Multilateral Environmental Agreements and the WTO

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Abstract

Rules promoting nondiscriminatory trade under the World Trade Organization (WTO), and its predecessor the General Agreement on Tariffs and Trade (GATT), may have a 'chilling' effect on participation in multilateral environmental agreements (MEAs). This chilling effect may arise since many MEAs either directly distort trade or because MEAs use trade policy to induce cooperation and/or prevent so-called trade leakage. We investigate the empirical relevance of this chilling effect while simultaneously addressing two econometric difficulties: self-selection into the GATT/WTO and the difficulty of actually classifying GATT/WTO membership status. To do so, we employ a partial identification approach in order to bound the causal effect of GATT/WTO membership on participation in MEAs using country-level panel data. The analysis reveals a positive association between WTO membership and MEA participation in the absence of misclassification. However, under the assumptions considered here, one is unable to exclude the possibility that the GATT/WTO has no causal effect on MEA participation for the full sample. We do obtain *strictly negative* bounds for non-OECD countries in the WTO era (1995-2001), indicating a negative, causal effect of WTO membership on MEA participation by less developed countries.

JEL: C21, F18, F64, Q37, Q56

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1 Introduction

Many aspects of the complex relationship between international trade and environmental quality have received significant attention by researchers, environmentalists, and policymakers. While much is now known about the interaction between trade and the environment, the same cannot be said about the interplay between international trade agreements and domestic environmental policy. Here, we are interested in the relationship between membership in the World Trade Organization (WTO) and its predecessor, the General Agreements on Tariffs and Trade (GATT), and participation in multilateral environmental agreements (MEAs).[1]

Since World War II, more than 150 countries have joined the GATT/WTO. During the same period, numerous MEAs have also been formed; over 350 international environmental agreements (IEAs) are currently in force and most consist of at least five countries. Moreover, the importance of MEAs to the protection of the environment is not likely to diminish in the future as the trend toward economic integration leads to a need for greater coordination of environmental efforts. In this paper, we investigate the *causal* effect of GATT/WTO membership on MEA participation.

In light of the positive time trends in WTO membership and the number of MEAs in force, the time series evidence does not suggest a 'chilling' effect of WTO membership on the creation of new MEAs. Nonetheless, there are reasons to be concerned. First, theoretical models of MEAs emphasize the need for full participation to achieve success, and full participation requires punishments (or rewards) which typically are enacted through trade policies such as trade sanctions, import tariffs, or export subsidies. Absent such punishments (or rewards), full participation is difficult to sustain in theory. Moreover, trade leakage due to nonparticipants may undermine the effectiveness of MEAs (Barrett 2005). In practice, Eckersley (2004, p. 26) states that "increasing international awareness of vulnerability to a WTO challenge has given rise to a conservative or 'cool' implementation of trade restrictive obligations under existing MEAs to avoid the threat of legal challenge." Second, some MEAs must impede free trade by definition to achieve their objectives. For example, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) aims "to ensure that international trade in specimens of wild animals and plants does not threaten their survival."[2] Thus, the underlying premise of the MEA is to impede trade in certain goods for the sake of environmental preservation.

Given that many MEAs are incompatible with the objectives of the WTO to further the "principles of liberalization" through "commitments to lower custom tariffs and other trade barriers" and agreements to "require governments to make their trade policies transparent by notifying the WTO about laws in force and measures adopted," countries may be wary of joining MEAs that distort free trade due to fear of violating WTO rules (Rauscher 2005).[3] Thus, even though an increasing number of MEAs have entered into force, less than full participation may, in part, be attributable to the WTO and may undermine the effectiveness of these agreements. Alternatively, attempts by relatively recent MEAs to ensure compatibility with multilateral trade rules through the avoidance of trade issues do so at the expense of effectiveness, making them less appealing to potential participants. For example, Eckersley (2004, p. 26) concludes that "the expanding reach of the WTO's trade agreements does serve to cramp the scope

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[1]For more general discussion of the relationship between the WTO and environmental policy, see Neumayer (2004), Bernasconi-Osterwalder et al. (2006), and Millimet and Tchernis (2009).

[2]See http://www.cites.org/eng/disc/what.php.

[3]See http://wto.org/english/thewto_e/whatis_e/what_we_do_e.htm.

and operation of MEAs ...”

