors suffered shrinking wages. So, the general equilibrium effects of outsourcing on the various occupations is not captured by the intuition of Blinder (2006). The policy recommendation could thus be rephrased: the labour force needs to reorient itself towards tradable as well as non-tradable occupations that will be least adversely affected by outsourcing.

Of course, this insight is not restricted to the case of the USA, but would hold true for other developed countries that are experiencing large increases in outsourcing in recent years and where domestic labour in a variety of occupations may experience lower demand or lower wages as a result of being displaced by Mode 1 services imports. Baldwin's (2006) insight on this for the European Union is that educational systems in the EU should be cautious about investing heavily in specific skills (e.g. information technology) for its labour force. Instead, the EU could consider re-orienting the educational system to produce workers that are occupationally flexible, and that have a greater ability to be retrained if the labour demands change.

Another US policy response to mitigate the detrimental effects of outsourcing that has been discussed in Brainard and Litan (2004), Drezner (2004) and Blinder (2006) is the improvement of programmes that mitigate the income losses to workers displaced by outsourcing. This is in spirit, similar to the suggestion in Geishecker and Gorg (2008b) to implement a policy mechanism for the UK, whereby those that would be worse off from greater outsourcing would be compensated from the overall benefits accruing to the economy and to other parties. A policy apparatus of this sort that the USA currently has in place is the Trade Adjustment Assistance (TAA) programme, administered by the US Department of Labor (2008). This programme provides income support and other assistance to eligible workers that have been displaced by trade. However, in its current form the TAA does not cover services workers. This

paper suggests that extending the TAA to include those displaced by outsourcing may be important in the future.

Our analysis identifies 16 occupational groups whose workers would experience wage declines due to greater outsourcing. However, only workers in some of the occupations that suffer income losses (such as those in production and construction occupations) are eligible to find support from the TAA. Workers in occupations like management or healthcare support would be ineligible to use this support mechanism. Hence, to remain relevant, programmes like the TAA must adapt to take into account all the occupational groups that are going to be adversely affected by the services trade, looking beyond just the production jobs in manufacturing that this programme was originally designed for.

Among the other policies presented in Brainard and Litan (2004), wage insurance is of particular interest since our results speak directly to how a wage insurance programme could be designed. Wage insurance is already a component of programmes like the Trade Promotional Authority Act (TPA), and provides qualifying workers with up to half the earnings they lost when displaced by trade, up to an annual ceiling of US$10,000 for two years. Like the TAA, the wage insurance in the TPA does not extend coverage to many of the workers that will suffer income losses from outsourcing. In several occupations, wage losses are predicted to be as great as 50 per cent, and policies that would smooth over income changes while the labour force adjusts to outsourcing would be undeniably helpful.

By identifying occupations that need to be targeted, this paper can help to specify more precisely the scope of these wage insurance programmes. However, it must be noted that it represents a preliminary step in understanding the sensitivity of labour to changes in services imports, and there are a few avenues for further work building on the framework developed here. This analysis simulated an asymmetric technological improvement that increased services imports into the USA only. It is possible that the simulated labour market impacts would be different if countries importing US services experienced a similar technological improvement, leading to an analysis of the effects of ‘insourcing’, as raised by Baldwin (2009) and mentioned earlier. The analysis presented here also did not consider the effects of foreign direct investment that can potentially have an important role to play in the global trade in services, or the impact of changing skill sets in the labour force.

7. CONCLUSION

This paper thus provides quantitatively determined insights into what the potential impact on the US economy and labour force would be if outsourcing increased in the near term along the lines suggested by Blinder (2007) and

Jensen and Kletzer (2007). It also describes the general equilibrium mechanisms by which these impacts are likely to occur.

All industries were found to increase their use of Mode 1 services, and their use of the composite input that is comprised of Mode 1 services and tradable labour. Industries with smaller cost shares of the Mode 1 Services–Tradable Occupations Labour composite demanded less tradable labour, while the industries with higher cost shares demanded more. With the exception of workers in Legal occupations, all workers in tradable occupations experienced declines in their real wages.

Demand for non-tradable occupations labour rose in the industries that expanded the most, while demand fell in the industries that shrank. The non-tradable occupations that were used intensively in the shrinking industries, experienced declines in wages, while the wages rose for workers in non-tradable occupations used intensively in the expanding industries. The rental rates of sector-specific capital behaved in a similar manner, with the rates in expanding industries increasing, with rates in shrinking industries declining. While the economy as a whole and certain non-tradable occupations labour would benefit, workers in most tradable occupational groups, and other factors in shrinking industries would suffer income losses.

Increased outsourcing from the USA thus presents both opportunities and challenges, which could potentially be similar for other major developed country services importers, like the UK. In order to successfully navigate these challenges, the USA must take appropriate policy responses, such as reform of wage insurance and other TAA programmes to assist the workers that will inevitably be adversely affected by greater outsourcing. The occupational groups that current TAA policies have been targeting do not include all the occupations that we have determined will suffer serious income losses as a result of more Mode 1 services imports. This would be consistent with the suggestions provided by Baldwin (2006) and Geishecker and Gorg (2008b) for the European context. The results presented here can inform policy design and reform by identifying the occupational groups that will experience income losses, and by how much.

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