Relaxing the Restrictions on the Temporary Movement of Natural Persons: A Simulation Analysis¹

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Abstract

While the liberalisation of trade has been at the forefront of the global agenda for many decades, the movement of natural persons remains heavily guarded. Nevertheless restrictions on the movement of natural persons across regions impose a cost on developing and developed economies that far exceeds that of trade restrictions on goods. This paper uses a global CGE model to investigate the extent of these costs, by examining the effects of an increase in developed countries' quotas on both skilled and unskilled temporary labour equivalent to 3% of their labour forces. The results confirm that restrictions on the movement of natural persons impose significant costs on nearly all countries (over \$150 billion per year in all), and that those on unskilled labour are more burdensome than those on skilled labour.

1. Introduction

While there has been an upsurge in bilateral and global agreements on trade in goods, the liberalisation of services and labour markets have proceeded much more slowly. Nearly twenty years ago Hamilton and Whalley (1984) suggested that the liberalisation of world labour markets could double world income and imply proportionately even larger gains for the developing countries. Thus allowing labour to move between countries would seem to be an important tool for growth and development. Far from seeking to exploit such opportunities, however, the developed world became less open to both migration and to temporary labour flows. Recently, however, the temporary movement of workers has moved back onto the agenda. It was recognised as one of four modes of delivering services abroad by the Uruguay Round's General Agreement on Trade in Services (GATS), where it became known as 'Mode 4' liberalisation – the Temporary Movement of Natural Persons (TMNP). A small number of liberalisations were recorded in the Uruguay Round and subsequently during negotiations for the accession to WTO by new members. These, however, mainly aimed to establish the right of intra-corporate transferees and business visitors from developed countries to move temporarily to developing countries to pursue their careers and business opportunities.

Even more recently, however, developed economies have begun to realise that they suffer from shortages of both skilled and available unskilled labour, and have started, *de facto* or *de jure*, to relax their entry restrictions on foreign labour. In the USA, illegal immigrants from Mexico are an important source of unskilled labour and have slowed the decline in the supply of unskilled labour in the USA considerably (Borjas, 2000). And the

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services sectors, facing severe shortages of specific skills, have been urging reforms that would allow more temporary workers to enter the country. Developing countries, as the largest potential suppliers of temporary labour, are intensely interested in the effects of such reforms on their own welfare.

Of course, agreements concluded under Mode 4 of the GATS relate only to the service sector, where restrictions on the movement of persons is seen as a barrier to exports, rather than an issue of migration *per se*. Moreover, all the developments refer explicitly to temporary, movement to provide specific services rather than to permanent migration and entry into the labour market. These are important distinctions when it comes to framing policy proposals: where permanent migration raises issues such as social assimilation, cultural identity, and burdens on the public purse, and, for sending countries, the loss of talent in a brain drain, TMNP is largely free of such difficulties. They are arguably of less significance, however, to the analysis of the effects of greater mobility on purely economic variables such as income, output and employment⁴. TMNP shifts workers from one country to another, and thus to a first approximation may be viewed as inducing changes in labour endowments accompanied by some income transfers.

This paper conducts such an analysis in order to see who might benefit from increasing the temporary movement of natural persons, and by how much⁵. A computable model, based on the GTAP Model (Hertel, 1997), is developed to examine the effects of an increase in TMNP between developing and developed countries, with labour alternatively flowing either into all sectors or just into the services sectors of the developed economies. The model captures the effects of temporary movement on wages, remittances, income and welfare, amongst other things, and takes account of differences in the productivities of the temporary workers and the resident workers. These differences, which are reflected in the different wages earned by the two types of workers, can have a significant impact on the effects of liberalising such flows.

We estimate that by increasing developed economies' quotas on inward movements of both skilled and unskilled labour by just 3% of their labour forces, world welfare would rise by \$US156billion – about 0.6% of world income. This figure is half as large again as the gains expected from the liberalisation of all remaining goods trade restrictions⁶ (\$US104billion). In general, developing countries gain most from the increase in quotas, with higher gains from the increase in quotas on unskilled labour than on skilled labour. Developed economies generally experience falling wages, but their returns to capital and overall welfare increase in most cases. The relaxation of restrictions on unskilled labour is also found to be the more important component of TMNP for the developed economies. This is because it has widespread positive effects on production and hence on real GDP,

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⁴ We do not argue that the issues of assimilation are 'non-economic' – they involve costs, benefits and trade-offs of precisely the kind that economics considers. However, they are less directly pecuniary than incomes etc..

⁵ A companion paper, Winters, Walmsley, Wang and Grynberg (2001), discusses a broader set of issues, including what exactly the GATS covers and how to frame reform proposals within it.

⁶ Including tariffs and export subsidies as quantified in the GTAP database.

whereas the benefits from skilled labour movements are felt primarily in specific service sectors. The latter result does, however, concur with the argument by the services sectors that they suffer from a serious shortage of skilled labour in these sectors.

The model and data necessarily make a number of simplifying assumptions, which should be noted at the outset. Although every effort was made to collect quality data on the flows of temporary labour, data are scarce and of questionable quality and assumptions had to be made to fill in the gaps. On the model, first, it is assumed that outward migration is not selective. Borjas (2000) has argued that permanent migrants are often among the most talented of their home generations, and although this is probably less true for temporary migrants, if it does still apply here, we will underestimate the losses that are expected to accrue to the permanent residents in the developing countries losing labour. Second, the model treats the movement of labour as the export and import of labour, not as the export of a service which requires the temporary movement of labour. Therefore reducing restrictions affects the service sectors only to the extent that they demand permanent and temporary labour, and not via a reduction in the cost of exporting.

