

## Bilateral trade impacts of temporary foreign visitor policy

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**Abstract** Using country-level panel data from 1950 to 2003, this paper critically examines the impact of the US Visa Waiver Program (VWP) on bilateral trade levels. Our empirical analysis uses a variety of specifications, estimators, and robustness checks, including a “random growth” specification that controls for selection bias from both time-varying and time-invariant unobserved country-specific characteristics. The results indicate that a temporary foreign visitor policy with less requirements, such as the US VWP, tends to increase the bilateral trade levels between the US and the selected VWP countries, especially for US exports. This suggests that VWP may have encouraged business travel and commerce enough such that there are export benefits from this less restrictive temporary foreign visitor policy of about 10–20% ( $\sim 2\text{--}4\%$  in tariff equivalent terms).

**Keywords** Bilateral trade · Cross-country labor movements · Face-to-face business interactions · International business · Temporary business travelers · Panel data · Random growth specification · Fixed effects · Poisson · Generalized method of moments

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## 1 Introduction

The main mechanism used by most countries, including the United States (US), to control the influx of foreign nationals into their borders is a national visa policy. Individuals from foreign countries wishing to enter the US are typically required to obtain a visa from a US consulate in their country (or another country) as a condition for entry. Visas are essentially documents that are attached to an individual's passport and serves as a formal request to enter a particular country, like the US, as a temporary (non-immigrant) or permanent (immigrant) visitor.<sup>1</sup> Temporary visitors are those individuals wishing to enter the country on a temporary basis for a specific purpose like business and tourism, but still maintain permanent residence in their home country. Permanent visitors are those individuals wanting to seek permanent residence in the US.

The visa waiver program (VWP) allows nationals from certain countries to enter the US as temporary visitors, for business or tourism purposes, without first obtaining a visa from a US consulate abroad. Temporary visitors from non-VWP countries, in contrast, must first obtain a visa from Department of State (DOS) officers at a consular post abroad before coming to the US. The VWP constitutes one of a few exceptions under the US Immigration and Nationality Act (INA) in which foreign nationals are admitted into the US without a valid visa (see the [Appendix](#) for a detailed description of the VWP). In 2006, 15.3 million visitors entered the United States under this program, constituting 51% of all overseas visitors.

By eliminating the visa requirement, the VWP program facilitates international travel and commerce and eases consular office workloads abroad, but it also bypasses the first step by which foreign visitors are screened for admissibility to enter the US. More importantly, the VWP program expedites the travel of foreign businessmen to the US and, consequently, makes it potentially easier for foreign businessmen to foster trade relationships with US firms (see Poole 2010, for example). The influx of tourists from VWP countries may also facilitate trade by making the foreign visitors aware of the products and services available in the US that can be exported abroad. However, the reduction of the “visa barrier” to foreign entry has been hampered by important security concerns that stem from increasingly widespread international terrorist events (i.e., 9–11 terrorist attack in New York, transit bombings in London) and occurrence of disease epidemics (i.e., avian flu influenza, mad cow disease, swine flu, etc.). There are also concerns of temporary visitors “overstaying” and becoming illegal immigrants in the US. The desire to increase the flow of foreign business travelers and tourists to potentially increase commerce and trade volume has to be balanced with the need to restrict entry due to security concerns and illegal immigration issues.

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<sup>1</sup> Note that obtaining a visa does not guarantee entry to a foreign country. A visa document only states that an individual is eligible to enter a foreign country for a specific purpose. The final decision for entry rests with each country's border authority.

The objective of this study is to determine the ex post bilateral trade impact of the VWP. Intuitively, since the VWP facilitates international business travel and commerce, one would expect a priori that the VWP should positively impact bilateral trade levels between the US and the VWP countries. This is the hypothesis we are interested in testing.

Investigating the bilateral trade impact of the VWP is important to national policymakers because it will allow them to better gauge the economic benefits from a less restrictive visa policy for temporary visitors and be able to weigh those benefits against the cost in terms of increased risks associated with security and illegal immigration. If it is shown that a less restrictive visa policy for temporary visitors (such as the VWP) does not contribute significantly to bilateral trade, then the government may need to rethink whether a more lenient visa policy for certain countries should continue in light of increasing security and illegal immigration concerns. Furthermore, a strong positive trade effect of a temporary business immigration policy provides another economic justification for the continued existence and maintenance of this particular visa policy.

There have been a number of studies that have consistently shown a strong positive relationship between permanent immigration and bilateral trade for several different countries.<sup>2</sup> But no study specifically investigated the effect of a less restrictive visa policy for temporary visitors, like the VWP, on bilateral trade. Head and Ries (1998) examined the effect of entrepreneur and business class immigration (e.g., investors and self-employed individuals) on trade and found a small but statistically insignificant effect. Note, however, that Head and Ries (1998) explored the bilateral trade effects of permanent (rather than temporary) entrepreneurs and/or businessmen. Hence, this article contributes to the literature by focusing on the bilateral trade effects of a less restrictive visa policy for *temporary* visitors (nonimmigrants), instead of *permanent* visitors (immigrants).

In addition, this study also contributes to the recent literature on the effects of face-to-face business interactions on bilateral trade. Several recent studies have argued that face-to-face visits of government officials and/or high-level business people from one country to another country (or countries) can probably contribute to increased trade levels between them. For example, Nitsch (2007) has shown that state and official visits by government officials are indeed positively correlated with exports (but not so much with imports). Presence of foreign embassies and foreign business agencies that facilitate face-to-face interactions between business people have also been shown to increase trade (see Rose 2007; Gil-Pareja et al. 2008). Head and Ries (2010), however, did not find any evidence of a statistically significant trade increasing effect from trade missions that facilitate interactions with foreign officials and businessmen. Since the VWP program facilitates face-to-face interactions of businessmen, this study also provides evidence on whether improved face-to-face interactions affects trade.

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<sup>2</sup> See, for instance, Gould (1994), Head and Ries (1998), Dunlevy and Hutchinson (1999, 2001), Rauch and Trindade (2002), Girma and Yu (2002), Wagner et al. (2003), Blanes (2005), Combes et al. (2005), Mundra (2005), and Faustino and Leitão (2008).

