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World Trade Organization

Economic Research and Statistics Division

<h3>The Impact of Mode 4 Liberalization on Bilateral Trade Flows</h3>

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WTO

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The Impact of Mode 4 Liberalization on Bilateral Trade Flows

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Abstract

This paper gives insights into the possible trade creating effects of service trade liberalization via Mode 4. In particular we expect that temporary movements of persons, like permanent movements, have the potential to reduce transaction costs for merchandise trade between home and host country. Exploiting data on H-1B beneficiaries from different origins in the United States and using a gravity model of trade, we find significantly positive effects of temporary movements of persons on bilateral merchandise trade. In addition to this, the paper provides insights into the determinants of temporary movements of persons.

JEL classification: C30, F13, F15, F29

Key words: Mode 4, bilateral trade flows, services liberalization, WTO

I. INTRODUCTION

The General Agreement on Trade in Services (GATS) defines four modes of trading services. One of these modes, Mode 4, refers to the cross-border delivery of services through the temporary movement of persons. An example of the provision of a service via Mode 4 is that of a lawyer (self employed or working for a law firm) who assists a foreign client in the client's home country by temporarily moving there.² Mode 4 liberalization has received a substantial amount of attention during the Doha Development Round negotiations, mainly because of the emphasis a number of important developing countries put on this issue.

Recent literature has emphasised the economic benefits to both host and home countries of increased Mode 4 liberalization.³ This paper contributes to the literature in two ways. First, it analyses a different channel through which host countries can gain from Mode 4 imports – i.e. through the effect

¹ This paper represents the opinions of the authors and is not meant to represent the position or opinions of the WTO or its Members, nor the official position of any staff members. Any errors are the fault of the authors. The authors want to thank Barbara d'Andrea-Adrian, Leila Bhagdadi, Carsten Fink, Joscelyn Magdeleine, Andreas Maurer, Hildegunn Nordas and participants in the second conference of the RTN "Trade, Industrialization and Development" in Brussels for their comments on previous versions of this paper. This paper differs in a number of ways from the previous version (appeared as WTO Staff Working Paper N. ERSD-2004-07). It uses a different measure for Mode 4, it focuses on merchandise trade only and controls for migration. Furthermore, a number of robustness tests are carried out and the potential problem of endogeneity is addressed.

² The other three modes are: "cross-border supply" (Mode 1), "consumption abroad" (Mode 2) and "commercial presence" (Mode 3). A lawyer offering his assistance to a foreign client on-line provides his service via Mode 1. A lawyer assisting in his office a foreign client provides his consultancy service via Mode 2. Finally, a lawyer establishing an office abroad to service the foreign market is exporting his services via Mode 3.

³ See, for instance, OECD (2002) and Mattoo and Carzaniga (2004). Winters and Walmsley (2005) emphasise that the gains of increased Mode 4 liberalization for developing countries can be significant, in particular if it comprises the temporary movement of low skilled service providers.

on merchandise trade - and tests the relevance of this channel empirically. Second, the measure for Mode 4 movements used in our tests is new to the literature on trade in services and is more directly linked to WTO commitments that measures that have previously been used in the literature.

Trade in services through the temporary movement of persons is likely to affect host country economies through three channels: through its impact on relative prices, through its impact on preferences and through its impact on transaction costs. Previous literature has focused on the first channel. The economic effects of Mode 4 movements through that channel have a strong likeness to the economic effects of merchandise trade. Like in the case of merchandise imports, imports of services are likely to lower domestic prices of the relevant services. This is to the advantage of consumers and of other producers that use the service as an input. Existing quantitative literature focuses on these effects. In particular, Winters and Walmsley (2005) model Mode 4 movements as the export and import of labour, with direct consequences on wages in the receiving country and indirect effects on consumer prices.⁴ They simulate the resulting welfare effects in a computable general equilibrium model.

This paper analyses the effects that liberalization of Mode 4 movements has on bilateral merchandise trade flows using a gravity model of trade. Relative prices, transaction costs and preferences all have an impact on trade patterns. As a consequence our analysis captures all three possible channels through which Mode 4 movements can affect economic activities, although it falls short of distinguishing between them.

The effects the movement of people may have on preferences and transaction costs have been analysed in the literature on migration, i.e. permanent movements of people, and trade. People when established in another country may have a preference for consuming goods from their home country. This paper argues that this is also likely to be true for people moving on a temporary basis. Mode 4 flows may therefore result in increased imports from the home country. In addition, by the time they move back home, the same people may have changed their preferences towards products from their temporary host country. This in turn may result in increased exports from the host to the home country.

Mode 4 flows may affect transaction costs through two channels. To the extent that more trade in services via Mode 4 results in the more efficient provision of services that determine transaction costs, such as telecommunication or transport services, it will increase the quality or lower the costs of these services, thus lowering transaction costs. The second channel has been discussed in the migration and trade literature. It has been argued that migrants may start building networks and analyse new business opportunities, during their stay in the receiving country. Given their particular knowledge of both the home and the host country, it would not be surprising if these business opportunities are related to trade (in either direction) between the two countries. This paper argues that Mode 4 flows may give raise to similar network effects. Anecdotal evidence on the links between migration and trade, for instance, often refers to the example of Indian IT experts working in Silicon valley and establishing business networks with their home country.⁵ Yet, a large number of Indian IT experts enter the United States on the basis of H-1B visas, i.e. with a temporary work permit. In the years 2000 and 2001, for instance, the number of H-1B beneficiaries of Indian origin, was higher than the number of new Indian immigrants accepted to the United States. Statistics show that the large majority of Indian H-1B visa holders work in the IT sector. The Silicon valley example used in the migration literature could thus equally apply to our analysis of the link between Mode 4 and trade.

⁴ This way of modelling is slightly at odds with the legal texts in GATS that explicitly state that "the Agreement does not apply to measures affecting natural persons seeking access to the employment market of a Member". Besides, as pointed out by the authors, in their simulations increased Mode 4 flows only affect the services sector to the extent that they demand labour and not through a direct effect on prices of services.

⁵ See for instance Herander and Saavedra (2005).

Empirical research on the links between migration and trade provides substantial evidence of a link between immigration and both import and export volumes. Estimates of the impact of a 10 per cent increase in migrant population on merchandise exports range from 0.1 per cent to 2.5 per cent, while the effect on imports ranges from 0.1 per cent to 3.1 per cent.⁶ A recent contribution to the literature provides insights into the characteristics of migration determining the size of the effect that migration has on merchandise trade. Herander and Saavedra (2005) find that the trade effects of migration increase with the skill level of migrants. They also find that the average length of stay of a migrant in the host area has a positive effect on trade flows, but they find a significant and negative effect for the square of this variable. This indicates, according to the authors, that it takes time to establish a network able to reduce transaction costs, but that once the network is established increases in the length of stay promote trade at a diminishing rate. As a consequence, it may not be necessary for the movement of people to be permanent in order to have significantly positive effects on bilateral trade flows.