On the other hand, there are some reasons for optimism when it comes to the compatibility of WTO membership and participation in MEAs. First, although the WTO aims to promote nondiscriminatory trade, Article XX of the GATT allows for exceptions in order to protect human, animal, or plant health (or life) as long as the adopted measures do not discriminate in an arbitrary or unjust manner, are not a form of disguised protection, and are the least trade restrictive among alternatives. If WTO members consider a particular MEA to fall under this exception, participation in the MEA may be undeterred by WTO membership. Second, while controversial, if WTO membership increases trade, and subsequently economic growth, then this income effect may induce greater demand for environmental protection and, hence, participation in MEAs. Third, WTO members may actually be more inclined to participate in MEAs in order to avail non-tariff barriers (such as labeling requirements) to circumvent the reduction in tariffs induced by WTO membership. While not allowed under WTO rules, countries may pursue this path as the WTO has yet to witness a formal dispute involving a measure supported by a MEA.

In the end, then, whether the WTO has a *causal effect* on participation in MEAs is an empirical question. Unfortunately, answering this question is not straightforward for two econometric reasons. First, countries self-select into the WTO (subject to WTO approval). As such, membership status in the WTO may reflect other country-level attributes (both observed and unobserved to the researcher) that are correlated with MEA participation. For example, countries that are committed to global integration may have a strong desire to simultaneously join the WTO and enter into a variety of MEAs. Or, countries may use participation in MEAs to signal creditworthiness to potential creditors, as shown in Rose and Spiegel (2009), which may also facilitate accession into the WTO. Alternatively, countries with certain political institutions may find it more difficult to agree to the terms of international trade and environmental agreements (Barrett 2005; Wangler et al. 2011). The econometric difficulty posed by this potential non-random selection is exacerbated by the lack of traditional instrumental variables (IVs); it is difficult to conceive of country-level attributes impacting its propensity to enter into international trade agreements but not directly affecting its propensity to enter into international environmental agreements.

The second econometric difficulty that arises, perhaps surprisingly, pertains to the measurement of WTO membership status. The literature on the effects of WTO membership on trade volumes has highlighted concerns over *de jure* versus *de facto* accession into the WTO (Tomz et al. 2007). Since misclassification of a binary indicator of membership status induces nonclassical measurement error this is not a trivial issue (Black et al. 2000; Millimet 2011).

To overcome these difficulties, we utilize the nonparametric partial identification method proposed in Kreider et al. (2012) to account for both non-random selection and measurement error in WTO membership in a single unifying framework. It provides sharp bounds on the average treatment effect (ATE) of WTO membership status on MEA participation when membership into the WTO is non-random and potentially measured with error. These bounds require weaker assumptions than those of an IV, classical measurement error, or linear response model while addressing both selection and measurement error in WTO membership. However, as a consequence of imposing less structure, we obtain bounds rather than point estimates. Nonetheless, the bounds reveal exactly what can be learned under different assumptions concerning the nature of the selection process and the extent of misreporting. Tamer (2010, p. 168) summarizes the advantages of this approach: "This partial identification approach favors the principle

that inference – and conclusions and actions – based on empirical models with fewer suspect assumptions is more robust, hence more sensible and believable. Stronger assumptions will lead to more information about a parameter, but less credible inferences can be conducted." See also Manski (2013) for a detailed introduction to these issues in a policymaking context.

In terms of the selection problem, we start with the assumption of exogenous selection. We then discuss what can be learned without making any assumptions concerning the selection mechanism; this is the so-called worst-case bounds (Manski 1995). Finally, we impose two monotonicity assumptions: a monotone instrumental variable (MIV) assumption that the latent probability of MEA participation is nondecreasing in gross domestic product (GDP) per capita and a monotone treatment selection (MTS) assumption that WTO members have a higher probability of being MEA participants compared to non-members conditional on membership status. The MIV assumption is weaker than that required for a typical IV (since the MIV is allowed to have a direct impact on the outcome of interest and may be non-random itself). The MTS assumption posits positive selection into the WTO and its plausibility is justified below.