We use country-level panel data to examine whether the VWP results in higher bilateral trade levels between the US and the VWP countries. Various econometric estimation strategies that control for dynamics, zero values in the data, and selection issues were used in the analysis, including a “random growth” specification that not only allows one to control for selection based on time-invariant unobserved country-specific characteristics, but also control time-varying unobserved characteristics that influence VWP designation and trade outcome changes. Results from the analysis indicate positive and statistically significant effects of VWP on US exports to VWP countries. The effect of VWP on US imports is positive in all specifications, but it is not as strong as the impact on exports. Thus, the findings from our empirical analysis suggest that the VWP program tend to encourage business travel and commerce that leads to strong trade effects.

The remainder of the paper is organized as follows. The next section describes the theoretical basis of the relationship between bilateral trade and temporary foreign visitor policy. Section three discusses the country-level data used in the study. The empirical specification is presented in the fourth section and the estimation strategy is described in the fifth section. Results of the empirical analysis are presented in the sixth section. Concluding comments are provided in the last section.

## 2 Conceptual framework

To understand whether a less restrictive nonimmigrant visa policy like the VWP can generate higher trade, it is important to conceptually identify the possible mechanisms and linkages by which trade creation would occur as a result of this policy change. The potential “path” of the VWP effect on trade is as follows: first, the VWP would result in more foreign business visitors and tourists in the US; second, the increase in foreign business visitors and tourists would then potentially increase the level of bilateral trade between the US and the home countries of the foreign visitors due to the increased interaction between foreign visitors and US businesses/firms.

The first “link” in the causal chain above suggests that the lowering of visa restrictions directly affects the number of foreign business visitors and tourists. This simply implies that with less visa requirements for a certain country the transactions costs to the foreign traveler is reduced, thereby increasing the probability that these foreigners will travel to this country. Reduced transactions costs is the mechanism that allows for the potentially significant positive effect of the VWP on the number of business visitors and tourists travelling to the US. Note that without the VWP program, individuals from other countries wishing to travel to the US would have had to process their visa application well in advance of the planned visit(s) and the time/documentation required to complete the visa application can be substantial. Thus, the transactions costs in terms of the time involved in applying for a normal nonimmigrant visa, as well as the visa application fees, are essentially eliminated with the VWP, which in turn provides more incentives for foreign travelers and tourists to visit the US.

Aside from the reduction in transactions costs in terms of application time and fees, another important “cost” that is significantly reduced with the VWP is the uncertainty of whether a visa application would be granted. Although an individual from a country participating in the VWP is still not automatically assured of entry into the US (i.e., immigration personnel at the port of entry can deny entry), he or she knows that compliance with the VWP requirements (i.e., valid passport, return ticket, etc.) ensures a high likelihood of entry. Potential business travelers and tourists from non-VWP countries have to factor in the expected cost of a business/tourist visa denial (i.e., foregone business opportunities, wages) when doing their calculations of whether or not to visit the US. For potential travelers from VWP countries, there would be no expected cost of visa denial since there is no visa to apply for. Although note that potential travelers in VWP countries still need to consider the expected cost of denial at the port of entry. But denial at the port of entry is unlikely if the individual follows all the VWP requirements. Compare that to a potential traveler in a non-VWP country that has to consider both the expected cost of entry denial (at the port of entry) and the expected cost of visa denial (at the consulate abroad). Hence, the reduction of transactions costs in terms of the uncertainty of visa denial also provides incentives for foreign business travelers and tourists from VWP countries to visit the US.

To provide some evidence on whether this first causal link actually exists (i.e., VWP increases foreign business travelers and tourists from the countries participating in VWP), we use available country-level data from 1989 to 2004<sup>3</sup> and ran panel data regressions that examine the percentage difference in the amount of business travelers/tourists before and after implementation of the VWP. Our empirical results indicate that the number of business travelers and tourists from VWP countries going to the US increased by 63 and 68%, respectively, after joining the VWP. Similar results are obtained when we ran regressions comparing the amount of business travelers and tourists from VWP countries relative to non-VWP countries.<sup>4</sup> Hence, these empirical results suggest that the VWP may indeed have a business travel/tourist travel increasing effect due to the lower transactions costs and uncertainty costs provided by the program.

The second “link” in the causal chain described above is the resulting increase in bilateral trade due to the increase in business visitors and tourists. One mechanism by which this materializes is with respect to the market information that the business visitor brings, as well as the faster development of trust when there are face-to-face

<sup>3</sup> This data is available for years 1989–1996, 1998, 1999, and 2002–2004 for the following countries only: Argentina, Australia, Belgium, Brazil, Colombia, Denmark, Finland, France, Germany, Greece, Hong Kong, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Kenya, Korea, Morocco, the Netherlands, New Zealand, Norway, Pakistan, the Philippines, Poland, Portugal, Singapore, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Thailand, Turkey, the United Kingdom, and Venezuela. These data about the flow of temporary nonimmigrants to the United States come from the Department of Homeland Securities’ online database for the years 1998, 1999, and 2002–2004. Data for 1989–1996 comes from the annual Statistical Yearbook of the Immigration and Naturalization Service. In all cases data comes from the chart titles “Nonimmigrants admitted by country of citizenship.” Online database accessed on October 31, 2005. Available at <<http://uscis.gov/graphics/shared/statistics/data/index.htm>>.

<sup>4</sup> The results of these regressions are not reported here in the spirit of conciseness, but are available from the authors upon request.

meetings between business partners. Temporary business visitors have first-hand information about the markets in their own countries, the demand patterns of people in their country, and have business contacts with wholesale traders in their home country. Having the opportunity to visit the US through the VWP makes it easier for foreign businessmen to communicate the details of their markets to US firms and establish trade relationships (Filatotchev et al. 2009). Several face-to-face meetings to exchange information would also allow the foreign business representatives to develop trust faster with the US firms. This facilitates business negotiations and contract enforcement (i.e., reputation effects), which eventually helps increase the level of bilateral trade between the foreign country and the US.<sup>5</sup>

Moreover, after a trade relationship has been established between a foreign business and a US firm, it is normal for foreign business representatives to regularly visit the US to either inspect products for quality (in the case of importing) or validate the existence/working of good markets (in the case of exporting). Periodic visits by the foreign trading partner to the US help maintain and foster the trade and business relationships among international firms.