This paper focuses on the temporary movement of people in the context of the United States' H-1B visa scheme. Under the scheme, workers are permitted to be employed for as long as three years initially with extensions not exceeding three years.⁷ The scheme is, besides, limited to skilled workers as a "bachelor's degree or its equivalent" in the relevant field of work is a precondition for obtaining a H-1B visa.⁸ Given the potential duration of H-1B holders' stay in the US and their high skill level, we expect that the number of H-1B beneficiaries may result in trade promoting effects of a similar size as those of permanent migration, notwithstanding the temporary nature of H-1B visas.

In order to test our hypothesis we augment a standard gravity model with a measure for H1-B movements into the United States. To do so we use data on the number of H-1B beneficiaries from different origins for the years 2000 to 2002. We find that the number of H-1B beneficiaries indeed have a significantly positive effect on bilateral merchandise trade and the order of magnitude of the effects we find is similar to those found in the migration literature. These results are robust to the inclusion of a migration variable into our regressions.

Given the parallels between the assumptions tested in this paper and those tested in the migration and trade literature, we use in a first instance the empirical approach common to that literature and perform simple OLS estimations. The fact that our Mode 4 variable to some extent reflects trade (in services) raises concerns that any variable omitted in our regression may simultaneously affect Mode 4 and the dependent variable (merchandise trade), thus creating an endogeneity problem. We address this issue by estimating a system of simultaneous equations, one of which explains the size of bilateral Mode 4 movements. As a result our paper also gives insights into the determinants of Mode 4 flows. In particular we find that the GDP per capita of sending countries has a negative effect on Mode 4 movements, while the level of schooling of home countries' population has a positive effect. Mode 4 movements also tend to be affected by the age structure of home countries' population, with Mode 4 movements decreasing the higher the number of dependents to the working-age population.

The remainder of this paper is organized as follows. The next section discusses in detail the reasons why Mode 4 movements are likely to have trade stimulating effects and discusses the potential direction and size of these effects. Next we discuss the measurement problems that are inherent to the Mode 4 definition in GATS and present the dataset used in this paper. Section IV introduces the empirical model employed to estimate the relation between Mode 4 movements and bilateral trade

⁶ See Gould (1994), Head and Ries (1998), Dunlevy and Hutchinson (1999, 2001), Girma and Yu (2002), Rauch and Trindade (2002) and the overview of the literature in Wagner et al. (2002).

⁷ See United States Citizenship and Immigration Services (USCIS, 2002).

⁸ Information on H-1B visa has also been used in Chellaraj et al. (2005). The paper estimates the impact of international students and skilled immigration in the United States on innovative activity, where skilled immigrants are defined to include both those coming under the H-1B visa scheme and employment based immigration.

and presents first regression results. Section V discusses the need to specify the determinants of Mode 4 movements and presents the results of the estimations of a system of simultaneous equations. Section VI concludes.

II. MODE 4: SERVICES TRADE AND MOVEMENTS OF PEOPLE

Mode 4 movements are commonly referred to as "the temporary movement of natural persons". Mode 4 liberalization was negotiated in the context of the Uruguay Round negotiations on services, in recognition of the fact that trade in services may require the movement of persons across borders. Mode 4 therefore only refers to the providers of services.

The negotiations resulted in the definition of Mode 4 in GATS Article I:2(d) as "the supply of a service by a service supplier of one Member, through presence of natural persons of a Member in the territory of any other Member". The Annex on Movement of Natural Persons Supplying Services under the Agreement, besides, specifies that two categories of measures are covered – those affecting natural persons who are "service suppliers of a Member" (i.e. self-employed suppliers who obtain their remuneration directly from customers), and those affecting natural persons of a Member who are "employed by a service supplier of a Member in respect of the supply of a service".

The Annex on Movement of Natural Persons Supplying Services under the Agreement also specifies that Mode 4 only refers to the temporary movement of persons. To be more precise it states in paragraph 2: "The Agreement shall not apply to measures affecting natural persons seeking access to the employment market of a Member, nor shall it apply to measures regarding citizenship, residence or employment on a permanent basis." The notion "non-permanent" is however not specified in GATS and WTO Members have interpreted it differently in their schedules of services commitments by making reference to employment periods varying between three months and five years.

To the extent that Mode 4 liberalization reduces the costs of trading services, it is expected to engender standard gains from trade. In particular it is expected to increase global welfare by favouring specialization and a more efficient allocation of resources, fostering transfer of technology, encouraging innovation and offering consumers in each country a wider variety of services.

In addition, Mode 4 flows have the potential to lower transaction costs and thus stimulate other trade flows with resulting welfare effects. This can happen through two channels. First, the quality and the cost of services (such as transport services or telecommunication services) are key components of the transaction costs paid by traders. For example, hardly any business can operate without telecommunications and the Internet is an increasingly important channel for marketing and sales in some industries, particularly in those sectors where just-in-time delivery of goods is essential such as electronics, fashion clothing or automotive sector. To the extent that Mode 4 flows lead to a more efficient provision of services, they will therefore also favour bilateral merchandise trade. A shortage of IT consultants could, for example, increase the costs of IT services and in turn increase costs, including trade costs, in the information-intensive sectors. Relaxing restrictions on Mode 4 trade could solve the problem.

Second, Mode 4 trade also involves that people move abroad. There are various channels through which the stay of people in a foreign country, both permanently and temporarily, may enhance merchandise trade flows:

(i) *Preference effect*: The presence of foreign workers increases the demand for foreign products. Foreigners prefer goods they were used to consuming at home. Some of these products might be very difficult to find abroad, and they will import them from their country of origin.

(ii) *Information effect*: Foreign workers possess knowledge about their country of origin that makes it easier for them to acquire information about profitable international trading opportunities and helps to reduce informal barriers to trade. In other words, migrants can help to reduce demand and supply *matching costs*. For example, since foreign workers know consumer preferences in their country of origin, they can inform exporters in the destination country about whether their product could be successfully marketed or whether it needs to be adapted to importers' preferences. Also foreign workers can help reducing *network search costs*. They have better connections with the local business network. They can help producers of consumer goods to find better distributors, assemblers to find the best component suppliers and investors to find joint-venture partners.

(iii) *Contract enforcement effect*: Foreign workers facilitate a stronger enforcement of international contracts. International transactions are traditionally based on confidence, as delivery and payment may occur at different places. Since foreign workers have a better knowledge of local business law and practices, uncertainties connected with transactions are reduced.