Following this introduction, sections 2 and 3 provide an overview of the model and data and define some of the terms used to distinguish between the different types of workers. Following this the various experiments are outlined in section 4 and the results analysed in section 5. Finally in section 6, the paper is summarised and concluded.

2. Model

In this section we outline the model used to investigate the effects of the movement of natural persons⁷. The model and data are based on the GTAP model and database.

The GTAP model, developed by Hertel (1997), is a standard applied general equilibrium model. It assumes perfect competition and hence there are no scale or clustering effects, which often figure in the skilled migration literature. In each region, a single regional household allocates income across private and government consumption, and saving according to a Cobb Douglas utility function and firms supply commodities to both the domestic and export markets, while minimising the costs of production.

A number of significant changes had to be made to the GTAP model and database to incorporate the movement of natural persons, but before describing them, we need to define two terms used in this paper: a temporary migrant and a temporary worker. Although technically these are the same person – a temporary migrant of one region is a temporary worker in another region – a distinction is made in the model to improve the tracking of these guest workers. The basic idea is that once temporary migrants cross the border into the host region they become temporary workers.

⁷ Further details on the model and data are available in Walmsley (2001).

The alterations made to the GTAP model can be divided into five distinct features: productivity, allocation methods, income, welfare, sectoral allocation and balancing equations.

2.1 Productivity

The differences between the productivities of permanent labour and temporary labour are a significant factor that could potentially affect the expected benefits of relaxing the restrictions on TMNP. We define both the number of temporary migrants and the equivalent number of average temporary migrants, given their home productivity relative to that of the average temporary migrant. The equivalent number of temporary migrants ($QTM_{i,r}^*$) is found by multiplying the number of temporary migrants ($QTM_{i,r}$) by their base-level productivity ($A_{i,r}$: Equation 1), where i is the set of labour (skilled and unskilled labour) and r is the set of regions (defined in column I of Table 1).

$$QTM_{i,r}^* = QTM_{i,r} \times A_{i,r} \quad 1$$

Estimates of base productivity ($A_{i,r}$) are obtained from the wage data in the GTAP database. We assume that wage differentials in the 1997 database reflect productivity differences between workers from these regions, part of which will arise due to the fact that there are quotas on the movement of labour. The purpose of calculating temporary migrant equivalents is to ensure that remittances sent back to the home region and welfare calculations are adjusted to reflect the fact that these temporary migrants may have higher/lower productivities than the average migrant (prior to moving into the host region) and hence that their wages and remittances reflect this.

We do not have data on bilateral flows of labour. Hence, when temporary labour is allocated across host regions, it is assumed to have the same productivity as the average temporary migrant (ATM_i^{Av}). This average productivity depends on the home regions of the temporary migrants and hence might change with the composition of temporary flows. For example, if more temporary migrants come from home regions with lower productivities the average productivity of the temporary migrant will decline⁸. Thus

$$ATM_i^{Av} = \sum_r \left(\frac{QTM_{i,r}}{QTM_i} \right) \times A_{i,r} \quad 2$$

Once working in the host region, temporary labour will acquire some of the productivity of the host region (Equations 3). For example a worker from the USA, who goes to work temporarily in Mexico cannot be expected to be as productive as she would have been in the USA, so her productivity is adjusted downwards to reflect the productivity of the workers in Mexico. Likewise an Indian worker entering the UK would increase his/her productivity to reflect the higher productivity in the UK. Equation 3 expresses the productivity of the

⁸ This has been occurring in the United States over the last two decades, as more workers from Mexico have entered, replacing the foreign workers from Europe. Since the productivity of a Mexican worker is lower than that of a European worker, the productivity and hence the relative wage of the average migrant worker has fallen (Borjas, 2000).

temporary labour ($ATL_{i,r}$) as the average productivity (ATM^{Av}_i) of a temporary migrant plus a proportion (β) of the difference between the host region's productivity ($A_{i,r}$) and the average temporary migrants productivity (ATM^{Av}_i). We fix β as 0.5 for all our experiments, but we have experimented with alternatives.

$$ATL_{i,r} = ATM^{Av}_i + \beta \times (A_{i,r} - ATM^{Av}_i) \quad 3$$

This productivity is then used to determine the equivalent, productivity weighted, quantity of temporary labour which enters the labour force of the labour importing region (Equation 4). The equivalent quantity of temporary workers ($QTL^*_{i,r}$) is given by the actual quantity ($QTL_{i,r}$) multiplied by the productivity of the temporary labour ($ATL_{i,r}$).

$$QTL^*_{i,r} = QTL_{i,r} \times ATL_{i,r} \quad 4$$

2.2 Allocation Methods

Since data on bilateral flows of guest workers between regions are generally unavailable or of dubious quality, the movement of natural persons has been incorporated into the model in such a way as to minimise the amount of data required. Figure 1 illustrates the method used. The model postulates a global labour pool, which collects temporary migrants from their home region, mixes them together and then allocates them across host regions. The temporary workers are then added to the supply of labour in the host region and allocated across sectors within the region according to labour demand. In the host country temporary workers' wages are related to their productivity. Part of the wage is sent back to the home region via the global pool as remittances, while the remaining income is added to the income of the host population where it is then allocated across consumption, saving and government spending to maximise utility⁹.

Figure 1: Allocation of Migrant Workers to the Host Region and Sector

⁹ Again restrictions on the availability of data preclude us from allocating the income of the temporary worker and permanent workers across consumption, saving and government spending separately (See Walmsley (forthcoming)).