Increased tourist volume from VWP countries may also facilitate trade by making the foreign visitors aware of the types of markets and services available in the US. These foreign visitors may create import demand in their countries for the products made/developed in the US. US businesses and firms dealing with tourists from VWP countries may also become more familiar with tastes and preferences of these foreign visitors such that domestic US firms/businesses would be able to export products that coincide with a particular foreign demand.

In summary, the VWP program can arguably have a positive impact on trade due to the lower transactions costs that result in increased business visitor and tourist volume in the US. In turn, more VWP businessmen and tourists can help facilitate the creation and development of export/import markets that will enhance bilateral trade performance.<sup>6</sup> The main hypothesis to be tested in this paper can therefore be expressed as follows: The US VWP will result in a statistically significant positive effect on bilateral trade levels between the US and the selected VWP countries.

### 3 Data description

A country-level panel data from 1950 to 2003 of the US and its different trading partners are used to critically examine the relationship between bilateral trade and the VWP. This is a subset of the data set constructed and used in Liu (2009).<sup>7</sup> With missing data and with our focus only on countries that trade with the US, we have a

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<sup>5</sup> Admittedly, the advancement in communication technologies has tempered the need for face-to-face business meetings to conduct contract negotiations in recent years. However, it is still fairly conventional that one party travels abroad to sign and formalize a trade agreement.

<sup>6</sup> An interesting study that is beyond the scope of the current paper is to investigate the direct impact of temporary business immigration on trade and use the VWP participation as an instrument in a two-stage least squares procedure. We attempted to go this route but the available US temporary business visitor data is only available for a limited number of years and countries.

<sup>7</sup> We are grateful to Xuepeng Liu for sharing his data with us.

total of 9,966 observations—204 cross-sectional (country) units and 54 years of data for each country (i.e.,  $n = 204$ ,  $t = 54$ ).<sup>8</sup>

As explained in more detail in Liu (2009) and Liu (2010), the panel data set in this study was constructed using various sources. The trade flow data (e.g., imports and exports) mainly came from the *Direction of Trade Statistics* (DOT) developed by the International Monetary Fund (IMF). Gross Domestic Product (GDP) and population data came from several sources like the Maddison *Historical Statistics* and the IMF *International Financial Statistics*. Data about country membership in the World Trade Organization (WTO) [and its predecessor the General Agreements on Tariffs and Trade (GATT)], as well regional trade agreement (RTA) data, were drawn from the WTO website. Data on geographic areas, locations, contiguity, languages, and religion were collected from the 2003 *CIA Fact Book*. Data on the presence of military conflicts and alliances are from the Militarized Interstate Dispute Dataset (Ghosn and Palmer 2003). For a more detailed discussion of how the variables in the data set were constructed see Liu (2009, p. 436–437). The Visa Waiver Program information is taken from US General Accounting Office (GAO) (2002).

#### 4 Empirical specification

At this point we more fully specify the empirical model needed to estimate the effect of the VWP program on the bilateral trade between the US and the VWP countries. We use the gravity model of international trade as a basis for more fully specifying our empirical model. The gravity equation has been extensively used in the trade literature for both its simplicity and empirical success in describing trade patterns (Bergstrand 1985; Feenstra 2004). Simply stated, the equation holds that bilateral trade flows ( $Y_{ij}$ ) are directly proportional to the product of the two countries' GDPs and inversely proportional to their geographic distance (Feenstra 2004):

$$Y_{ij} = \alpha \frac{GDP_i^{\beta_1} GDP_j^{\beta_2}}{Distance_{ij}^{\beta_3}} \quad (1)$$

From the former, it follows that countries with larger economies trade more than smaller ones and that countries whose economies are more similar in relative size have greater magnitudes of bilateral trade than a disparate pair of countries. The latter implies that as transportation and transactions costs increase as a positive function of distance, bilateral trade proportionately decreases.

Following the previous empirical literature, we use the constant elasticity specification (i.e., log-log model) to empirically implement the gravity model in the context of our study. There are two dependent (or outcome) variables in our case—the natural log of US exports to country  $i$  in year  $t$  ( $\ln Exports_{it}$ ) and the natural log

<sup>8</sup> We also estimated our models by using different time periods (i.e., from 1960 to 2003 and from 1970 to 2003) to check the robustness of our results. The findings were similar.

of US imports from country  $i$  in year  $t$  ( $\ln Imports_{it}$ ).<sup>9</sup> Furthermore, the main independent variable of interest in this study is a dummy variable ( $VMP_{it}$ ) that is equal to one if country  $i$  participated in the VWP in year  $t$ , zero otherwise.

Consistent with the insights from the gravity equation and previous immigration/trade studies,<sup>10</sup> as well as our own data availability constraints, the set of “control” variables used in this study include: the natural log of a country’s population ( $\ln POP_{it}$ ), the natural log of a country’s GDP per capita ( $\ln GDPPC_{it}$ ), the geographic distance between country  $i$  and the US in thousands of miles ( $\ln DIST_{it}$ ), the geographic area of country  $i$  ( $\ln AREA_i$ ), a dummy variable that indicates if the country is a member of GATT/WTO in year  $t$  ( $WTO_{it}$ ), a dummy variable that is equal to one if country  $i$  and the US share a land border ( $BOR_i$ ), a dummy variable of whether or not English is the official language of country  $i$  ( $LANG_i$ ), a dummy variable that is equal to one if country  $i$  and the US share a common religion ( $REL_i$ ), a dummy variable that is equal to one if country  $i$  and the US belong to the same regional trade agreement in year  $t$  ( $RTA_{it}$ ), a dummy variable that indicates if there was a military conflict between country  $i$  and the US in year  $t$  ( $HOST_{it}$ ), a dummy variable that indicates if country  $i$  and the US were in a formal alliance in year  $t$  ( $ALL_{it}$ ), and year dummy variables ( $d51_t, \dots, d03_t; d50_t$ ) is the omitted year dummy).