Overall, the information and enforcement effect suggest a positive impact of cross-border movement of people on both imports and exports, whereas the preference effect mainly affects imports.⁹ A link between immigration, imports, and exports has been found by a number of studies that have used a gravity equation to analyse bilateral trade patterns. Most studies on the impact of labour mobility on trade flows base their empirical analysis on an augmented form of the traditional gravity model, where the effect of migration on trade flows is captured by adding a measure of the migrant stock to the conventional variables (GDP, distance, border, common language). All studies find a positive effect of migration on trade.¹⁰

Regarding temporary movement of people, theoretical considerations suggest that the impact of Mode 4 mobility on trade may be different from that estimated by the literature on migration discussed so far. As far as imports are concerned, workers moving abroad temporarily might have a higher propensity than permanent migrants to import from their country of origin, as they have probably not yet adapted to local products. As regards exports, temporary foreign workers upon their return home, might begin to import products from their former host country discovered during their stay abroad. Both arguments would result in stronger trade effects of temporary as compared to permanent movements of people. On the other hand, one could argue that temporary stays may not be enough for the establishment of business networks, i.e. the information effect of temporary movements would be weaker than the one of permanent movements. The relative size of these effects will certainly depend on the length of stay of temporary service providers in the host country. Recent literature finding positive but decreasing effects from the duration of migrants' stay on bilateral trade flows, however, suggest that movements of people do not need to be permanent to have significant effects on bilateral trade flows.¹¹

III. MEASURING MODE 4

Unfortunately the Mode 4 definition that resulted from Uruguay Round negotiations does not correspond to any variable for which data are collected for production or trade statistics. Information on cross-border services transactions in balance of payment statistics mainly reflects the value of Mode 1 (cross-border supply) and Mode 2 (consumption abroad) trade. Information on "labour" crossing borders, is instead provided in balance of payment statistics on "compensation of employees"

⁹ There might be a preference effect on a country's exports, if upon its return back home, the person imports products for which he has developed a preference during his staying abroad.

¹⁰ See Wagner et al. (2002) for an overview of the relevant empirical literature. Rauch and Trindade (2002) is to our knowledge the only paper that attempts to estimate separately the role of migration in reducing information barriers and that in facilitating international contract enforcement.

¹¹ Herander and Saavedra (2005).

and "workers' remittances". Yet the definition of none of these two variables is close to the definition of Mode 4 in GATS.¹² "Compensation of employees" refers to the income of temporary workers employed in any economic sector and includes border workers. The range of activities covered by this definition is thus significantly larger than the one under Mode 4.

"Workers' remittances" refer to current transfers of migrant workers who are employed in a foreign economy in which they are residents.¹³ Also this measure relates to foreign workers employed in any economic sector, not specifically the service sector. Besides, it also covers transfers made by permanent migrants, who are explicitly not included in the definition of Mode 4. Notwithstanding the obvious shortcomings of "compensation of employees" and "workers' remittances" as measures for Mode 4, both indicators have frequently been used in the literature, most likely due to the lack of alternative measures. The often-quoted simulations in Winters and Walmsley (2005), for instance, use data on workers' remittances as an input.

The definition of Mode 4 not only does not correspond to any well-defined indicator in economic statistics, it also does not necessarily correspond to any indicator provided in migration statistics. WTO Members are free to define their visa policy in any way they find suitable to fit their commitments under GATS.¹⁴ Therefore, WTO Members' Mode 4 commitments typically do not make reference to any specific national visa scheme. The US schedule of commitments under Mode 4 is a notable exception to this rule as it binds the US H-1B visa provision covering the temporary employment of highly skilled foreign workers in US firms.¹⁵ In particular the US committed to admit up to 65,000 persons annually on a world-wide basis on H-1B visa. This number corresponds to the annual cap for initial H-1B beneficiaries valid in the United States previous to 1998. Congress subsequently changed this cap to 115,000 for fiscal years 1999 and 2000 and to 195,000 for fiscal years 2001-2003. By default it fell back to 65,000 for fiscal year 2004, the cap also committed under GATS.

The H-1B visa scheme permits foreign professionals to enter the United States on a temporary basis to work in their field of expertise. Under the program, specialty workers are permitted to be employed for as long as three years initially with extensions not exceeding three years.¹⁶ Specialty occupations include computer systems analysts and programmers, physicians, professors, engineers, and accountants. In 2000, some 136,800 new petitions were approved for initial employment, mainly in computer-related occupations.¹⁷ The second largest group was electrical/electronics sector workers, industrial engineers, and architects, followed by specialized administrative occupations, such as accountants and specialist auditors in related services industries. The scheme explicitly targets skilled workers as a "bachelor's degree or its equivalent" in the relevant field is a precondition for obtaining a H-1B visa.

Two characteristics of the H-1B visa scheme deserve particular attention: the H-1B scheme explicitly targets skilled workers and it is not restricted to intra-corporate transferees, i.e. persons employed by an affiliate of a company with head-quarters in the person's home country. Since the large majority of

¹² See WTO (2004) for a more detailed discussion of the shortcomings of BOP variables as a measure for Mode 4.

¹³ In the context of BOP statistics a person is considered as resident when he or she stays for a year or more.

¹⁴ In the context of the Doha negotiations a group of 17 developing countries made a collective proposal concerning Mode 4 liberalization. The proposal evokes, among others, the establishment of a separate visa or separate sub-set of procedures for the temporary movement of persons (Marchetti, 2004).

¹⁵ A debate exists on whether foreign workers employed by a locally-owned firm are included or not in the definition of Mode 4 under GATS, the predominant interpretation being that they are not (see for instance the discussion in Marchetti, 2004). Note that H-1B visas are not restricted to employees of foreign companies based in the US.

¹⁶ See USCIS (2002).

¹⁷ Data refer to fiscal year 2000 (1 October 1999 to 30 September 2000). See also WTO (2004).

commitments under the GATS on Mode 4 are restricted to skilled persons. Close to 70 per cent of the commitments, besides, specifically refer to intra-corporate transferees, which implies that they are linked to the commercial presence of firms from the same home country. It has been argued that this implies that mainly industrialized countries can take advantage of existing Mode 4 commitments as they are the main "exporters" of FDI. Developing countries have repeatedly demanded more openness for Mode 4 flows of lower skilled persons and increased de-linkage of Mode 4 from commercial presence abroad. Given the measure for Mode 4 used in this paper, we cannot say anything about the potential effects of increased movements of lower skilled persons.¹⁸ Yet, our findings do suggest that the trade effects of Mode 4 can be significantly positive even if Mode 4 is not linked to FDI.

The Office of Migration Statistics publishes data on two indicators related to H-1B visa: H-1B admissions and H-1B beneficiaries. Information on non-immigrant admissions is based on immigration forms collected upon the arrival of temporary visitors in the United States by air. Since individuals may enter more than once in a fiscal year, the count of admissions exceeds the number of individuals arriving. For the sake of this study and in line with the arguments developed above, we are neither interested in the number of entries to US floor nor in the number of persons crossing borders with a H-1B visa. Instead, we are interested in the number of persons being active in the United States on the basis of a H-1B permit. This number is reflected in the data on H-1B beneficiaries published by the Office of Migration Statistics. Data on H-1B beneficiaries include both initial beneficiaries and continuing beneficiaries.

Data on the number of H-1B beneficiaries by countries of birth were first published in 2000. Data are also available for fiscal years 2001 and 2002, but after this have not been reported anymore in the Yearbook of Immigration Statistics. This paper therefore relies on the information available on H-1B beneficiaries in 2000, 2001 and 2002 to measure annual US Mode 4 stocks originating in different countries.¹⁹ The first column in Table 1 gives an overview of the distribution of H-1B beneficiaries of different origins for the ten principal sending countries. India is by far the most important sending country of H-1B beneficiaries, followed by China. The ranking of sending countries at the top end was rather stable in the period of 2000 to 2002 with only Russia falling out of that group in 2002 to be replaced by Colombia.