Allocation can occur in two ways: across host regions (B in Figure 1) or across home regions (A in Figure 1). In this paper we assume an excess demand for temporary work places in developed countries and examine the case where quotas on such workers are exogenously increased by 3% of the current skilled and unskilled labour forces. Our problem, therefore, is to determine where these additional workers come from, i.e. their home regions (A in Figure 1). Temporary workers are allocated across home countries ($QTM_{i,r}$) by labour force shares ($L_{i,r} / L_i$) (Equation 5).

$$QTM_{i,r} / QTM_i = L_{i,r} / L_i \quad 5$$

2.3 *Income*

Separate calculations are made for income earned by permanent labour, temporary labour and temporary migrants. Total income earned in the host region, by permanent and temporary labour, is also calculated for the purposes of allocating income across private and government consumption and saving to maximise utility.

In the standard GTAP model, income includes all factor incomes ($Y_{f,r}$, where f is the source of income: skilled and unskilled labour, land, capital and natural resources) less depreciation (D_r), plus taxes (T_r). Factor incomes include income earned on factors owned by temporary and permanent labour ($Y_{f,r} = YPL_{f,r} + YTL_{f,r}$, where $YPL_{f,r}$ is the income from factor f , earned by permanent labour and $YTL_{f,r}$ is the income from factor f earned by temporary labour¹⁰). In addition, we must also take account of net remittances ($NR_{i,r}$, where i is the two labour types: skilled and unskilled labour). Net remittances ($NR_{i,r}$) equal remittances received ($RR_{i,r}$) from temporary migrants less remittances paid ($RP_{i,r}$) by temporary labour.

$$Y_r = \sum_f Y_{f,r} - D_r + T_r + \sum_i NR_{i,r} \quad 6$$

Remittances paid are assumed to be a fixed proportion of wages, as observed in the base data. Thus remittances paid by temporary workers reflect changes in the number of equivalent temporary workers ($QTL^*_{i,r}$) and the wages they receive. These remittances paid were then summed and allocated across home regions as remittances received. Remittances received from temporary migrants by a home region are assumed to reflect their numbers of temporary migrant equivalents and average remittances¹¹. The latter reflect wages and hence productivities, and since productivities vary with both the home and host country composition of temporary movement, so too will average remittances.¹²

As stated previously, regional income is the sum of the incomes earned by temporary and by permanent labour. For the welfare calculations we treat these incomes separately. The income of temporary labour is

¹⁰ $YTL_{f,r}$ is non-zero only for skilled and unskilled labour, i.e, temporary labour does not earn income from other factors of production.

¹¹ In the absence of data on bilateral flows of temporary workers we are obliged to assume that all remittances vary proportionately with the average.

¹² The average productivity of migrants reflects their origins, while the extent of productivity catch-up reflects their allocation over host countries.

assumed to include the income from labour ($YTL_{i,r}$: i is skilled and unskilled labour) less remittances sent home ($RP_{i,r}$: Equation 7); all other income, including income on land, capital etc, taxes and remittances received are earned by permanent labour.

$$YTL_r = \sum_i (YTL_{i,r} - RP_{i,r}) \quad 7$$

The income of temporary migrants by home region is discussed in section 2.4 as part of the calculation of welfare of temporary migrants.

2.4 Welfare

In the standard GTAP model the measure of welfare change used is the Equivalent Variation (EV), which is obtained from the income and utility function of each regional household¹³. In this model the EV of the host region is divided into two components, as with income: the EVs for permanent (EVPL_r) and temporary (EVTL_r) workers.

In any situation, the welfare of permanent labour, excluding any temporary migrants that are temporarily working abroad, (EVPL_r) is a function of the utility derived from the income of the permanent workers (YPL_r), which includes remittances received from workers abroad. The utility of permanent residents is a function of their (total) income, numbers and the prices of goods they purchase with this income. Given this utility with and without the policy changes under analysis, we can then calculate the EV for permanent workers.

The welfare of temporary labour (EVTL_r) is found similarly. Their welfare is a function of the utility derived from the income of the temporary residents (YTL_r), from which remittances paid have already been subtracted. Their utility is a function of their (total) income, numbers and the price level in the host region, and from these EVs can be calculated.

The welfare change for a region as host (EV_r^{HOST}), can now be found by summing the parts for permanent and temporary labour (Equation 8). The total EV of all temporary workers (EVTL) is then equal to the sum across regions of the EVs of all the temporary workers (EVTL_r, Equation 9).

$$EV_r^{HOST} = EVPL_r + EVTL_r \quad 8$$

$$EVTL = \sum_r EVTL_r \quad 9$$

The income of the temporary labour by host region and labour type is aggregated across host regions (Equation 10) and distributed across home regions to find the income attributable to temporary migrants from each region (Equation 11). The distribution of total income by all temporary labour (YTM_i) across home regions

¹³ Note that the income of permanent residents and temporary workers is added together and then allocated across private and government consumption and saving. This means that the utility derived in the standard GTAP model is for a regional household, which is made up of permanent residents and temporary labour.

depends on the equivalent quantities of temporary migrants ($QTM^*_{i,r}$) from the home region relative to the total (QTM^*_i).

$$YTM_i = \sum_r (YTL_{i,r} - RP_{i,r}) \quad 10$$

$$YTM_r = \frac{QTM^*_{i,r}}{QTM^*_i} \times YTM_i \quad 11$$

This income is then used to determine the utility and EV of the temporary migrants. An average price has to be used to determine utility of temporary migrants - the average price for goods paid by temporary labour in their host regions.