In terms of the measurement error problem, the existing literature analyzing the effect of WTO membership on trade and the environment defines membership in more than one way. While WTO membership is typically based on a country's formal accession to the WTO, Tomz et al. (2007) argue that this approach fails to capture the role of colonies, *de facto* members, and provisional members as WTO participants. Moreover, Allee and Scalera (2012, p. 245) "reclassify WTO membership based on type of accession." Here, we utilize the date of a country's formal accession to the WTO to define membership. While we start with the assumption of arbitrary patterns of measurement error, ranging from zero to 5% of the sample, we focus on the assumption of no false positives since, according to Tomz et al. (2007), our definition may miss *de facto* members, but should not incorrectly classify non-members as members.

To proceed, we utilize panel data on GATT/WTO membership and participation in MEAs for roughly 200 countries over 42 years. Thus, our paper is most similar to Egger et al. (2011). However, a few important distinctions arise. First, Egger et al. (2011) assess the causal effect of trade liberalization on participation in MEAs. The authors' measure of trade liberalization is obtained using a gravity model of bilateral trade. Preferential trade agreements (PTAs) are one component of their gravity model. As a result, while they find a strong effect of trade liberalization on MEA participation, the *ceteris paribus* effect of trade agreements may be positive or negative. When the authors compare the predictions of their model with and without controls for PTAs, they find that PTAs induce a slight increase in MEA participation. Second, WTO membership is not included in their analysis. Finally, the identification strategy used differs from that considered here.[4]

Our results are striking and ought to serve as a note of caution and guide to future evaluations of the effects of WTO membership on MEA participation. First, using three measures of participation in environmental agreements, we obtain positive associations between WTO membership and MEA participation when failing to account for non-random selection or misclassification. Second, if WTO membership status is incorrectly measured for even five percent of the sample, the ATE cannot always be signed even under the assumption of exogenous selection. Third, bounds

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[4]In a related study, Egger et al. (2013) classify MEAs into five clusters (i.e., biodiversity, atmosphere, land, chemicals and hazardous wastes, and seas) and analyze the determinants of participation in each type while allowing for spillover effects across clusters. Similarly, Davies and Naughton (2013) also consider the role of trade costs while examining the factors affecting IEA participation in a spatial lag model.

that account for non-random selection into the WTO always include zero for the full sample even if one assumes no misclassification. However, we obtain *strictly negative* bounds for the subsample of non-OECD countries in the WTO period (1995-2001). Finally, measurement error matters as it relates to a widening of the bounds. These results highlight the importance of accounting for both non-random selection and measurement error in WTO membership status, as well as exploring heterogeneity in the causal effect of WTO status over time and by development status, in order to identify the causal impact of WTO membership on MEA participation. More importantly, the results reveal fairly convincing evidence that WTO membership has a chilling effect on MEA participation by less developed countries given the demands placed on them for accession to the WTO (Subramanian and Wei 2007).

The remainder of the paper is organized as follows. Section 2 presents the empirical methodology. Section 3 discusses the data. Section 4 discusses the results. Section 5 concludes.

2   Methodology

Our objective is to bound the ATE of WTO membership status on MEA participation. The ATE captures the expected effect of WTO membership (relative to non-membership) for a random country chosen from the underlying population. With binary outcomes, the ATE is defined as

$$ATE(1,0) = P\left[M(WTO^* = 1) = 1 | X \in \Omega\right] - P\left[M(WTO^* = 0) = 1 | X \in \Omega\right] \tag{1}$$

where $P[\cdot]$ denotes the probability of the argument being true, M is a binary indicator defined such that one (zero) denotes MEA participation (non-participation), and WTO^* is a binary indicator defined such that one (zero) corresponds to *true* WTO membership (non-membership). The probabilities are conditioned on observed covariates denoted by $X \in \Omega$ with values in the set Ω. In this approach, conditioning on covariates only helps to define subpopulations of interest (Kreider et al. 2012). For notational simplicity, $X \in \Omega$ is dropped in the following derivations. Furthermore, from here on let $M(1) \equiv M(WTO^* = 1)$ and $M(0) \equiv M(WTO^* = 0)$, where $M(1)$ and $M(0)$ represent *potential* outcomes.