¹⁸ Where bilateral or regional agreements exist that allow for lower skilled labour flows, those flows turn out to be significant in size (WTO, 2004). Winters and Walmsley (2005) find that both developing and developed countries gain more from the liberalization of low skilled labour flows than from the liberalization of skilled labour flows.

¹⁹ The Yearbook of Migration Statistics 2002 reports data for 198 partner countries. All H-1B beneficiaries are covered by this dataset and we thus know that no H-1B beneficiary originates in the countries that are missing from the dataset. We could therefore safely set to zero the number of H-1B beneficiaries for those countries not listed in the Yearbook. Out of the 237 countries in our sample, over 40 countries do not record any H-1B beneficiaries and 30 countries record less than 10 beneficiaries.

Table 1: H-1B beneficiaries, immigrant stocks and immigrant flows by country of birth, 2000

	H1-B beneficiaries	Immigrant stocks	Immigrant flows
All countries	257,640	30,286,289	848,626
Top 10			
India	124,647 (1)	1,022,552 (3)	42,046 (4)
China	22,570 (2)	988,857 (4)	45,652 (2)
Canada	8,365 (3)	820,771 (8)	
United Kingdom	7937 (4)		
Philippines	7396 (5)	1,369,070 (2)	45,652 (3)
Taiwan	5420 (6)		
Japan	4920 (7)		
South Korea	4815 (8)	864,125 (7)	
Pakistan	4651 (9)		
Russia	3983 (10)		
Mexico		9,177,487 (1)	173,919 (1)
Vietnam		988,174 (5)	26,747 (5)
Cuba		872,716 (6)	20,831 (9)
El Salvador		817336 (9)	22,578 (7)
Germany		706704 (10)	
Nicaragua			24,029 (6)
Haiti			22,364 (8)
Dominican Republic			17,536 (10)
Median	31	62,262	554
Average	1089	240,367	3,966
Standard deviation	8296	843,784	13,528

Note: Numbers in brackets refer to ranks.
Source: US Census 2000 and USCIS(2000).

The absence of Mexico among the top ten sending countries may seem surprising. It is explained by the fact that most Mexican citizens temporarily entering the United States do so on the basis of other visa schemes thanks to bilateral or regional (NAFTA) agreements with the US. This is also the case for Canadian citizens. While most temporary admissions from Canada take place under the schemes for professional workers under the US-Canada Free Trade Agreement and under NAFTA, the largest percentage of Mexican admissions hold H-2B visa for temporary workers "performing non-agricultural services unavailable in the United States". US Immigration statistics only provide information on admissions of holders of the visa most relevant for Canada and Mexico and not on the number of beneficiaries. The particular situation of these two countries with respect to short-term movements of people can therefore only be taken care of by using dummies in our regressions.

Given the relevance of the migration literature for this paper and given that we include migration data in a number of regressions, it is important to compare our data for temporary migration to those for permanent migration. Information on immigrant stocks is available from US Census data. Censuses

are carried out every ten years and the most recent data available are from the year 2000. The Yearbook on Migration Statistics reports data on immigration flows on an annual basis. The second column in Table 1 presents data for the top ten countries of origin of migrants as reported in Census 2000. The third column in the Table provides data immigration inflows for the year 2000 from the Yearbook of Migration Statistics. Note that immigration flows do not include Mode 4 inflows. In this context it is interesting to compare the absolute size of Mode 4 flows and immigration flows, as it shows that Mode 4 inflows are certainly not negligible compared to migration flows. It should also be taken into account that our Mode 4 measure only covers specialty workers themselves as their family members would enter the US via another visa scheme, if they follow the H-1B beneficiary. Migration flows, instead, cover also children, retirees and other immigrants who do not pursue a professional activity in the United States.

Like in the case of Mode 4, India and China are among the top senders of migrants, but a number of countries appear among the top ten senders of migrants that did not appear to be major senders of H-1B visa holders. This is for instance the case for Vietnam, Cuba and El Salvador. Overall the impression arises that geopolitical events have a much stronger impact on immigration than on Mode 4 movements.

It is customary to use information on migration stocks to control for migration in gravity equations explaining bilateral trade. As data for stocks are only available for the year 2000 we calculate figures for the years 2001 and 2002 by adding immigration flows to the immigration stock in 2000. This is not a very precise method as we ignore attrition, but this approach has been used previously in the literature.²⁰

Census 2000 only reports data for countries reaching a certain minimum migration threshold. As a result our sample size is reduced significantly by the inclusion of a measure for migration stocks. Information on migration flows is available for a larger number of countries.²¹ Migration flows and migration stocks are highly correlated²² and migration flows therefore appears to be a suitable instrument for migration stocks and it has the advantage of enlarging our sample size.

IV. THE IMPACT OF MODE 4 MOVEMENTS ON MERCHANDISE TRADE

A. EMPIRICAL SPECIFICATION AND FIRST RESULTS

In this Section we estimate the impact the temporary movement of service providers to the US has on bilateral imports and exports. We estimate the impact of Mode 4 movements on trade using a gravity model of trade. This model is widely employed in empirical work and has been shown to be consistent with a wide range of theoretical trade models.²³ In its standard form, the gravity model explains bilateral trade flows as a function of the trading partners' market size and their bilateral barriers to trade. Market size is commonly measured by GDP. Trade barriers are commonly measured by geographic distance, indicators of whether either or both trading partners are an island, landlocked, share a common border or speak a common language. Implicit is the assumption that transport costs increase with distance, are higher for islands and landlocked countries and lower for neighbouring countries. The dummy for common language is intended to capture information costs. GDP per capita has traditionally also been included as an explanatory variable for international trade.

²⁰ See for instance Herander and Saavedra (2005). We compute migration stocks for 2001 by adding the year 2000 flows to the migration stock in 2000.

²¹ Like in the case of H-1B beneficiaries we know that all new immigrants are covered by the data reported in the Yearbook of Migration Statistics and can thus assign zero values to missing countries.

²² The coefficient of correlation is 0.95.

²³ See for example Anderson (1979), Bergstrand (1990) and Deardorff (1998).

This variable tends to perform well in gravity regressions and has been interpreted in recent literature as an indicator for country characteristics like the quality of institutions and infrastructure.²⁴

We argue that the movement of natural persons to provide a service abroad may affect bilateral merchandise trade both because it affects the demand for imports (preference effect) and because it reduces overall trade costs (more efficient provision of services, information and enforcement effect of the movement of natural persons). Therefore, bilateral merchandise trade will tend to be higher between those countries where Mode 4 trade is more intense.