From the information above, the effect of VWP on US bilateral trade can be examined using the traditional gravity equation specification as follows:

$$\ln Y_{it} = \delta VWP_{it} + \beta X_{it} + \gamma \mathbf{Year}_t + a_i + u_{it}, \quad (2)$$

where  $Y_{it}$  is either  $\ln Exports_{it}$  or  $\ln Imports_{it}$ ;  $VMP_{it}$  is a dummy variable that indicates if country  $i$  is part of the VWP program in year  $t$ ;  $X_{it}$  is a vector of control variables as described above (e.g.,  $\ln POP_{it}$ ,  $\ln GDPPC_{it}$ ,  $\ln DIST_{it}$ ,  $\ln AREA_i$ ,  $WTO_{it}$ ,  $BOR_i$ ,  $LANG_i$ ,  $REL_i$ ,  $RTA_{it}$ ,  $HOST_{it}$ ,  $ALL_{it}$ );  $\mathbf{Year}_t$  is a vector of year dummy variables;  $a_i$  is an unobservable time-invariant country fixed effect;  $u_{it}$  is the time-varying idiosyncratic error;  $\delta$ ,  $\beta$ , and  $\gamma$  are parameters to be estimated.

## 5 Estimation strategy

### 5.1 Ordinary least squares and first differencing approaches

Equation 2 can be estimated by using ordinary least squares (OLS) although this estimation strategy does not account for the unobserved time-invariant country effects ( $a_i$ ) in the error term that may be systematically related to whether country  $i$  is in the VWP. In this case, the trade impact estimated by OLS in (Eq. 2) may be

<sup>9</sup> Multilateral resistance requires the use of either bilateral imports or bilateral exports (instead of average trade) as the dependent variable in the gravity equations (Baldwin and Taglioni 2006). We use both bilateral imports and exports as a dependent variable to mitigate the bias introduced by averaging the trade flows.

<sup>10</sup> For instance, see Rauch (1999), Rauch and Trindade (2002), Girma and Yu (2002), Santos-Silva and Tenreyro (2006), Helpman et al. (2008), Liu (2009), and Roy (2010a, b).



due to differences in these factors among VWP and non-VWP countries rather than measuring the effect of the program (i.e., there is selection bias).<sup>11</sup>

If this selection bias is primarily due to time-invariant factors, first-differencing (i.e., differencing out the first time period value from the second period value) or a fixed effects transformation (a time-demeaning or mean-differencing transformation where each value is subtracted by the mean value (over time) for each cross-sectional unit) of the right-hand side variables can help alleviate the problem.<sup>12</sup> If the time-varying unobservables ( $u_{it}$ ) are uncorrelated over time and are homoskedastic, Eq. 2 is more efficiently estimated by fixed effects. In this empirical application,  $u_{it}$  are likely to be correlated such that first-differencing Eq. 2 may be a more appropriate approach to control for potential selection problems due to time-invariant factors (Wooldridge 2002):

$$\Delta \ln Y_{it} = \delta \Delta VWP_{it} + \beta \Delta X_{it} + \gamma \Delta \text{Year}_t + \Delta u_{it}, \quad (3)$$

where the deltas ( $\Delta$ ) represent the first-differencing transformation on the time-varying variables (i.e., time-varying control variables are:  $\ln POP_{it}$ ,  $\ln GDPPC_{it}$ ,  $WTO_{it}$ ,  $RTA_{it}$ ,  $HOST_{it}$ ,  $ALL_{it}$ ). The first-differenced equation in Eq. 3 can then be estimated by OLS to get a more accurate estimate of the impact of VWP ( $\delta$ ) on the trade variables of interest (exports and imports).<sup>13</sup> In this study, we specifically use the first-differencing approach based on the “forward mean-differencing” procedure introduced by Arellano and Bover (1995). This particular differencing approach subtracts the average of all future observations from the contemporaneous one instead of subtracting the previous observation from the contemporaneous one. This approach is preferable because it “saves” observations and regardless of the gaps in the data, it can be computed for all observations except the last observation for each country.

The first-differencing approach works well in helping mitigate selection problems if the selection of VWP participants is based on roughly time-invariant variables (regardless if these are observable or unobservable). However, there may still be selection problems if there are unobserved country-specific time-varying characteristics that influence VWP designation and the trade outcome changes ( $\Delta \ln Y_{it}$ ). For instance, nations may have different technologies of production (Trefler 1995). To account for this issue, we use a “random growth” specification

<sup>11</sup> We investigated this selection problem further by analyzing whether countries that have traded more with the US in the past tend to be selected into the VWP program (see Aw et al. 2000 for a similar approach). If selection issues are present, the trade volumes of VWP countries tend to be higher than non-VWP countries in years even prior to the establishment of the VWP. Results of this analysis indicate that there are indeed selection issues (i.e., trade volumes were already higher for VWP countries prior to the start of the program). These results are available upon request. A similar approach was used by Clerides et al. (1998), Bernard and Jensen (1999), and Aw et al. (2000) in a different context.

<sup>12</sup> In our case, we know that visa denial rates and a host of social, economic, and political factors are some of the unobserved variables that are considered for the US to select a country into the VWP. Since these unobserved variables are roughly time invariant, then first-differencing or fixed effects transformation will take care of the majority of selection problems.

<sup>13</sup> Note that the parameter estimates from an OLS estimation of the first-differenced equation in Eq. 2 can also be produced by using a least squares dummy variable (LSDV) approach to Eq. 1 where country-specific dummy variables are included in Eq. 1 to represent  $a_i$ .

(Heckman and Holtz 1989; Papke 1994) that allows for selection to be based on country-specific growth rates:

$$\ln Y_{it} = \delta VWP_{it} + \beta \mathbf{X}_{it} + \gamma \mathbf{Year}_t + \varphi_{1i} trend + a_i + u_{it}, \quad (4)$$

where *trend* is a time trend and  $\varphi_{1i}$  represents the country-specific growth rate in the dependent variable.<sup>14</sup> Equation 4 can then be first-differenced to sweep away the time-invariant fixed effects ( $a_i$ ):

$$\Delta \ln Y_{it} = \delta \Delta VWP_{it} + \beta \Delta \mathbf{X}_{it} + \gamma \Delta \mathbf{Year}_t + \varphi_{1i} + \Delta u_{it}. \quad (5)$$

As in Eq. 3 above, the first differencing also allows us to control for the likely correlation of  $u_{it}$  across time. A fixed effects approach is then used to estimate Eq. 5 to eliminate the country-specific growth rate parameter  $\varphi_{1i}$ . The use of country-specific time trends in Eqs. 4 and 5 allows us to more thoroughly address the multilateral resistances issue of Anderson and van Wincoop (2003). Furthermore, the specification in Eqs. 4 and 5 allows us to control for unobservable factors that would change over time within nations such as productivity, immigrant population, technologies of production, trade costs, education, regulations, preferences and prices (Feenstra 2004). This helps address the selection issue that may still be present due to unobservable time-varying country-specific variables. Therefore, Eq. 5 serves as our primary first-difference specification to determine whether the VWP do really affect bilateral trade performance since it controls for unobserved heterogeneity and a host of potential selection issues.