Once the EV of temporary migrants is determined, the welfare change by home region (EV_r^{HOME}), regardless of temporary residence, and the world welfare change (WEV) can also be calculated by simply summing the relevant regional figures.

2.5 Sectoral Allocation

The last issue to be examined relates to what industries the temporary labour will be employed in or what sectors the temporary migrants will come from. In the standard GTAP model, labour moves across sectors to equalise the wage – thus labour moves to the sectors with the highest demand. This is also the standard closure used here. On the other hand, since Mode 4 is restricted to services and since particular service sectors in the developed economies, e.g. the computing sector in the USA, are interested in obtaining skilled temporary workers, it is interesting to think what happens if labour is restricted to specific sectors.

This is achieved in the model by dividing the sectors into two groups: one group of sectors which employ temporary labour (B); and a second group of sectors which do not (A). The supply of labour to each group must equal its demand, and labour can flow freely within each group but not between them. All temporary labour flows are supplied to the group of sectors which accept temporary labour (A), while the supply of labour to the other group (B) is held fixed. This approach also has implications for permanent labour. In order that the inflow of temporary labour not just be off-set by outflows of permanent labour, we have to fix supplies of permanent labour in each group. Hence labour is not perfectly mobile, except between sectors of the same group, and wages differ between the two groups. We note that Borjas and Freeman (1992) found that permanent residents do tend, in fact, to move out of geographical areas in which there has been an influx of foreign workers, leaving the total labour force unchanged, so our assumption of the opposite for TMNP should be considered rather carefully.

Finally, in all our exercises the total number of temporary migrants (QTM_i) from all home regions equals the total number of temporary labour (QTL_i) in all host regions¹⁴.

¹⁴ The share allocation method ensures this equality holds, although other methods may not. In each case this equation should be checked to ensure that it does hold during the simulation.

3. Data

The primary database used to support the model is version 5 of the GTAP Database (Dimaranan et al., 2001). Version 5 of the GTAP database contains 66 countries/regions and 57 sectors. The GTAP database was supplemented with additional data on the labour force, numbers of temporary migrants and workers, and their remittances and wages¹⁵. The revised GTAP database was then aggregated into 21 regions and 22 sectors for undertaking the analysis. A list of the regions and the commodities can be found in column I of Tables 1 and 2, respectively.

4. Simulations

A number of simulations were undertaken to examine how relaxing the restrictions on the temporary movement of natural persons (TMNP) is likely to affect developed and developing countries. The paper commences by focusing on an increase in developed country quotas on the numbers of skilled and unskilled temporary workers. Following this we examine how these results are affected if labour is restricted to particular services sectors.

Quotas on the temporary movement of natural persons are assumed to increase in a number of traditionally labour importing regions, and to be filled by labour from a number of traditionally labour exporting countries according to their labour force shares. Table 1 divides the regions used in this analysis in to labour importing and labour exporting regions (regions with non-zero elements in columns II and IV respectively)¹⁶. The quotas are increased by an amount which would allow the quantity of both skilled and unskilled labour supplied in the host (or labour importing) countries to increase by 3%¹⁷. The figures in Table 1 are the shocks to the quotas (columns II and III) and the resulting supply of those temporary workers by the labour exporting regions (Columns IV and V). For example, in the case of the USA, the increase in the quota would amount to an extra 2.7 million unskilled temporary workers and 2.4 million skilled temporary workers. Table 2 also shows that China would supply 2.4 million of the total 8.4 million unskilled workers required and 0.49 million of the total 8 million skilled workers required.

¹⁵ Walmsley (2001) provides a summary of the data sources, the assumptions made for filling in any missing data, the calculation of wage data and the calibration procedure used.

¹⁶ The decision of whether a region was a labour exporter or importer was based on wage rates (high wages were expected in labour importing countries and low wages in labour exporters), data on the quantities of temporary migrants relative to temporary workers and the level of development.

¹⁷ By this we mean the number of workers (actual bodies) increases by 3% of the labour force. Note that since relative productivities differ this may not mean that the labour force increases by 3%, since the labour force increases by the number of equivalent workers. For example the USA may allow in 3% more workers but if their productivity is half that of the typical USA worker, the labour force will increase by much less than 3%.

5. The Results

5.1 *Macroeconomic Effects*

The increase in the developed countries' quotas of both skilled and unskilled temporary labour increases world welfare by an estimated \$US156billion – about 0.6% of initial income. The gain, which arises from increasing quotas by only 3% of the labour force of the developed economies, is considerable, and is around 1.5 times that expected from the liberalisation of all remaining trade restrictions (\$US104billion).

The labour exporting economies gain most from the increase in quotas on the movement of labour (Column V in Table 3). Most of this increase is the result of higher incomes earned by the temporary workers themselves. Permanent residents of the developing countries who do not move generally lose as a result of the outflow of temporary migrants (Column IV in Table 3): the decrease in labour endowments raises the wages of skilled and unskilled workers (Column II and III of Table 4), but real GDP (Column V in Table 4) and returns to other factors such as capital (Column IV in Table 4) fall. With the exception of Brazil, however, developing economies experience an improvement in their terms of trade. Shifting factors from developing to developed countries reduces the relative supply of developing country output and hence raises its price relative to that of the developed countries. Overall, despite the higher remittances received from temporary workers, the income and welfare of permanent residents decline in most developing economies (Column IV in Table 3). In the exceptions, including India, the rest of South Asia and South Africa, welfare increases (Column IV of Table 3) as increased remittances outweigh the declines in capital income. In India, remittances increase significantly by 4% of the initial level of income. This increases the demand for domestic goods, reduces the decline in production and raises local prices, generating a large terms of trade gain. Real wages for both skilled and unskilled workers rise¹⁸ (Columns II and III in Table 4).