To assess the causal effect of WTO membership on MEA participation using observational data, two identification problems must be addressed. The first is the well-known problem of the missing counterfactual. For instance, we do not observe MEA participation for WTO members if instead they had not been members. This is referred to as the *selection* problem. To see this, note that by the Law of Total Probability we can write

$$\begin{aligned} P\left[M(1) = 1\right] &= P\left[M(1) = 1 | WTO^* = 1\right] P(WTO^* = 1) + \tag{2} \\ &\quad P\left[M(1) = 1 | WTO^* = 0\right] P(WTO^* = 0). \end{aligned}$$

If true WTO status is observed, the sampling process identifies $P(WTO^* = 1)$ and $P(WTO^* = 0)$ and the expected outcome conditional on the outcome being observed, $P[M(1) = 1 | WTO^* = 1]$. However, the sampling process fails to identify the average outcome for countries who are not WTO members, $P\left[M(1) = 1 | WTO^* = 0\right]$. Thus, $P\left[M(1) = 1\right]$ is not nonparametrically identified. A similar result holds for $P\left[M(0) = 1\right]$.

The second identification problem arises if *true* WTO membership status is not observed for all countries. Let

WTO denote the observed indicator of WTO membership, where WTO equals one if the country is considered to be a formal member and zero otherwise. This is referred to as the *measurement* or *misclassification error* problem. With misclassification the sampling process fails to provide any useful information on actual WTO membership status, WTO^*, absent assumptions on the extent and type of measurement error. In this case, *all* quantities on the right hand side of equation (2) are unknown.

Let the latent variable Z^* denote whether formal membership is accurate or not; Z^* equals one if $WTO^* = WTO$ and zero otherwise. Kreider et al. (2012) show that $P[M(1) = 1]$ may be decomposed as follows:

$$
\begin{aligned}
P[M(1) = 1] \quad = \quad & [P(M = 1, WTO = 1) - \theta_1^+ + \theta_1^-] + \\
& P[M = 1 | WTO^* = 0][P(WTO = 0) + (\theta_1^+ + \theta_0^+) - (\theta_1^- + \theta_0^-)]
\end{aligned}
\tag{3}
$$

where M is the observed (realized) MEA outcome, $\theta_j^+ \equiv P(M = j, WTO = 1, Z^* = 0)$ and $\theta_j^- \equiv P(M = j, WTO = 0, Z^* = 0)$ represent the proportion of false positive and false negative classifications of WTO membership, respectively, for countries realizing outcome $M = j$, $j = 0, 1$.[5] Examination of (3) reveals that all of the terms on the right hand side except $P(M = 1, WTO = 1)$ and $P(WTO = 0)$ are unobserved. $P[M = 1 | WTO^* = 0]$ is not identified since WTO^* is unobserved and the θ terms are not identified since Z^* is unobserved.

Given the lack of nonparametric identification of the ATE, bounds are derived by combining various assumptions concerning the nature of the selection process along with assumptions about the nature and extent of measurement error.[6]

2.1 Classification Error Assumptions

When considering measurement error, we discuss two cases. In the first case, no structure is placed on the pattern of reporting errors. We refer to this case as *arbitrary errors*. In the second case, some structure is imposed by assuming that no countries are falsely considered to be WTO members. We refer to this as the case of *no false positives*. While the literature examining the effect of WTO membership on trade and the environment defines membership in more than one way (e.g., Rose 2004; Tomz et al. 2007; Millimet and Tchernis 2009; Roy 2011; Allee and Scalera 2012), we utilize the dates of a country's formal accession to the WTO to define membership. However, Tomz et al. (2007) contend that this fails to capture the role of colonies, *de facto* members, and provisional members as WTO participants. In other words, the conventional definition of WTO membership mistakenly classifies a number of WTO participants as non-members. Accordingly, the assumption of no false positive errors appears to be a reasonable restriction. That said, for ease of exposition, it helps to begin with the case of arbitrary errors and then impose the assumption of no false positives.

Formally, we follow Gundersen and Kreider (2008) and impose the following assumptions pertaining to classification errors:

(A1) Upper Bound Error Rate Assumption: $P(Z^* = 0) \leq Q$

(A2) No False Positives Assumption: If $WTO = 1$, then $Z^* = WTO^* = 1$.

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[5] The formulae and their derivations come from an earlier version of Kreider et al. (2012).

[6] Estimation is performed using the command -tebounds- in Stata. See McCarthy et al. (2014).

Here, Q is an upper bound on the degree of misclassification. It takes a value of zero if one wishes to rule out the possibility of measurement error in WTO membership status. The second assumption states that countries which are considered to be WTO members are accurately classified; no such assumption is made concerning countries that are considered non-members. The arbitrary errors case imposes only Assumption A1; the no false positives case imposes both Assumptions A1 and A2. In both cases, we vary values of Q, setting $Q = 0, 0.01, 0.03$, and 0.05. As will be evident in the presentation of the results, higher values of Q will only widen the bounds further.