Notwithstanding the flexibility of the specification in (Eq. 5), we also examine a dynamic model specification that allows for VWP participation to depend on lagged trade volume ( $Y_{it-1}$ ):

$$\ln Y_{it} = \delta VWP_{it} + \beta \mathbf{X}_{it} + \gamma \mathbf{Year}_t + \rho \ln Y_{it-1} + a_i + u_{it}. \quad (6)$$

To estimate the parameters in Eq. 6, the equation is first-differenced and the resulting equation is:

$$\Delta \ln Y_{it} = \delta \Delta VWP_{it} + \beta \Delta \mathbf{X}_{it} + \gamma \Delta \mathbf{Year}_t + \rho \Delta \ln Y_{it-1} + \Delta u_{it}. \quad (7)$$

The instrumental variables (IV), dynamic generalized method of moments (GMM) approach as suggested by Arellano and Bond (1991) is used to estimate Eq. 7. In this approach, the lagged values of  $\ln Y_{it}$  are used as instruments for  $\Delta \ln Y_{it-1}$  since  $\Delta \ln Y_{it-1}$  and  $\Delta u_{it-1}$  are correlated.

To determine whether our instruments are valid, we use the specification tests proposed by Arellano and Bond (1991) and Arellano and Bover (1995). First, we apply the Hansen test, a test of overidentifying restrictions, to determine any correlation between instruments and errors. For an instrument to be valid, there should be no correlation between the instrument and the error terms. The null hypothesis is that the instruments and the error terms are independent. Thus, failure

<sup>14</sup> Another approach to account for time-varying variables that may cause selection problems is to use propensity score matching (PSM) procedures. But this may not be appropriate in this case since we only have a small cross-sectional sample of countries. In addition, PSM procedures would only account for *observable* time-varying characteristics and would still not account for *unobservable* time-varying characteristics. .

to reject the null hypothesis could provide evidence that valid instruments are used. Second, we test whether there is a second order serial correlation with the first-differenced errors. The estimator of Arellano and Bond (1991) is consistent if there is no second order serial correlation in the error term of the first-differenced equation. The null hypothesis in this case is that the errors are serially uncorrelated. Failure to reject the null hypothesis means that valid orthogonality conditions are used and the instruments are valid. One would expect the differenced error term to be first order serially correlated, although the original error term is not.

## 5.2 The Poisson regression approach

One shortcoming of the estimation strategies discussed above is that it does not account for the typically large number of zeroes in bilateral trade flow data. This can lead to inconsistent parameter estimates from log-linear gravity model specifications.<sup>15</sup> By utilizing log-linear models, only observations with positive trade are used in the estimation. Since the zero trade values are not assigned randomly, this could result in sample selection bias. In order to deal with this issue, we also use fixed-effect Poisson model that allows us to account for the zero trade observations when estimating the gravity model.

Santos-Silva and Tenreyro (2006) suggested estimating the gravity equation multiplicatively (i.e., without taking the natural logarithm of  $Y_{it}$ ) by using a Poisson quasi-maximum likelihood estimator.<sup>16</sup> For a dependent trade variable with many zeros (but continuous if positive), Santos-Silva and Tenreyro (2006) highlighted the shortcomings of log transformation and suggested to estimate the multiplicative models directly by allowing the dependent variable to have an exponential conditional mean function. The estimators originally developed for count data (such as Poisson and negative binomial) can be applied to models where the dependent variable is a positive continuous variable and the conditional mean function is exponential (Blundell et al. 2002; Wooldridge 2002). These two conditions are met for bilateral trade variables.

In order to estimate our model to deal with the zero-mass problem and control for the unobserved country-specific factors, we estimated a fixed-effect Poisson model with robust standard errors (Blundell et al. 2002; Cameron and Trivedi 1998; Wooldridge 1999; Hausman et al. 1984). As highlighted by Wooldridge (1999), this estimator is consistent as long as the mean is correctly specified.

## 6 Results and discussion

The VWP parameter estimate from the OLS estimation of Eq. 2—the model without any variable transformation to account for time-invariant fixed effects or selection issues—are shown in Table 1. Without controlling for unobserved

<sup>15</sup> Note that based on Jensen's inequality, the expected value of the logarithm of a random variable is different from the logarithm of its expected value, i.e.,  $E(\ln T) \neq \ln E(T)$ .

<sup>16</sup> By using nonparametric specifications, Henderson and Millimet (2008) also suggested estimating the gravity models using the levels of the trade flows.

**Table 1** The trade impact of VWP: OLS estimation of Eq. 2, panel model with country dummies (no lagged dependent variable), and panel model with lagged dependent variable (no country dummies)

| VWP dummy variable | Dependent variable |                    | OLS estimation: Eq. 2 with country dummies |                    | OLS estimation: Eq. 2 with lagged dependent variables |                    |
|--------------------|--------------------|--------------------|--|--------------------|---|--------------------|
|                    | $\ln Exports_{it}$ | $\ln Imports_{it}$ | $\ln Exports_{it}$                         | $\ln Imports_{it}$ | $\ln Exports_{it}$                                    | $\ln Imports_{it}$ |
| $VWP_{it}$         | 0.261 (0.083)***   | 0.522 (0.112)***   | 0.344 (0.064)***                           | 0.348 (0.089)***   | -0.016 (0.022)  | 0.128 (0.028)***   |

Robust standard errors are in parentheses

The omitted continent variable is *Africa*

In the spirit of conciseness, parameter estimates for all the control variables are not reported here but are available from the authors upon request