While the developing (labour exporting) countries are the main beneficiaries of the increase in quotas, most of the labour importing countries also gain in terms of welfare. In all regions, except for the USA, higher incomes are obtained from the higher returns to capital and the increase in taxes collected. In the USA, the increase in the apparent subsidies paid (on factors of production usage and output)¹⁹, combined with lower wages outweighs the increase in income due to the returns to capital and hence income and welfare fall (Column IV in Table 3). Real GDP also increases substantially in all of the labour importing economies (Column V in Table 4)

¹⁸ Note that there may be a case for arguing that India has a pool of unemployed unskilled workers who would become employed in India as a result of the outflow of temporary migrants. In this case the quantity of unskilled workers would rise and the real wages of unskilled workers would remain fixed. Hence total earnings would rise as there would be fewer people in the informal or unproductive sectors.

¹⁹ There is no tax information for the USA economy in the GTAP data base, reflecting the fact that no tax information was provided in the initial IO table. Thus net indirect taxes reflect only subsidies. If data on taxes were available, welfare would increase in the USA, as it has in the other developed economies. Assuming taxes of 4% on private consumption and 1.5% on output (based on tax rates in other developed countries) and adjusting other US data compatibly, the USA gains \$1.61 billion in the exercise above.

as a result of the increase in skilled and unskilled labour endowments, and in most cases the terms of trade decline.

In addition, the increase in the rental price of capital raises the current rate of return – defined as the rental price relative to cost of capital net of depreciation. Since rates of return are expected to equate in the long run, the high current rate of return leads to higher levels of investment in the developed economies.

5.2 Sectoral Output

Figure 2 illustrates the effect of the increase in quotas on domestic production in a selection of labour importing regions. Agriculture is the least affected of all the sectors in both the developed and developing economies. Private consumption of agriculture has a low income elasticity of demand, there is little intermediate demand from other sectors, and agriculture is very land intensive in developing countries and capital intensive in developed countries. Conversely, the skilled labour intensive sectors experience the largest shocks. In the developed economies, services, particularly trade, business services and other services, and most of the manufacturing sectors are positively affected, while in labour exporting countries the opposite is true.

India, again, shows a slightly different pattern, with production in some services and agricultural sectors increasing. These sectors benefit from the additional income received as remittances: a high proportion (approximately 97%) of their output is supplied to the domestic market, and, with the exception of construction, these sectors are very capital or land intensive, rather than labour intensive. In the case of construction, the increase in output is primarily due to an increase in investment resulting from an increase in the return to capital.

5.3 Skilled v. Unskilled Quotas

Most current discussions under GATS concern skilled labour. In this section we apply the increases in quotas separately to examine how much of the gains come from increasing skilled labour quotas and how much from increasing unskilled labour quotas.

Both the developed and developing countries would benefit more from the liberalisation of restrictions on unskilled labour than on skilled labour. While the skilled temporary migrants may earn considerably more overseas than they would in their home regions, the negative effect of their departure on their home economies is considerable. Eastern Europe, the Former Soviet Union and East Asia are cases in which skilled workers obtain greater benefits from working overseas (Column V of Table 5), than do their unskilled counterparts (Column IV in Table 5), but in which the difference is more than offset by the larger losses from skilled worker mobility at home (Column III in Table 5). The reason for this is that skilled labour is scarce in developing countries, so its loss has more detrimental effects on production than does the loss of unskilled labour (Column V in Table 6). Hence reducing restrictions on unskilled labour is better for the developing (labour exporting) regions.

For the labour importing regions relaxing the restrictions on unskilled labour is also more beneficial in terms of welfare (compare columns VI and VII in Table 5) and Real GDP (compare column V in Table 6), than is

relaxing them on skilled workers. The increased supply of unskilled labour reduces unskilled wages (column III in Table 6), and stimulates most sectors (agricultural and manufactures and some services), whereas the benefits of increasing skilled labour supplies are concentrated in a few services sectors. Even though skilled labour is an important input into the production in most commodities in the developed countries, unskilled labour is generally more important. The returns to capital and other inputs (natural resources and land) are increased more as a result of the increase in unskilled labour quotas, than of those for skilled labour (column IV in Table 6). Of course, the relative benefits of skilled and unskilled quota relaxations depend on how far the respective quotas are relaxed. But our results are remarkable in that we have assumed, based on real data, almost equal increments of skilled and unskilled labour (8.0 and 8.5 million respectively).

5.4 Services Sectors

As noted in the introduction, the GATS concerns the services sectors. Hence we now assume that all additional temporary workers are allocated to the services sectors in the labour importing region. For this to change any of the above results, we need to assume that it does not cause a corresponding outflow of permanent resident workers to other sectors. Thus the additional labour supply is restricted to the services sectors, a list of which is in column II of Table 2. We do not restrict the sectors of origin of the workers in the sending countries.

Restricting the increase in labour supply to the services sector results in a larger expansion in the services sectors of the developed economies at the expense of the expansions in other sectors. In the services sectors the wages of skilled and unskilled labour decline (between 1 to 2%), whereas in the other sectors wages increase substantially (between 1 to 3%). The prices of services decline in the developed economies while the prices of other goods and the general cost of living rise. In addition, capital is replaced with the cheaper skilled labour within the services sector and therefore moves to other sectors in the economy – agriculture and manufacturing. In most cases, the increase in real income and welfare in the developed economies is slightly reduced by restricting temporary labour to the services sectors (Column III in Table 7 compared to Column V in Table 3), although not in Canada, Germany and the Rest of Europe.