In order to capture this effect, we augment the standard gravity model with the additional explanatory variable Mode 4. Using the number of H-1B visas beneficiaries as a measure of Mode 4 we thus estimate the following gravity equation :

$$\ln M_j = a_0 + a_1 \ln Y_j + a_2 \ln y_j + a_3 \ln d_j + a_4 \textit{border}_j + a_5 \textit{english}_j + a_6 \textit{island}_j + a_7 \textit{landlocked}_j + a_8 \ln \textit{remoteness}_j + a_9 \ln \textit{Mode4}_j + u_j$$

where M_j denotes US imports (or exports) from (to) country j , Y denotes GDP in PPP, y indicates GDP per capita, d distance, *border* and *english* are dummy variables that assume value of one if the partner country shares a border with the US and speaks the common language - English, in this case - respectively and zero otherwise. *Island* and *landlocked* also represent dummy variables. They are equal to one if country j is an island or a landlocked country respectively, and zero otherwise. Finally, *remoteness* denotes remoteness with respect to the rest of the world²⁵, *Mode4_j* corresponds to the number of H-1B beneficiaries from country j temporarily residing in the United States, and u is the error term. Data for imports, exports, GDP and GDP per capita are deflated using the GDP deflator. Bilateral trade in goods data were taken from the United Nations COMTRADE database. Data for GDP and GDP per capita were taken from the World Bank's World Development Indicators (WDI). The variable "distance" is taken from the CEPII database.

A first set of results obtained by using the OLS estimator on the pooled database for the period 2000-2002 is reported in Table 2. We first run the regressions without the Mode 4 variable in order to compare the performance of our sample with the standard results obtained in the literature. The standard gravity model variables GDP, GDP per capita and distance appear with the correct sign, are significant and the magnitude of the coefficients matches common results. Remoteness is also significant and has the expected positive sign.

The variable *border* is neither significant for US imports nor for US exports, which is particularly surprising as the two bordering countries, Mexico and Canada, have signed a free trade agreement (NAFTA) with the United States. This finding is however not new in the literature.²⁶ The reason is probably the different role on trade of the two US neighbouring countries. We therefore replaced the variable denoting adjacency with two separate dummies, one for Mexico and the other for Canada.

Column III shows the regression results when Mode 4 is introduced. The Mode 4 variable is significant at the 1 per cent level and has the expected sign both in the bilateral import and export equations. A 10 per cent increase of Mode 4 movements into the US is estimated to lead to a 1.7 per cent increase in imports from the beneficiaries' home country and a 2.0 per cent increase in US exports to their home country. This result falls in the upper range of the effects found in migration

²⁴ De Groot et al. (2004).

²⁵ We use a definition of remoteness that has been introduced in the literature by Helliwell (1997) and commonly used in the gravity models. It is calculated as the weighed average distance of each country from the rest of the world, where GDP values are the weights. Remoteness here is intended to capture the important result provided by the theory that bilateral trade depends on relative trade costs (Anderson and van Wincoop, 2003).

²⁶ The NAFTA-dummy is for instance insignificant in Herander and Saavedra (2005).

studies. Since H-1B visa relate to temporary movement of skilled workers, this result is consistent with recent findings showing that immigrant-based network effects are stronger for newer immigrant groups and higher skilled immigrants (Herander and Saavedra, 2005).

In order to test whether our results are determined by the omission of the immigration variable, we also run a regression including a measure for immigration. Column IV reports results for this regression when we use immigration stocks as a measure. Mode 4 remains strongly significant and the parameter size is not altered much by the inclusion of the migration variable. The migration parameter is also positive and significant. As discussed before, the sample size is reduced significantly if we use migration stocks as a measure for migration. We therefore perform the same exercise with migration flows as a measure for migration, which increases sample size. Mode 4 remains significant while the impact of migration turns out to be insignificant in this case.

Including time fixed effects did not change our results. We also performed the same gravity regressions for different samples. In particular we excluded India and China, the two countries that are outliers in our sample with respect to the Mode 4 variable. Also this change did not affect our results. Next we excluded the lower end of our sample, i.e. those countries with small Mode 4 flows into the US. We used the number of 10 H-1B beneficiaries as a cut-off point, admittedly an arbitrary choice, and again found similar results as in our original regressions. To test for the possibility that it takes time for Mode 4 flows to affect exports, we introduced Mode 4 lagged by one period in the export equation. The results were slightly weaker but did not change significantly.²⁷

²⁷ The results of these regressions are available from the authors upon request.

Table 2: The Impact of Mode 4 movements on US merchandise trade
(OLS estimates, pooled data 2000-2002)

Explanatory Variables	Imports					Exports				
	I	II	III	IV	V	I	II	III	IV	V
GDP	1.09*** (0.04)	1.09*** (0.04)	0.91*** (0.08)	0.80*** (0.10)	0.89*** (0.08)	0.87*** (0.03)	0.87*** (0.03)	0.65*** (0.06)	0.67*** (0.06)	0.65*** (0.06)
GDP per capita	0.21*** (0.06)	0.21*** (0.06)	0.30*** (0.07)	0.28*** (0.08)	0.31*** (0.07)	0.20*** (0.04)	0.20*** (0.04)	0.30*** (0.05)	0.27*** (0.05)	0.32*** (0.05)
Distance from US	-0.82*** (0.17)	-0.87*** (0.18)	-0.74*** (0.18)	-0.86*** (0.24)	-0.76*** (0.19)	-1.44*** (0.12)	-1.53*** (0.12)	-1.38*** (0.13)	-1.48*** (0.16)	-1.34*** (0.14)
Border	0.96 (0.68)					0.21 (0.49)				
Canada		-0.02 (.98)	0.23 (.98)	-0.06 (1.04)	0.18 (1.00)		-1.62** (0.69)	-1.30** (0.68)	-1.52** (0.67)	-1.19** (0.69)
Mexico		1.74** (0.88)	1.81** (0.88)	0.99 (0.86)	1.86** (0.88)		1.67*** (0.62)	1.75*** (0.61)	1.36** (0.56)	1.72*** (0.61)
English	0.05 (0.16)	0.08 (0.16)	-0.08 (0.18)	-0.25 (0.21)	-0.08 (0.18)	0.36*** (0.12)	0.42*** (0.12)	0.22* (0.12)	0.24* (0.14)	0.21* (0.12)
Island	0.36 (0.24)	0.35 (0.24)	0.27 (0.24)	0.15 (0.32)	0.12 (0.23)	-0.04 (0.17)	-0.07 (0.17)	-0.16 (0.17)	-0.03 (0.21)	-0.15 (0.16)
Landlocked	-0.60*** (0.18)	-0.59*** (0.18)	-0.51*** (0.18)	-0.08 (0.23)	-0.55*** (0.18)	-0.70*** (0.13)	-0.68*** (0.12)	-0.58*** (0.12)	-0.35** (0.15)	-0.56*** (0.13)
Remoteness	2.12*** (0.41)	2.14*** (0.42)	2.32*** (0.42)	2.56*** (0.46)	2.32*** (0.42)	1.52*** (0.30)	1.56*** (0.29)	1.77*** (0.29)	2.23*** (0.30)	1.79*** (0.29)
Migration stock				0.18** (0.07)					0.08* (0.05)	
Migration flow					-0.01 (0.04)					0.02 (0.03)
Mode 4			0.17*** (0.06)	0.19** (0.09)	0.19*** (0.07)			0.20*** (0.04)	0.18*** (0.06)	0.18*** (0.05)
Number of observations	525	525	525	359	525	525	525	525	359	525
Adjusted R-square	0.77	0.77	0.78	0.76	0.78	0.83	0.84	0.84	0.85	0.84