\* Significant at the 10% level; \*\* significant at the 5% level; \*\*\* significant at the 1% level

heterogeneity and potential selection problems, the OLS results suggest that the estimated impact of the VWP on US exports to VWP countries is 29.82%  $((1.291-1) \times 100 \approx 29.82)$ , while the impact of the VWP on US imports from VWP countries is 68.54%  $((1.685-1) \times 100 \approx 68.54)$ .<sup>17</sup> These estimated impacts were found to be strongly statistically significant. Furthermore, assuming that the price elasticity is 5, the tariff-equivalent effect of the VWP for export is 6.74% for export and 13.94% for imports.<sup>18</sup>

As suggested by one reviewer to serve as means of comparison, we also estimated two simple panel models prior to our models involving first-differencing, the random growth specification, and the dynamic model with lagged dependent variables. The two simple panel models are OLS estimation of: (i) Eq. 2 with country dummy variables only (with no lagged dependent variables), and (ii) Eq. 2 with lagged dependent variables only (not country dummy variables).<sup>19</sup> The estimated VWP impact based on these two models are presented in Table 1. In the model with country dummies only (no lagged dependent variable), the coefficient on the VWP is positive and statistically significant for both exports and imports. When we estimate the model with lagged dependent variable but with no country dummies, the coefficient in the VWP variable in the exporting equation becomes insignificant while in the imports equation it is positive and statistically significant.

Results of the various first-differencing models (Eqs. 3, 5, and 7) that controls for time-invariant fixed effects and potential selection issues are presented in Table 2. We find that the VWP has a positive, statistically significant effect on US exports to VWP countries, regardless of the first-difference model specification used. For the standard first-difference model (Eq. 3), the estimates suggest that the VWP program increases US exports to VWP countries by about 46.2%. The first-differencing approach helps address selection problems if the selection of VWP participants is based on roughly time-invariant variables. However, there may still be selection problems if there are unobserved country-specific time-varying characteristics that influence VWP designation and the trade outcome changes.

The results from the first-difference models with country-specific growth rates that allow us to control for unobservable factors changing over time within nations suggest that there may indeed be selection bias caused by unobserved time-variant variables. The first-difference models with country-specific growth rates (Eq. 5) and dynamic specification (Eq. 7) indicate that the VWP have a more modest positive impact on US exports to VWP countries at 20.80 and 10.85%, respectively.

<sup>17</sup> We made the transformation advocated by Halvorsen and Palmquist (1980), which is  $(e^{\beta_{VWP}} - 1) \times 100$ ; the antilog of the estimated coefficient on the VWP dummy, subtracting 1, and multiplying by 100.

<sup>18</sup> The tariff equivalent estimate requires an estimate of the price elasticity, which can be obtained by including price or tariff variables in the regressions. Unfortunately, our data does not include the price and tariff variables. In order to estimate the tariff-equivalent effect of VWP, we followed Rose and Van Wincoop (2001) and used a price elasticity of 5. We then computed the tariff equivalent effect of VWP by using the  $\exp(\beta_{VWP}/\sigma - 1) - 1$  transformation. Also, see Hummels (1999), Head and Mayer (2000), Head and Ries (2001), Eaton and Kortum (2002), Lai and Trefler (2002), and Anderson and Van Wincoop (2003, 2004) for more information on tariff equivalent estimate.

<sup>19</sup> See Angrist and Pischke (2009) for a helpful discussion on the use of these two methods.

**Table 2** The trade impact of VWP: first-differencing (Eq. 3), first-differencing with country-specific growth rates (Eq. 5), and dynamic model with lagged trade variable (Eq. 7)

| Independent variables:  | Equation 3: dependent variable |                           | Equation 5: dependent variable |                           | Equation 7: dependent variable |                           |
|-------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|
|                         | $\Delta \ln Exports_{it}$      | $\Delta \ln Imports_{it}$ | $\Delta \ln Exports_{it}$      | $\Delta \ln Imports_{it}$ | $\Delta \ln Exports_{it}$      | $\Delta \ln Imports_{it}$ |
| $\Delta VMP_{it}$       | 0.380 (0.051)***               | 0.277 (0.057)***          | 0.189 (0.049)***               | 0.047 (0.055)             | 0.103 (0.029)***               | 0.039 (0.035)             |
| $\Delta \ln POP_{it}$   | 0.664 (0.092)***               | 0.289 (0.112)***          | 0.715 (0.098)***               | 0.275 (0.147)*            | 0.218 (0.041)***               | 0.064 (0.067)             |
| $\Delta \ln GDPPC_{it}$ | 1.174 (0.047)***               | 1.438 (0.061)***          | 1.108 (0.056)***               | 1.349 (0.072)***          | 0.395 (0.018)***               | 0.443 (0.037)***          |
| $\Delta WTO_{it}$       | 0.384 (0.033)***               | 0.437 (0.046)***          | 0.259 (0.031)***               | 0.239 (0.043)***          | 0.130 (0.012)***               | 0.108 (0.019)***          |
| $\Delta RTA_{it}$       | 0.633 (0.073)***               | 1.118 (0.090)***          | 0.263 (0.074)***               | 0.318 (0.089)***          | 0.265 (0.081)***               | 0.280 (0.062)***          |
| $\Delta ALL_{it}$       | 0.672 (0.100)***               | 0.333 (0.105)***          | 0.618 (0.084)***               | 0.306 (0.081)***          | 0.193 (0.039)***               | 0.010 (0.034)             |
| $\Delta \ln Y_{it-1}$   | -                              | -                         | -                              | -                         | 0.657 (0.009)***               | 0.692 (0.011)***          |
| No. of obs.             | 7,543                          | 6,940                     | 7,543                          | 6,940                     | 7,295                          | 6,675                     |
| No. of countries        | 203                            | 203                       | 203                            | 203                       | 203                            | 202                       |
| AR1 (p-value)           |                                |                           |                                |                           | 0.000                          | 0.000                     |
| AR2 (p-value)           |                                |                           |                                |                           | 0.670                          | 0.051                     |
| Hansen Test (p-value)   |                                |                           |                                | 1.000                     | 1.000                          |                           |

Robust standard errors are in parentheses

In the interest of space, parameter estimates for the year dummies are not reported above but are available from the authors upon request

\* Significant at the 10% level; \*\* significant at the 5% level; \*\*\* significant at the 1% level