Developing countries accommodate the changes in the developed economies. Their services sectors decline further than previously and the non-services sectors by less; in fact, some even expand (e.g. textiles and wearing apparel). The real incomes and welfare of permanent residents of the developing home countries decline by more (Column II in Table 7), and the temporary migrants gain less than previously as a result of being restricted to the services sectors in host countries where, of course, wages fall²⁰.

²⁰ We also considered restricting entry to a narrower set of services. The more restricted the set of sectors into which the temporary migrants flow, the less the migrants and the world gain from relaxing the quotas on TMNP, and the more developing country residents lose. This is not surprising because the restrictions frustrate one of the optimality conditions. And it is possible that mobility could become harmful if the distortion became so large that the services sectors extracted capital from other sectors and reduced their output by more than the capital and labour together would increase output in the services sector.

While restricting the sectors in which temporary migrants are permitted to work is common, assuming that permanent labour does not move in compensation seems doubtful. Rather, permanent labour seems likely to move if wages in the services sector became too low – so that all that changes relative to our main exercise is the composition of the work-force.

6. Conclusion

Restrictions on the movement of natural persons are increasingly being recognised as a severe impediment to trade, particularly in the services sectors. The relaxation of these restrictions could result in important benefits to the world as a whole and in particular to the suppliers of this labour. In this paper a model was developed to analyse the effect of relaxing these restrictions on the movement of labour.

The model takes into account a number of important issues related to the movement of labour, including:

- a) differences in the productivities of temporary and permanent labour;
- b) the importance of remittances on home country income;
- c) the calculation of income and welfare of permanent and temporary labour; and
- d) the movement of labour into particular sectors in the host region.

We have treated the temporary movement of natural persons as a shift in labour services to the host regions rather than as a question of exporting services as is implied by the institutional framework in which such liberalisations are likely to take place. Although temporary mobility is not a migration issue, temporary workers are assumed to produce, earn wages, pay taxes and consume in the host country, as well as send remittances back to their home countries. By treating the movement of natural persons as the export and import of labour, the model can properly take account of the productivity, wages, taxes and consumption of the temporary workers.

In our main exercise, quotas on the number of temporary workers permitted into the developed economies are increased by 3% of the developed economies' labour forces. The increase in world welfare is substantial and far exceeds the benefits expected from any remaining trade liberalisation. Overall, the developing countries gain most from the increase in quotas, highlighting again that this is an important issue for development. The developed economies also experience gain in welfare, however, so the liberalisation would be no mere act of charity: their real wages fall, but increases in the returns to capital and other factors more than offset this, leaving net gains overall. It is also interesting to note that while most of the progress in policy discussions have been concerned with increasing the mobility of skilled labour, it is the relaxation of quotas on unskilled labour that generates the most benefits. This is the case for both the developed and developing economies.

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Table 1: Changes in the Movement of Natural Persons

I Region	II Increase in quotas of Unskilled Labour (‘000s people) ^a	III Increase in quotas of Skilled Labour (‘000s people) ^a	IV Temporary Unskilled workers by Home region (‘000s people)	V Temporary Skilled workers by Home region (‘000s people)
USA	2763.14	2402.22	0	0
Canada	306.3	266.7	0	0
Mexico	0	0	151.78	224.12
UK	575.1	558.9	0	0
Germany	844.39	820.61	0	0
Rest of EU	2399.27	2313.83	0	0
Rest of Europe	118.73	115.39	0	0
Eastern Europe	0	0	177.69	360.68
Former Soviet Union	0	0	516.09	1047.56
Australia and New Zealand	212.89	223.01	0	0
China	0	0	2426.44	490.21
Japan	1304.06	1305.94	0	0
Rest of East Asia	0	0	117.82	391.98
South East Asia	0	0	719.51	989.51
India	0	0	1628.08	1216.64
Rest of South Asia	0	0	481.69	180.15
Brazil	0	0	284.79	369.67
Rest of Latin America	0	0	362.72	776.78
Middle East and Northern Africa	0	0	539.04	720.65
Southern Africa	0	0	869.53	940.75
Rest of World	0	0	248.71	297.9
Total	8523.88	8006.6	8523.89	8006.6

a. Shock is equal to 3% of the labour force.

Source: Authors’ shocks and simulations

Table 2: Sectors

I Sectors	II Services Sectors	I Sectors	II Services Sectors
Crops		Electronics	
Livestock		Other Manufacturing	
Meat		Household Utilities	○
Dairy		Construction	○
Food		Trade	○
Other Primary Products		Transport	○
Wood and paper products		Communications	○
Textiles and Wearing Apparel		Financial services	○
Petroleum, chemical and mineral products		Insurance	○
Metals		Business Services	○
Autos		Other Service	○