B. ENDOGENEITY

The fact that the Mode 4 variable used here to some extent reflects trade (in services) raises concerns that any variable omitted in our regression may simultaneously affect Mode 4 and the dependent variable (merchandise trade), thus creating an endogeneity problem. To address the possible problem we estimate a system of equations that estimates simultaneously bilateral merchandise exports, merchandise imports and Mode 4 movements to the United States. We rely on the same gravity equation that has been used to explain trade flows also to explain Mode 4 movements.²⁸ All independent variables included in the regressions for merchandise trade are also included in the regression for Mode 4 and we expect them to have the same sign. Indeed, one could expect Mode 4 outflows to be larger for bigger countries and for countries that are closer to the host country. It should be easier for English speaking persons to provide their services in the United States and the island and landlocked dummy could have similar effects on services trade as on merchandise trade.

The only standard variable in gravity model of trade that may have a different effect on Mode 4 outflows than on merchandise trade is GDP per capita. The level of development is often taken as a proxy for the quality of institutions and infrastructure in the analysis of merchandise trade flows. Rich countries are likely to have better institutions and infrastructure, thus facing lower transaction costs. As a consequence GDP per capita is expected to have a positive and significant effect on trade. But GDP per capita may have an additional influence on Mode 4 flows that is of an entirely different nature. From the migration literature we know that the incentives to migrate are higher the higher the wage differences between home and host country. To the extent that GDP per capita differences reflect wage differences and that services providers are more likely to temporarily move abroad the higher wage differences, GDP per capita in the home country may have a negative effect on Mode 4 flows. The Mexico and Canada dummy may also perform differently in the Mode 4 regression than in the regressions for merchandise trade. In contrast to nationals from other countries, Mexicans and Canadians have privileged access to other types of temporary work visa. We therefore expect both dummies to have a negative sign in the Mode 4 regression.

Three additional variables are included to explain the movement of natural people to provide a service. *Age dependency* indicates the ratio of dependents (defined as people younger than 15 and older than 64) to the working-age population (those aged between 15 and 64), *Schooling3* is the ratio of people enrolled in tertiary education to the population of the age group that officially corresponds to the tertiary level of education shown.²⁹ *Year2002* is a dummy variable that assumes the value 1 for observations relative to the year 2002.

The rationale behind the inclusion of these three variables among the regressors for Mode 4 is the following. The movement of people abroad involves separation costs. Separation costs may be due to the fact that by moving abroad people will no longer enjoy the closeness of their relatives. Alternatively, separation costs may consist in the costs of moving the whole family abroad. The higher these costs, the higher the resistance to move abroad. We expect that the higher the age dependency ratio, i.e. the higher the likelihood that workers have to take care of children and elderly parents, the higher their separation cost.

Since the H-1B visa is intended to be used by skilled workers, it will be more likely that people using this type of visa come from countries relatively well endowed with skilled workers. The variable *Schooling3* is intended to proxy the potential size of the pool of service workers with appropriate skills to apply for H-1B visa.

²⁸ This approach is consistent with the fact that Mode 4 movements are a way of trading a service. Following the literature on bilateral trade flows, we model bilateral trade in services with a gravity model. Furthermore, although not theoretically grounded, the use of a gravity model is also common in the literature on the determinants of migration (see Helliwell, 1998, for a review of gravity-based migration models).

²⁹ Data for both variables have been taken from the World Bank's WDI Database.

Finally, we expect that the security restrictions introduced in the US after September 11th result in a generalised fall in the number of people entering the country with an H-1B visa in 2002. The Year2002 dummy is intended to capture this effect.

We thus estimate a system of simultaneous equations of the following form, where M_j denotes US imports from country j and E_j US exports to country j :

- $$(1) \quad \ln M_j = a_0 + a_1 \ln Y_j + a_2 \ln y_j + a_3 \ln d_j + a_4 \text{canada} + a_5 \text{mexico} + a_6 \text{english}_j + a_7 \text{island}_j + \\ + a_8 \text{landlocked}_j + a_9 \ln \text{remoteness}_j + a_{10} \ln \text{Mode4}_j + u_j$$
- $$(2) \quad \ln E_j = a_0 + a_1 \ln Y_j + a_2 \ln y_j + a_3 \ln d_j + a_4 \text{canada} + a_5 \text{mexico} + a_6 \text{english}_j + a_7 \text{island}_j + \\ + a_8 \text{landlocked}_j + a_9 \ln \text{remoteness}_j + a_{10} \ln \text{Mode4}_j + z_j$$
- $$(3) \quad \ln \text{Mode4}_j = b_0 + b_1 \ln Y_j + b_2 \ln y_j + b_3 \ln d_j + b_4 \text{canada} + b_5 \text{mexico} + b_6 \text{english}_j + b_7 \text{island}_j + \\ + b_8 \text{landlocked}_j + b_9 \ln \text{remoteness}_j + b_{10} \ln \text{Age Dependency}_j + b_{11} \ln \text{Schooling3}_j + \\ + b_{12} \text{year2002} + v_j$$

Table 3 shows the results of the three stage least-square regression used to estimate the simultaneous equation model. Columns numbered from I to III only differ in the list of regressors for Mode 4. For example, regression I refers to a system of three equations for imports, exports and Mode 4 respectively, where Mode 4 only includes *Age Dependency* as extra explanatory variable added to the standard gravity equation regressors. Regression II includes also the variable *Year2002* as an explanatory variable for Mode 4 and Regression III, in addition, contains the variable *Schooling3*.

The results indicate that the previous regression results for US imports might have suffered from a downward bias due to the endogeneity of our regressor. The coefficient of Mode 4 ranges from 0.36 to 0.54 in the import regression, well above previous estimates. Mode 4 also has a significant and positive effect on exports and the size of the coefficients broadly replicates that of OLS estimations.

Since OLS estimation is to be preferred to instrumental variable (IV) estimation, if there is not an endogeneity problem, we perform the Hausman test and the augmented regression test proposed by Davidson and MacKinnon (1993). Both tests show that the OLS is likely not to be indicated to estimate the import equation. Nevertheless, when run on the export equation they seem to show that there is not sufficient correlation between the disturbances to warrant estimation by instrumental variables.³⁰ In other words, as far as exports are concerned the OLS results presented in Table 2 are to be preferred to the results of the IV regression presented in Table 3.

³⁰ For imports, the Hausman test provides a $\chi^2(11)=15.01$ and the augmented regression test record a t-statistic = 1.78; for exports the values of these tests are 5.63 and -0.19 respectively.