**Table 3** Parameter estimates from the fixed effect poisson model

| Independent variables   | FE Poisson: dependent variable |                             |
|-------------------------|--------------------------------|-----------------------------|
|                         | <i>Exports<sub>it</sub></i>    | <i>Imports<sub>it</sub></i> |
| <i>VMP<sub>it</sub></i> | 0.184 (0.083)**                | 0.210 (0.146)               |
| $\ln POP_{it}$          | 0.622 (0.211)***               | 0.661 (0.235)***            |
| $\ln GDPPC_{it}$        | 1.067 (0.114)***               | 1.391 (0.241)***            |
| <i>WTO<sub>it</sub></i> | 0.565 (0.228)***               | 0.470 (0.170)***            |
| <i>RTA<sub>it</sub></i> | 0.448 (0.226)**                | 0.479 (0.192)***            |
| <i>ALL<sub>it</sub></i> | 0.557 (0.294)*                 | 0.568 (0.393)               |
| No. of obs.             | 8,999                          | 8,994                       |
| No. of countries        | 204                            | 204                         |

Robust standard errors are in parentheses

In the interest of space, parameter estimates for the year dummies are not reported above but is available from the authors upon request

\* Significant at the 10% level; \*\* significant at the 5% level; \*\*\* significant at the 1% level

Assuming that the price elasticity is 5, the tariff-equivalent effect of the VWP is 4.84 and 2.61%, respectively. Note that the Hansen test and serial correlation test (AR2) suggest that we indeed have valid instruments and no serial correlation; which supports validity of the first-difference model with dynamic specification.

The effect of VWP on US imports from the first-difference models, however, is not as strong and robust as the effect on exports. Only the standard first-difference specification (Eq. 3) displays a positive and statistically significant impact (31.92%) of VWP on US imports to VWP countries (Table 2, column 3). The first-difference models from Eqs. 5 and 7 indicate that the effect of VWP on US imports is not statistically significant (although still positive).

The fixed-effects Poisson regression results are presented in Table 3. As with the previous estimation procedures, the effect of VWP on US exports to VWP countries is positive and statistically significant. The magnitude of the VWP effect using the fixed effects Poisson (20.20%) are fairly similar to the estimated VWP impacts from the first-difference models with country-specific growth rates and dynamic specification (see Table 2). As with the results in Table 2, the evidence on the effect of VWP on US imports to VWP countries are mixed based on the estimates from the fixed-effects poisson model (Table 3). Based on the Poisson model, VWP has no statistically significant impact on US imports.

In summary, the parameter estimates in Tables 2–3 shows a robust result that the VWP program has a strong positive and statistically significant effect on US exports to VWP countries. Alternative specifications that control for selection issues, dynamics, and zeros in the bilateral trade data uniformly provides evidence showing a 10–20% effect of the VWP on US exports to VWP countries.<sup>20</sup> The evidence on

<sup>20</sup> We believe that the magnitudes of these VWP trade effects (especially the one 10% export effect in Eq. 7) are reasonable based on previous estimates of permanent immigration effects on trade. Girma and Yu (2002) found that a 10% increase in immigrant stock can increase long-run exports by 5%. If VWP can increase temporary immigrant stock by 20% or more, then the magnitude of our export effects is not unrealistic.

the effect of the VWP on US imports to VWP countries, however, is not as strong: while some specifications show a significant effect (e.g., ordinary least square and standard first-difference) and some specification reveals an insignificant effect (e.g., first-difference with country-specific growth rates and first-difference with dynamic specification). The magnitudes of these VWP trade effects (especially the one in Eq. 7) are fairly consistent with the previous estimates of permanent immigration effects on trade.

The stronger export effect of the VWP (relative to the import effect) is consistent with previous studies by Gould (1994) and Girma and Yu (2002) which found that immigration effects on trade are typically stronger for exports than for imports. They argue that host country export impacts of immigration materialize (or is observed) faster than the import effects because imports depends largely on the size of the immigrant population in the host country and its preference for home country products. In our case, it is possible that the resulting export outcomes from the temporary business travelers going to the US through the VWP materialize faster than the import outcomes. Even if there were business travelers going to the US to promote their home country products (i.e., increase US imports of their home products), it is likely that this import effect will take time and will only materialize if the permanent immigrant population in the US has reached a certain size threshold. Hence, the stronger effect of VWP on US exports to VWP countries is not unreasonable.

## 7 Conclusions

There have been a number of studies that found a robust relationship between *permanent* immigration and bilateral trade. However, no study has yet examined the impact of a more lenient visa policy for *temporary* visitors (or nonimmigrants), such as the VWP, on trade. We use country-level panel data to examine whether the US VWP results in higher bilateral trade levels between the US and VWP countries. Our results based on a number of empirical specifications and estimation strategies reveal that a less restrictive temporary foreign visitor policy (like the VWP) tends to strongly increase US bilateral trade, especially US exports to VWP countries.

The empirical results suggest that travel of temporary business visitors and tourists through the VWP have a positive relationship with bilateral trade. Foreign business visitors and tourists that enter through VWP contribute to the economic welfare of the US by encouraging more trade between their countries and the US, especially US exports to VWP countries. The trade creation effect of VWP can be seen as an additional tangible benefit of this type of visa policy (aside from the reduction in the work burden of consular offices abroad).

Thus, in light of our results, there is some economic justification for continuing the policy of providing less restrictive visa requirements for temporary business travelers. However, if the US continues this visa policy in the future, the trade creation effect of VWP would need to be balanced with the increased risks presented by this type of visa policy. This issue can be further examined as more business travel and illegal immigration data becomes available over time.



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## Appendix

### Background of the US national visa policy and the US visa waiver program

The US issues visas in two broad categories: immigrant visas for individuals seeking permanent residence in the US and nonimmigrant visas for individuals that still maintain foreign residences but wish to temporarily enter the US for business, tourism, work, study, medical treatment, etc. As with most other countries, the US generally requires all foreign nationals wishing to visit on a temporary basis to first obtain a visa from a US consulate abroad prior to entry.