The above assumptions on classification errors impose reasonable restrictions on the unknown misclassification rates θ_1^-, θ_0^-, θ_1^+, and θ_0^+. Assumption A1 implies

$$
\begin{aligned}
0 &\leq \theta_0^- \leq \min\{Q, P(M = 0, WTO = 0)\} \equiv \theta_0^{UB-} \\
0 &\leq \theta_1^- \leq \min\{Q, P(M = 1, WTO = 0)\} \equiv \theta_1^{UB-} \\
0 &\leq \theta_0^+ \leq \min\{Q, P(M = 0, WTO = 1)\} \equiv \theta_0^{UB+} \\
0 &\leq \theta_1^+ \leq \min\{Q, P(M = 1, WTO = 1)\} \equiv \theta_1^{UB+}
\end{aligned}
$$

and

$$
\theta_1^+ + \theta_1^- + \theta_0^+ + \theta_0^- \leq Q \tag{4}
$$

Assumption A2 implies

$$
\theta_1^+ = \theta_0^+ = 0. \tag{5}
$$

2.2 Exogenous Selection

2.2.1 No Misclassification Errors

To examine the causal effect of WTO membership on MEA participation, the assumption of exogenous selection into the WTO provides a useful starting point for the analysis. It is expressed as

$$
P[M(1) = 1, WTO^*] = P[M(1) = 1]
$$

which implies

$$
P[M(1) = 1, WTO^* = 1] = P[M(1) = 1, WTO^* = 0] = P[M(1) = 1].
$$

Accordingly, using (2) implies

$$
\begin{aligned}
P[M(1) = 1] &= P[M = 1|WTO^* = 1] \\
P[M(0) = 1] &= P[M = 1|WTO^* = 0].
\end{aligned}
$$

Finally, with exogenous selection and no misclassification errors, the ATE is nonparametrically identified and given by

$$
\begin{aligned}
ATE \quad &= \quad P\left[M(1) = 1\right] - P\left[M(0) = 1\right] & (6) \\
&= \quad P\left[M = 1 | WTO^* = 1\right] - P\left[M = 1 | WTO^* = 0\right].
\end{aligned}
$$

2.2.2 Misclassification Errors

Allowing for misclassification, the ATE is no longer nonparametrically identified even under the assumption of exogenous selection as WTO^* is not observed in (6). To illustrate, note that

$$
P\left[M(1) = 1\right] = P\left[M = 1 | WTO^* = 1\right]
$$

can be decomposed as

$$
P\left[M(1) = 1\right] = \frac{P(M = 1, WTO = 1) + \theta_1^- - \theta_1^+}{P(WTO = 1) + (\theta_1^- + \theta_0^-) - (\theta_1^+ + \theta_0^+)} \tag{7}
$$

where the sampling process identifies only $P(M = 1, WTO = 1)$ and $P(WTO = 1)$. The term $(\theta_1^- + \theta_0^-) - (\theta_1^+ + \theta_0^+)$, in the denominator, denotes the unobserved excess of false negatives over false positives in the population. The term $(\theta_1^- - \theta_1^+)$, in the numerator, reflects the excess of false negatives over false positives among those countries with $M = 1$.

To derive bounds on the ATE under different assumptions concerning the nature and extent of the misclassification errors, recall that ATE is given by

$$
ATE = P\left[M(1) = 1\right] - P\left[M(0) = 1\right]. \tag{8}
$$

Thus, the bounds for the ATE are given by

$$
\begin{aligned}
UB_{ATE} \quad &= \quad UB_{P[M(1)=1]} - LB_{P[M(0)=1]} & (9) \\
LB_{ATE} \quad &= \quad LB_{P[M(1)=1]} - UB_{P[M(0)=1]}, & (10)
\end{aligned}
$$

where UB and LB denote the upper and lower bounds, respectively.