Table 3: Welfare of Agents^a

I Regions	II Welfare of temporary workers	III Welfare of temporary Migrants	IV Welfare of permanent residents	V Welfare by home region III + IV	VI Welfare by host region II + IV
USA	73079.16	0	-2956.43	-2956.43	70122.73
Canada	5596.47	0	1049.94	1049.94	6646.41
Mexico	0	5514.63	-1428.5	4086.13	-1428.5
UK	12640.77	0	851.03	851.03	13491.8
Germany	15993.82	0	2453.96	2453.96	18447.78
Rest of EU	36610.51	53524.79	34.41	53559.2	36644.92
Rest of Europe	2919.54	6920.7	630.96	7551.66	3550.5
Eastern Europe	-7.49	3744.93	-1404.42	2340.51	-1411.91
Former Soviet Union	-17.71	8766.47	-3586.92	5179.55	-3604.63
Australia-New Zealand	3900.34	0	375.63	375.63	4275.97
China	-54.48	9681.33	-2135.62	7545.71	-2190.1
Japan	25219.18	8131.04	4541.71	12672.75	29760.89
Rest of East Asia	-87.22	11402	-7475.31	3926.69	-7562.53
South East Asia	-620.7	8564.03	-2581.25	5982.78	-3201.95
India	-3.34	2639.11	16027.19	18666.3	16023.85
Rest of South Asia	-49.76	1518.99	350.3	1869.29	300.54
Brazil	-210.27	13399.82	-7252.92	6146.9	-7463.19
Rest of Latin America	-508.09	12065.18	-3774.84	8290.34	-4282.93
Middle East and Northern Africa	-3236.15	17295.96	-7503.9	9792.06	-10740.05
South Africa	-207.75	4392.06	81.97	4474.03	-125.78
Rest of World	-24.97	3143.34	-922.99	2220.35	-947.96

a. \$US millions

Source: Authors' simulations

Table 4: Percentage Changes^a in Real Wages of Skilled and Unskilled Workers

I Regions	II % change in Real Wage of Skilled Labour	III % change in Real Wage of Unskilled Labour	IV % Change in Rental Price of Capital	V % Change in Real GDP^b	VI % Change in Terms of Trade
USA	-0.79	-0.56	0.82	1.07	-0.35
Canada	-1.27	-0.61	0.86	1.12	0.04
Mexico	4.53	-0.05	-0.37	-0.56	0.27
UK	-0.86	-0.48	0.87	1.16	-0.08
Germany	-1.02	-0.62	0.74	0.97	-0.05
Rest of EU	-1.29	-0.7	0.71	1.03	-0.13
Rest of Europe	-0.64	-0.4	0.71	0.88	0.06
Eastern Europe	4.58	-0.2	-0.47	-0.9	0.27
Former Soviet Union	4.34	-0.58	-0.87	-1.12	0.12
Australia-New Zealand	-1.3	-0.71	0.76	1.05	-0.09
China	4.68	-0.02	-0.33	-0.79	0.37
Japan	-0.95	-0.63	0.76	1.07	-0.39
Rest of East Asia	4.01	-0.45	-0.9	-1.23	0.21
South East Asia	5.43	0.21	-0.37	-0.72	0.21
India	6.12	0.71	0.86	-0.44	5.81
Rest of South Asia	4.6	0.22	-0.23	-0.62	0.69
Brazil	4.47	-0.29	-0.79	-1.05	-0.34
Rest of Latin America	4.8	-0.22	-0.59	-0.86	0.35
Middle East and Northern Africa	6.48	0.38	-1.26	-1.63	0.27
South Africa	5.19	0.08	-0.62	-0.98	0.55
Rest of World	4.59	-0.12	-0.39	-0.76	0.48

a. Percentage changes in variable from base case.

b. Readers are reminded that Real GDP is not a measure of welfare. Real GDP is a measure of production, while welfare is a measure of the utility achieved from consumption. In this model differences in sign between Real GDP and welfare are very likely, due to the fact that income is affected by remittances received and production is affected by temporary labour.

Source: Authors' simulations

Figure 2: Changes in Volume of Selected Labour Importing Regions

Source: Authors' simulations

Table 5: Welfare^a – Decomposed according to effects of increasing Skilled and Unskilled Quotas

I	II Welfare of permanent workers (unskilled ^b)	III Welfare of permanent residents (skilled ^c)	IV Welfare of temporary migrants (unskilled ^b)	V Welfare of temporary migrants (skilled ^c)	VI Welfare of home region (unskilled ^b) II + IV	VII Welfare of home region (skilled ^c) III + V
USA	-1282.47	-1673.97	0	0	-1282.47	-1673.97
Canada	667.73	382.2	0	0	667.73	382.2
Mexico	154.85	-1583.35	3012.92	2501.72	3167.77	918.37
UK	564.7	286.33	0	0	564.7	286.33
Germany	1539.77	914.19	0	0	1539.77	914.19
Rest of EU	2272.93	-2238.52	39450.78	14074.01	41723.71	11835.49
Rest of Europe	559.98	70.97	5020.04	1900.66	5580.02	1971.63
Eastern Europe	3.19	-1407.61	1255.78	2489.15	1258.97	1081.54
Former Soviet Union	201.54	-3788.46	2161.86	6604.61	2363.4	2816.15
Australia-New Zealand	243.65	131.98	0	0	243.65	131.98
China	2952.58	-5088.2	2838.79	6842.54	5791.37	1754.34
Japan	2293.51	2248.2	6116.48	2014.56	8409.99	4262.76
Rest of East Asia	-641.34	-6833.97	2448.29	8953.71	1806.95	2119.74
South East Asia	19.54	-2600.79	4270.98	4293.05	4290.52	1692.26
India	8615.22	7411.97	1023.87	1615.24	9639.09	9027.21
Rest of South Asia	679.71	-329.41	764.77	754.22	1444.48	424.81
Brazil	-505.06	-6747.86	4719.32	8680.5	4214.26	1932.64
Rest of Latin America	192.43	-3967.27	5484.07	6581.11	5676.5	2613.84
Middle East and Northern Africa	383.73	-7887.63	8367.09	8928.88	8750.82	1041.25
South Africa	1040.52	-958.55	1327.88	3064.18	2368.4	2105.63
Rest of World	224.53	-1147.53	1083.09	2060.25	1307.62	912.72
Total	20181.24	-34807.3	89346.01	81358.39	109527.3	46551.11

a. \$US millions

b. This is the welfare of the whole population when only quotas on unskilled workers are relaxed.

c. This is the welfare of the whole population when only quotas on skilled workers are relaxed.