Table 3: A simultaneous system of gravity model equations for imports, exports and Mode 4
(Three stage least square estimations, pooled data 2000-2002)

	Imports			Exports			Mode 4		
	I	II	III	I	II	II	I	II	III
GDP	0.75*** (0.15)	0.74*** (0.14)	0.59*** (0.17)	0.71*** (0.15)	0.69*** (0.10)	0.62*** (0.12)	1.02*** (0.03)	1.01*** (0.03)	0.98*** (0.03)
GDP per capita	0.36*** (0.09)	0.37*** (0.09)	0.38*** (0.11)	0.26*** (0.06)	0.27*** (0.06)	0.29*** (0.08)	-0.76*** (0.04)	-0.76*** (0.04)	-0.84*** (0.05)
Distance from US	-0.69*** (0.20)	-0.68*** (0.20)	-0.72*** (0.25)	-1.48*** (0.14)	-1.47*** (0.14)	-1.49*** (0.18)	-0.90*** (0.11)	-0.90*** (0.11)	-0.94*** (0.14)
Canada	0.32 (0.99)	0.34 (0.99)	0.22 (1.16)	-1.57** (0.67)	-1.54** (0.67)	-1.46* (0.85)	-1.66*** (0.58)	-1.70** (0.58)	-1.77*** (0.68)
Mexico	1.77** (0.87)	1.78** (0.87)	1.74* (1.00)	1.61*** (0.59)	1.61** (0.59)	1.66** (0.73)	-0.23 (0.52)	-0.22 (0.52)	-0.14 (0.59)
English	-0.27 (0.21)	-0.28 (0.21)	-0.37 (0.24)	0.21# (0.14)	0.20# (0.14)	0.08 (0.17)	0.99*** (0.10)	0.99*** (0.10)	0.96*** (0.12)
Island	0.19 (0.24)	0.18 (0.24)	0.34 (0.31)	-0.17 (0.16)	-0.18 (0.16)	-0.19 (0.23)	0.11 (0.14)	0.11 (0.14)	0.11 (0.19)
Landlocked	-0.40** (0.19)	-0.40 (0.19)	-0.25 (0.23)	-0.56*** (0.13)	-0.55*** (0.13)	-0.61*** (0.17)	-0.36*** (0.11)	-0.36*** (0.11)	-0.43*** (0.12)
Remoteness	2.52*** (0.43)	2.53*** (0.43)	2.25*** (0.48)	1.78*** (0.29)	1.79*** (0.29)	1.75*** (0.36)	0.15 (0.26)	0.15 (0.26)	0.54* (0.30)
Mode 4	0.34*** (0.13)	0.35*** (0.13)	0.50*** (0.15)	0.18** (0.08)	0.19** (0.08)	0.24** (0.11)			
Age dependency							-7.29*** (0.56)	-6.58*** (0.76)	-6.66*** (0.76)
Schooling3									1.38*** (0.48)
Year2002								-1.13* (0.08)	-0.22* (0.11)
Number of observations	519	519	293	519	519	293	519	519	293
Adjusted R-square	0.78	0.79	0.79	0.85	0.85	0.85	0.86	0.86	0.86

The partial R-squares for the instruments and the Sargan test of over-identification suggest that the instruments we have used are relevant and tend not to be correlated with the errors. The partial R-squares obtained from the first stage estimation are between 0.30 and 0.25 for the import equation (depending on whether the instrument *Schooling3* is included or not among the instruments), thus indicating that the instruments are relevant. The Sargan statistic clearly shows that instruments are

valid when *Schooling3* is not among the instruments (p-value is 0.48). However, when *Schooling3* is among the instruments the p-value of the Sargan test is 0.10.

The inclusion of the variable *Schooling3* significantly reduces the number of observations on which the analysis is run (from 519 to 293), thus the results of regressions II and III are not strictly comparable with those of regression I and previous regressions. In particular, the coefficient of Mode 4 on imports appears higher. It is nevertheless remarkable that all standard variables in the regression maintain the expected signs and that GDP, GDP per capita, distance, remoteness and Mode 4 always remain significant and within the same order of magnitude. Given the relevance of schooling for the likelihood to obtain a H-1B visa, we maintain this variable among the instruments, notwithstanding the impact of the schooling measure on sample size.

The estimated Mode 4 equation provides a good fit of the data, reflected in an adjusted R-square of 0.86. The results of the regressions show that the coefficients of the significant variables have the expected signs. The temporary movement of people from abroad to the United States to provide a service is likely to be negatively related to the cost of moving abroad, positive related to the size of the country of origin (either measured in terms of GDP or population) and to the likelihood that the people in the country possess the appropriate skills (such as a bachelor degree).

The results of Table 3 confirm expectations. The inflow to the US of temporary workers that provide a service is negatively related to the GDP per capita of their country of origin, its distance from the US, whether it is a landlocked country and the age dependency ratio, while it is positively related to whether the official language is English.

The number of people that enter the US using an H-1B visa is also likely to be positively affected by the probability of meeting the requirements and negatively affected by the difficulty of getting an H-1B visa or the facility of entering the US via either types of visa. Table 3 shows that an increase in the enrolment in tertiary education ratio by 10 per cent increase the number of people temporarily moving to the US to provide a service by 15 per cent. Since H-1B visas target skilled workers, the probability of meeting the requirements is higher for those countries where there is a relatively larger pool of qualified people. As expected, the coefficients for the Canada, the Mexico and the year 2002 dummy reported in Table 3 are negative.

The results obtained including both Mode 4 movements and migration stocks or flows in the system of simultaneous gravity equations are reported in Table 4. In the Table only the estimated coefficients for the labour mobility variables are shown, since the values for the coefficients of the standard gravity model remain substantially invariant. The sign of the coefficient for Mode 4 is consistently positive and significant in the import regressions. In the case of the export equation, Mode 4 do not appear significant in the case of migration stock. However, the results of the endogeneity tests suggest that the OLS estimates should be preferred to the IV results in the case of exports.

Table 4: The Movement of people to the US and US merchandise Trade
(Three Stage Least Square)

Additional regressors in Mode 4 equation	Imports						Exports					
	Age dependency		Age dependency & year2002		Age dependency & Schoolling3 & year 2002		Age dependency		Age dependency & year2002		Age dependency & Schoolling3 & year 2002	
	I	II	I	II	I	II	I	II	I	II	I	II
Mode 4	0.35** (0.18)	0.21 (0.18)	0.36*** (0.18)	0.23## (0.18)	0.52*** (0.18)	0.31* (0.18)	0.15 (0.12)	0.05 (0.12)	0.16 (0.14)	0.07 (0.12)	0.20# (0.13)	0.13 (0.13)
Immigration flow	-0.01 (0.06)		-0.01 (0.06)		-0.01 (0.06)		0.03 (0.04)		0.03 (0.04)		0.07# (0.05)	
Migration Stock		0.18* (0.09)		0.17* (0.09)		0.12 (0.09)	0.09## (0.06)		0.08## (0.06)			0.06 (0.06)
Number of observations	519	359	519	359	293	235	519	359	519	359	293	235
Adjusted R-square	0.78	0.76	0.78	0.76	0.79	0.77	0.85	0.85	0.85	0.85	0.85	0.84

Note: # indicates 15 per cent significance, ## indicates 20 per cent significance level.