With arbitrary errors, Kreider et al. (2013) derive the following expressions for the bounds:

$$
UB_{ATE} \quad = \quad \sup_{a \in \left[0, \theta_1^{UB-}\right], f \in \left[0, \min\{Q-a, \theta_0^{UB+}\}\right]} \left[\frac{P\left[M = 1, WTO = 1\right] + a}{P(WTO = 1) + a - f} - \frac{P\left[M = 1, WTO = 0\right] - a}{P(WTO = 0) - a + f} \right] \tag{11}
$$

$$
LB_{ATE} \quad = \quad \inf_{b \in \left[0, \theta_1^{UB+}\right], h \in \left[0, \min\{Q-b, \theta_0^{UB-}\}\right]} \left[\frac{P\left[M = 1, WTO = 1\right] - b}{P(WTO = 1) - b + h} - \frac{P\left[M = 1, WTO = 0\right] + b}{P(WTO = 0) + b - h} \right]. \tag{12}
$$

Estimation is accomplished by performing separate grid searches for b, h and a, f over the feasible region to minimize

(maximize) the LB (UB) of the ATE subject to verifying that each conditional probability does not exceed one:

$$\frac{P[M=1, WTO=1]-b}{P(WTO=1)-b+h} \leq 1$$

$$\frac{P[M=1, WTO=0]+b}{P(WTO=0)+b-h} \leq 1$$

$$\frac{P[M=1, WTO=1]+a}{P(WTO=1)+a-f} \leq 1$$

$$\frac{P[M=1, WTO=0]-a}{P(WTO=0)-a+f} \leq 1.$$

Under the assumption of no false positives, the bounds on the ATE are given by

$$UB_{ATE} = \sup_{a \in \left[0, \theta_1^{UB-}\right]} \left[\frac{P[M=1, WTO=1]+a}{P(WTO=1)+a} - \frac{P[M=1, WTO=0]-a}{P(WTO=0)-a}\right] \tag{13}$$

$$LB_{ATE} = \inf_{h \in \left[0, \theta_0^{UB-}\right]} \left[\frac{P[M=1, WTO=1]}{P(WTO=1)+h} - \frac{P[M=1, WTO=0]}{P(WTO=0)-h}\right]. \tag{14}$$

Estimation is accomplished by performing separate grid searches for h and a over the feasible region to minimize (maximize) the LB (UB) of the ATE subject to verifying that each conditional probability does not exceed one:

$$\frac{P[M=1, WTO=1]}{P(WTO=1)+h} \leq 1$$

$$\frac{P[M=1, WTO=0]}{P(WTO=0)-h} \leq 1$$

$$\frac{P[M=1, WTO=1]+a}{P(WTO=1)+a} \leq 1$$

$$\frac{P[M=1, WTO=0]-a}{P(WTO=0)-a} \leq 1.$$

2.3   No Selection Assumption

The bounds given in (11) – (14) invoke the assumption of exogenous selection which is highly improbable. As argued above, many country-specific attributes, unobserved to the researcher, are likely correlated with both WTO membership and MEA participation. Preferences regarding outward orientation, creditworthiness, and political institutions represent several examples. Moreover, spatial considerations, found to be important in the literature, imply that neighboring country attributes are also relevant. Consequently, we next consider what can be learned about the ATE of WTO membership on MEA participation without invoking any assumptions concerning selection into the treatment following Manski (1995).

2.3.1   No Misclassification Errors

In the absence of measurement error, but with no assumptions concerning selection, the only information available concerning the missing counterfactuals are that they lie in the unit interval since they represent probabilities; formally, $P[M(1)=1|WTO^*=0]$, $P[M(0)=1|WTO^*=1] \in [0,1]$. Accordingly, the individual components of the ATE are bounded as follows

$$P[M = 1, WTO^* = 1] \leq P[M(1) = 1] \leq P[M = 1, WTO^* = 1] + P(WTO^* = 0)$$
$$P[M = 1, WTO^* = 0] \leq P[M(0) = 1] \leq P(WTO^* = 1) + P[M = 1, WTO^* = 0].$$

Note, the width of the bounds on $P[M(1) = 1]$ is the censoring probability, $P(WTO^* = 0)$, while the width of the bounds on $P[M(0) = 1]$ is the inclusion probability, $P(WTO^* = 1)$. As a result, although the bounds on the ATE are sharp, the width always equals unity and includes zero (Manski 1995). So, without identifying restrictions on the selection mechanism, it is impossible to sign the ATE. While the sign is unknown, extreme values are excluded from the bounds, thus providing some potentially useful information.