There are twenty-four major nonimmigrant categories in the US, such as tourists, workers, refugees, etc., and seventy specific visas for which an application can be made (see Office of Immigration Statistics (2003) for more details). Each visa varies according to entry reason and length of stay (or period of validity of the visa). For example, tourist visas are usually granted for ninety day periods, while student visas may last considerably longer. Visas may also vary by being either single or multiple entry. The former allows an individual to gain entry only once without obtaining a new visa, and the latter allows an individual to gain multiple entries on a single visa during its period of validity.

During the visa application process, US policy places the burden of proof on the applicant to show that he or she is eligible for the desired visa (GAO 2002). In addition, applicants for temporary immigration visas must prove that they are not coming to the US for permanent residence. Individual applications may either be accepted for entry or denied for various reasons. Some examples of grounds for immediate denial are, *inter alia*, terrorist links, criminal histories, or health hazards (see US Immigration and Naturalization Act Section 212 for a complete list of grounds for inadmissibility). Interviews are usually required with an immigration officer at a US consulate and an amount of paperwork commensurate with filing IRS income tax forms is also often needed (GAO 2002). Individuals with more complicated situations may require more documentation and more time to successfully apply. US visa fees are currently \$100 non-refundable and the time required for processing varies by individual consulate but can range from a few days to a few weeks (Note: information obtained from the US State Department Website: [http://travel.state.gov/visa/visa\\_1750.html](http://travel.state.gov/visa/visa_1750.html), (3/6/2006). Finally, temporary immigrants must present completed I-94 visitor information forms to border inspectors in conjunction with a visa to enter the US.

In the interest of facilitating international travel and commerce, as well as to more efficiently allocate scarce immigration enforcement resources, the US implemented the Visa Waiver Program (VWP) that allows citizens of qualified countries to enter the US as nonimmigrants (for the purpose of either business or pleasure/tourism) without obtaining a visa, as long as they stay for periods of 90 days or less (GAO 2002). Originally created on a temporary basis under the Immigration Reform and Control Act of 1986, the program was subsequently made permanent under the Visa Waiver Permanent Program Act of 2000. The VWP began

**Table 4** Visa Waiver program participating countries and year of program entry

| Country               | Year of entry | Country            | Year of entry |
|-----------------------|---------------|--------------------|---------------|
| <b>Japan</b>          | <b>1988</b>   | <b>Luxembourg</b>  | <b>1991</b>   |
| <b>United Kingdom</b> | <b>1988</b>   | Monaco             | 1991          |
| <b>France</b>         | <b>1989</b>   | <b>New Zealand</b> | <b>1991</b>   |
| <b>Germany</b>        | <b>1989</b>   | <b>Norway</b>      | <b>1991</b>   |
| <b>Italy</b>          | <b>1989</b>   | San Marino         | 1991          |
| <b>Netherlands</b>    | <b>1989</b>   | <b>Spain</b>       | <b>1991</b>   |
| <b>Sweden</b>         | <b>1989</b>   | <b>Brunei</b>      | <b>1993</b>   |
| <b>Switzerland</b>    | <b>1989</b>   | <b>Ireland</b>     | <b>1995</b>   |
| Andorra               | 1991          | <b>Argentina</b>   | <b>1996</b>   |
| <b>Austria</b>        | <b>1991</b>   | <b>Australia</b>   | <b>1996</b>   |
| <b>Belgium</b>        | <b>1991</b>   | Slovenia           | 1997          |
| <b>Denmark</b>        | <b>1991</b>   | <b>Portugal</b>    | <b>1999</b>   |
| <b>Finland</b>        | <b>1991</b>   | <b>Singapore</b>   | <b>1999</b>   |
| <b>Iceland</b>        | <b>1991</b>   | <b>Uruguay</b>     | <b>1999</b>   |
| Liechtenstein         | 1991          |                    |               |

Bolded country names indicate data availability in this study

Argentina's and Uruguay's membership were terminated in 2002 and 2003, respectively. *Source:* GAO (2002)

admitting temporary immigrants from Japan and the United Kingdom in 1988 and has since grown to include 27 countries in 2004 (see Table 4 for a list of participating countries).

In order to participate in the VWP, a country must meet several requirements. First, a country must extend reciprocal visa-free travel to US nationals seeking temporary admission into their country. A country must have a US visa refusal rate no higher than an average of 3% over the last two years and not exceeding 3.5% in any single year (CRS 2005). Prior to 1997 this requirement was set at 2 and 2.5%, respectively (CRS 1998). The country must also issue machine-readable passports. In addition, the US Justice Department must review a country's case and not object to its participation on a host of political, social, legal, and economic conditions that may threaten US interests. Particular attention is given to security issues and the likelihood that participation in the program may increase nonimmigrant "overstays" (i.e., increase illegal immigration). Then, in consultation with the Attorney General, the Secretary of State decides whether to admit a country into the VWP (GAO 2002). The Secretary of State may also terminate a country's participation for violations of any requirements. Notably, Argentina's and Uruguay's participation were terminated in 2002 and 2003, respectively, on the basis of domestic turmoil that may lead to increased nonimmigrant overstays (CRS 2005). See Table 4 for a list of the countries that participated in the VWP and their year of program entry.

In addition to being a citizen of a participating country, foreign individuals applying for entry through the VWP must satisfy several individual requirements.

For example, individuals seeking entry through the VWP must have a valid passport, seek entry for 90 days or less as a temporary visitor for either business or pleasure/tourism, and waive the right to a hearing. They must also pass an identity check at the US port of entry and they should have complied with all conditions of any previous admission under the program. Foreign individuals from participating VWP countries must also possess a return ticket if entering by air or sea, and if entering by land show proof of financial solvency and foreign residency (GAO 2002). Beginning in 2006, individuals must also present passports with electronic integrated information chips (CRS 2005). Entrants under the VWP are also unable to change their nonimmigrant status while in the US.

Most relevant to this paper are those temporary business immigrants that seek entry to the US as business visitors who engage in commercial transactions but not employment. Business visitors that apply for entry using normal visa application procedures (i.e., foreign individuals from non-VWP participating countries) are typically granted multiple-entry visas for a maximum duration of six months, during which time applications for additional six month extensions can be made. Business visitors from VWP participating countries can enter the US under all the conditions specified in the program's legislation as described. The major difference is that business visitors from VWP participating countries do not need to formally apply for visas, but they can only stay in the US for only a maximum of 90 days at a time.

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