V. CONCLUSIONS

This paper analysed the effects of the temporary movement of persons on bilateral merchandise trade flows between home and host country. The temporary movement of people for the purpose of providing a services is one of the four modes of delivering a service, i.e. Mode 4, under the General Agreement on Trade in Services (GATS).

Previous empirical literature has found that permanent movements of persons, i.e. migration, have a positive effect on both host country's imports from and exports to the home country. Trade flows increase because the presence of migrants reduces transaction costs for trade with the relevant home country. Besides, migrants may have a preference for goods from their home country which explains why imports from that country increase. Recent empirical literature has also shown that the trade effects of migration increase with the skill level of migrants and that the trade promoting effects are greatest for newer cohorts of migrants. This indicates that it may not be necessary for migration to be permanent in order to have significantly positive effects on bilateral trade flows.

We test for the potential positive effects of temporary movements of people by including the number of H-1B beneficiaries in the United States into a gravity model explaining trade flows between the United States and the home countries of the H-1B beneficiaries. The H-1B visa scheme permits foreign professionals to enter the United States on a temporary basis to work in their field of expertise. We find that workers being temporarily active in the United States have a positive effect on both imports from and exports to host countries and that the magnitude of these effects is close to the one found in the existing literature on migration. Our results are robust to the inclusion of measures for permanent migration.

The fact that the services provided by H-1B beneficiaries reflect trade in services via Mode 4 raises concerns about possible problems of endogeneity in our OLS regressions explaining merchandise

trade. We address this concern by estimating a system of simultaneous equations where age dependency and the level of schooling are used as instruments for Mode 4. Our tests show that our previous OLS results for the effect of Mode 4 on merchandise imports are likely to have suffered from a downward bias, as the effect of Mode 4 on imports remains significant but with a larger parameter when estimating a system of simultaneous equations. The tests also show that both age dependency and the level of schooling are relevant instruments for Mode 4. With respect to merchandise export, instead, the results from the OLS regressions are likely to be more reliable.

Our results indicate that Mode 4 liberalization can have welfare promoting effects in addition to the standard welfare effects of trade through its effect on transaction costs for trade in goods. Mode 4 flows are also likely to have an effect on other modes of services trade, an issue that has not been addressed in this paper. Due to the measure used in this paper for Mode 4 flows, the analysis is restricted to skilled workers. Future research could try to extend the argument to low-skilled services providers.

VI. REFERENCES

Anderson, James E. (1979) 'A Theoretical Foundation for the Gravity Equation', *American Economic Review* 69: 106-116.

Anderson, J. and E. van Wincoop (2003) "Gravity with Gravitas: A Solution to the Border Puzzle" *American Economic Review*, 93, 1:170-92.

Bergstrand, Jeffrey H. (1990) 'The Heckscher-Ohlin-Samuelson Model, the Linder Hypothesis and the Determinants of Bilateral Intra-Industry Trade', *Economic Journal* 100: 1216-1229.

Bigsten, Arne, Paul Collier, Stefan Dercon, Bernard Gauthier, A. Isaksson, A. Oduro, R. Oostendorp, C. Pattillo, M. Söderbom, M. Sylvain, F. Teal, and A. Zeufack (2000) 'Contract Flexibility and Dispute Resolution in African Manufacturing', *Journal of Development Studies* 36,4:1-37.

Chellaraj, Gnanaraj, Keith E. Maskus and Aaditya Mattoo (2005) "The Contribution of Skilled Immigration and International Graduate Students to U.S. Innovation," World Bank Policy Research Working Paper 3588, Washington D.C.: World Bank.

Davidson, R. and J.G. MacKinnon (1993) *Estimation and Inference in Econometrics*, New York: Oxford University Press

Deardorff, Alan V. (1998) 'Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World?' in J.A. Frankel (Ed.), *The Regionalization of the World Economy*, Chicago: University of Chicago Press.

Dunlevy, J.A. and W.K. Hutchinson (2001) "The Pro-Trade Effect of Immigration on American Exports During Period 1870 to 1910" Working Paper 1-W25, Department of Economics University of Viderbilt.

Dunlevy, J.A. and W.K. Hutchinson (1999) "The Impact of Immigration on American Import Trade in the late Nineteenth and Early Twentieth Centuries" *The Journal of Economic History*, 59:1043-1062.

Girma Sourafel and Zhihao Yu (2000) "The Link between Immigration and Trade: Evidence from the United Kingdom," *Weltwirtschaftliches Archiv*, 138:115-130.

Gould David M. (1994) "Immigrant Links to Home Country: Empirical Implications for US bilateral trade flows," *The Review of Economics and Statistics* 76: 302-316.

Greif, Avner (1993) "Contract Enforceability and Economic Institutions in Early Trade: The Maghribi Traders' Coalition," *American Economic Review*, 83: 524-548.

de Groot, Henri L.F, Gert-Jan Linders, Piet Rietveld and Uma Subramanian (2004) "The Institutional Determinants of Bilateral Trade Patterns," *Kyklos* 57:103-123.

Head Keith and John Ries (1998) "Immigration and Trade: Econometric Evidence from Canada," *Canadian Journal of Economics*, 31: 47-62.

Helliwell J. (1997) "National Bordes, Trade and Migration", *NBER working paper* 6027.

Helliwell J. (1998) "*How Much do National Border Matter?*", Brooking Institution Press, Washington D.C.

Herander, Mark G. and Luz A. Saavedra (2005) "Exports and the Structure of Immigrant-Based Networks: The Role of Geographic Proximity," *The Review of Economics and Statistics* 87: 323-335.

Marchetti, Juan (2004) "Developing Countries in the WTO Services Negotiations," Staff Working Paper ERSD-2004-06, Geneva: World Trade Organization

Mattoo, Aaditya and Antonia Carzaniga (2004) *Moving People to Deliver Services* Washington D.C.: The World Bank and Oxford University Press, 2004

OECD (2002) "Service Providers on the Move: A close Look at Labour Mobility and the GATS", TD/TC/WP(2002)26, Paris: Organization for Economic Co-operation and Development.

Rauch, James E. (1996) "Trade and Search: Social Capital, Sogo Sosha, and Spillovers," NBER working paper no. 5618.

Rauch, James E. (1997) "Networks versus Markets in International Trade," *Journal of International Economics* 48: 7-36.

Rauch, James E. (2001) 'Business and Social Networks in International Trade', *Journal of Economic Literature*, XXXIX:1177-1203.

Rauch James E. and Vitor Trindade (2002) "Ethnic Chinese Networks in International Trade," *Review of Economics and Statistics* 84: 116-130.

US Citizenship and Immigration Services (2002) *2002 Yearbook of Immigration Statistics*, US Department of Homeland Security, Office of Immigration Statistics.

Wagner, Don, Keith Head and John Ries (2002) "Immigration and the Trade of Provinces", *Scottish Journal of Political Economy* 49: 507-525.

Winters, A. and T.L. Walmsley (2005)"Relaxing the Restrictions on the Temporary Movements of Natural Persons: A simulation Analysis", *Journal of Economic Integration*, forthcoming

WTO (2004) *World Trade Report 2004*, Geneva: World Trade Organization.