2.3.2 Misclassification Errors

Allowing for measurement error, the bounds on individual components of the ATE become

$$P[M = 1, WTO = 1] - \theta_1^+ + \theta_1^- \leq P[M(1) = 1] \leq P[M = 1, WTO = 1] + P(WTO = 0) + \theta_0^+ - \theta_0^-$$
$$P[M = 1, WTO = 0] + \theta_1^+ - \theta_1^- \leq P[M(0) = 1] \leq P[M = 1, WTO = 0] + P(WTO = 1) - \theta_0^+ + \theta_0^-.$$

With arbitrary errors, the bounds on ATE are given by

$$UB_{ATE} = P[M = 1, WTO = 1] + P(WTO = 0) + \min\{Q, \theta_0^{UB+} + \theta_1^{UB-}\} - P[M = 1, WTO = 0] \quad (15)$$
$$LB_{ATE} = P[M = 1, WTO = 1] - \min\{Q, \theta_1^{UB+} + \theta_0^{UB-}\} - P[M = 1, WTO = 0] - P(WTO = 1). \quad (16)$$

Under the assumption of no false positives, the bounds become potentially tighter and are given by

$$UB_{ATE} = P[M = 1, WTO = 1] + P(WTO = 0) + \theta_1^{UB-} - P[M = 1, WTO = 0] \quad (17)$$
$$LB_{ATE} = P[M = 1, WTO = 1] - \theta_0^{UB-} - P[M = 1, WTO = 0] - P(WTO = 1). \quad (18)$$

2.4 Monotonicity Assumptions

While the bounds given in (15) – (18) have the advantage of not invoking any assumptions concerning the selection process into actual treatment assignment, they have the disadvantage of never being able to exclude zero from the bounds. Thus, the sign of the ATE cannot be learned. To tighten the bounds on ATE, without going so far as to assume exogenous selection, we assess the identifying power of two monotonicity assumptions which impose different restrictions on the relationships between WTO membership, MEA participation, and the available data.

2.4.1 Monotone Treatment Selection

The *Monotone Treatment Selection* (MTS) assumption places some structure on the relationship between potential outcomes and treatment assignment (Manski and Pepper 2000). Specifically, the MTS assumption posits that countries that select into the WTO are more likely to participate in MEAs regardless of membership status. This

assumption – indicative of *positive* selection into the WTO – is relatively innocuous given that countries may opt for participation in both MEAs and the WTO in order to signal credibility (Dreher and Voigt 2011) or a pro-growth stance (Tang and Wei 2009) to potential investors. Following Kreider et al. (2012), this assumption translates to

$$P[M(1) = 1|WTO^* = 1] \geq P[M(1) = 1|WTO^* = 0] \tag{19}$$

$$P[M(0) = 1|WTO^* = 1] \geq P[M(0) = 1|WTO^* = 0] \tag{20}$$

where $M(\cdot) = 1$ represents MEA participation. Imposing MTS, the upper bound of the ATE is given by the upper bound of the ATE under exogenous selection and the lower bound is given by the lower bound under no selection assumptions. As such, under the assumption of arbitrary errors the upper bound of the ATE is given in equation (11) and the lower bound is given by the lower bound in equation (16). Under the assumption of no false positives, the bounds are obtained from the same models while invoking the no false positive assumption (i.e., equations (13) and (18)).

2.4.2 Monotone Instrumental Variable

To further tighten the bounds, we turn to the *Monotone Instrumental Variable* (MIV) assumption which makes use of new information through the introduction of a monotone instrumental variable. A MIV should not be confused with a typical instrumental variable. The only requirement for a MIV is that potential outcomes vary monotonically with the variable (Manski and Pepper 2000). Following Kreider et al. (2012), the MIV assumption imposes

$$P[M(1) = 1|\nu = u_1] \leq \quad P[M(1) = 1|\nu = u] \quad \leq P[M(1) = 1|\nu = u_2]$$
$$P[M(0) = 1|\nu = u_1] \leq \quad P[M(0) = 1|\nu = u] \quad \leq P[M(0) = 1|\nu = u_2],$$

where ν is the MIV and $u_1 < u < u_2$. In other words, higher values of ν are associated with higher potential outcomes. Here, we use GDP per capita as the MIV since greater income is likely to induce greater demand for environmental protection on average in the population (e.g., Fredriksson et al. 2003; Egger et al. 2011).