Source: Authors' simulations

Table 6: Percentage Changes^a in Real Wages of Skilled and Unskilled Workers – Decomposed according to effects of increasing Skilled and Unskilled Quotas

I Regions	II % Change in Real Wage of Skilled Labour		III % Change in Real Wage of Unskilled Labour		IV % Change in Rental Price of Capital		V % Change in Real GDP^d	
	Unskilled^b	Skilled^c	Unskilled^b	Skilled^c	Unskilled^b	Skilled^c	Unskilled^b	Skilled^c
USA	0.25	-1.34	-1.02	0.15	0.31	0.2	0.58	0.49
Canada	0.39	-1.72	-0.9	0.23	0.51	0.29	0.69	0.43
Mexico	0.04	4.69	0.24	-0.1	0	-0.19	-0.07	-0.49
UK	0.43	-1.36	-0.83	0.28	0.46	0.33	0.61	0.55
Germany	0.44	-1.32	-0.76	0.28	0.53	0.35	0.51	0.46
Rest of EU	0.37	-1.77	-0.98	0.17	0.4	0.19	0.53	0.5
Rest of Europe	0.31	-0.96	-0.62	0.21	0.42	0.27	0.47	0.41
Eastern Europe	0.02	4.79	0.24	-0.22	0	-0.24	-0.12	-0.78
Former Soviet Union	0.02	4.93	0.18	-0.18	-0.03	-0.26	-0.12	-1
Australia-New Zealand	0.29	-1.81	-1.05	0.13	0.33	0.21	0.53	0.52
China	0.2	4.78	0.4	-0.14	0.09	-0.13	-0.12	-0.67
Japan	0.14	-1.33	-1.03	0.16	0.27	0.25	0.6	0.48
Rest of East Asia	-0.09	4.36	0.16	-0.36	-0.1	-0.56	-0.13	-1.1
South East Asia	0.06	5.61	0.53	-0.1	0.02	-0.18	-0.15	-0.57
India	3.99	8.56	3.64	3.18	3.52	3.45	-0.08	-0.36
Rest of South Asia	0.8	4.75	0.98	0.14	0.59	0.08	-0.13	-0.5
Brazil	-0.21	4.41	0.06	-0.61	-0.25	-0.81	-0.13	-0.92
Rest of Latin America	0.05	5.23	0.36	-0.13	0.01	-0.16	-0.13	-0.73
Middle East and Northern Africa	-0.04	6.91	1.3	-0.56	-0.14	-0.76	-0.52	-1.11
South Africa	0.5	5.58	0.73	0.19	0.24	-0.03	-0.17	-0.81
Rest of World	0.19	4.86	0.4	-0.08	0.14	-0.09	-0.1	-0.66

a. Percentage changes in variable from base case.

b. This is the welfare of the whole population when only quotas on unskilled workers are relaxed.

c. This is the welfare of the whole population when only quotas on skilled workers are relaxed.

d. Readers are reminded that Real GDP is not a measure of welfare. Real GDP is a measure of production, while welfare is a measure of the utility achieved from consumption. In this model differences in sign between Real GDP and welfare are very likely, due to the fact that income is affected by remittances received and production is affected by temporary labour.

Source: Authors' simulations

Table 7: Results for allocation of Temporary Labour to Services Sectors

I Region	II Welfare of Permanent residents^a (Services^b)	III Welfare of temporary Residents^a (Services^b)	III Welfare of home region^a (Services^b) II + III	IV % Change in Real GDP^c (Services)
USA	-3616.13	0	-3616.13	1.06
Canada	1176.11	0	1176.11	1.12
Mexico	-1530.13	5397.96	3867.83	-0.56
UK	346.51	0	346.51	1.14
Germany	3195.59	0	3195.59	0.94
Rest of EU	-933.62	51717.76	50784.14	1
Rest of Europe	886.67	6687.99	7574.66	0.87
Eastern Europe	-1472.47	3705.71	2233.24	-0.9
Former Soviet Union	-3530.16	8696.77	5166.61	-1.12
Australia-New Zealand	239.54	0	239.54	1.02
China	-1834.84	9615.31	7780.47	-0.78
Japan	6232.68	7855.1	14087.78	1.05
Rest of East Asia	-7181.41	11315.46	4134.05	-1.22
South East Asia	-2698.73	8402.81	5704.08	-0.71
India	15827.93	2617.74	18445.67	-0.43
Rest of South Asia	307.37	1494.62	1801.99	-0.61
Brazil	-6969.39	13219.48	6250.09	-1.04
Rest of Latin America	-3990.25	11868.86	7878.61	-0.87
Middle East and Northern Africa	-8047.15	16965.67	8918.52	-1.64
Southern Africa	8.68	4353.69	4362.37	-0.97
Rest of World	-969.99	3108.61	2138.62	-0.77
Total	-14553.19	167023.54	152470.35	

a. \$US millions

b. Services as defined in Column II of Table 2.

c. Percentage change in real GDP from base case. Readers are reminded that Real GDP is not a measure of welfare. Real GDP is a measure of production, while welfare is a measure of the utility achieved from consumption. In this model differences in sign between Real GDP and welfare are very likely, due to the fact that income is affected by remittances received and production is affected by temporary labour.

Source: Authors' simulations