To proceed, we combine the MIV and MTS (with and without measurement error) assumptions. Let $UB(u)$ and $LB(u)$ denote the upper and lower bounds of the individual components of the ATE obtained under a set of MTS and measurement error assumptions evaluated conditional on $\nu = u$. As a result, the joint MTS-MIV assumption implies

$$\sup_{u_1 \leq u} LB(u_1) \leq P[M(t) = 1|\nu = u] \leq \inf_{u_2 \geq u} UB(u_2), \ t = 0, 1.$$

See Proposition 1 in Manski and Pepper (2000).

To calculate these bounds in practice, the sample is divided into five GDP per capita cells. Weighted averages of the estimates of the UB and LB across the five cells yield joint MTS-MIV bounds on the individual components of the ATE. Final bounds for the ATE are then computed using (9) and (10). The MIV estimator is biased in finite samples, but consistent (Manski and Pepper 2000). In light of this, we use Kreider and Pepper's (2007) nonparametric

finite sample bias-corrected MIV estimator.[7]

3   Data

The data on environmental agreements come from Mitchell (2013a).[8] We do not consider all MEAs in the analysis. To begin, we focus on MEAs with dates of signature between 1960 and 2001. Next, we utilize Appendix 6.1 in Barrett (2003) and the *United Nations Treaty Series Online Collection* to further reduce the set of agreements to open MEAs (i.e., those without any participation restrictions).[9] In case of any discrepancy between the two sources, the corresponding agreement text is consulted. The agreement texts are also relied upon to classify agreements that are not listed in these sources. In this paper, we choose to focus solely on open MEAs (as opposed to MEAs that are only relevant, and hence open, to a subset of countries) as this ensures that all countries face the same pool of potential agreements in which they might participate. Moreover, it seems plausible that any causal effect of WTO membership on MEA participation may differ between open treaties and those that are more regional in nature. Thus, restricted MEAs merit their own, independent analysis. Finally, we exclude amendments to open MEAs included in the analysis if the amendments entered into force via tacit acceptance provisions (i.e., without requiring members of the underlying agreements to explicitly ratify).[10]

The unit of observation is a country-year. The dependent variable, M, is a binary indicator if the country participates in a *new* MEA in a given year.[11] A country may be counted as new participant of a particular MEA according to three distinct criteria: (i) in the year that it *signs* the MEA, (ii) in the year that it *ratifies* the MEA, and (iii) in the year that the MEA *enters into force*. However, a country may also *withdraw* from an agreement or *rejoin* a MEA. Accordingly, the dependent variable is defined in three ways. First, for any country-year observation, M is assigned a value of one if the country signs at least one MEA on which it had taken no prior action. Second, M takes the value one if a country participates in a new MEA, where participation is defined as any of the three possibilities listed above (signature, ratification, or entry into force). Third, for any country-year observation, M is assigned a value of one if the country participates in at least one MEA regardless of when the country first started participating. In other words, M equal to one implies that the country is a party to at least one MEA regardless of when the decision to participate in the MEA was made. Thus, the first two outcomes reflect the 'flow' of participation, whereas the final outcome captures the 'stock.'

The treatment indicator, WTO, is based on formal dates of accession to the WTO.[12] In other words, for any country, WTO takes the value one from its year of formal membership onwards. The control group includes all other countries. The MIV, ν, is real per capita Gross Domestic Product (GDP). The data mainly come from the World Bank's *World Development Indicators*.[13] However, for some observations, the Quality of Government Institute's

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[7]See McCarthy et al. (2014) for additional discussion.

[8]We are grateful to Ronald Mitchell for sharing the data on MEA actions undertaken by countries at different dates, as well as answering our numerous questions.

[9]See http://treaties.un.org/Home.aspx?lang=en.

[10]See Mitchell (2013b) for a discussion on environmental agreements with tacit acceptance provisions.

[11]By *new MEA* we mean not that the MEA is new, but rather that the country decides to participate in an MEA to which it did not participate in in prior years.

[12]While the dates of formal accession are available at http://www.wto.org/english/thewto_e/gattmem_e.htm and http://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm, we utilize the data at http://www.stanford.edu/~tomz/pubs/pubs.shtml in order to consider countries that no longer exist.

[13]Data are obtained using the command -wbopendata- in Stata (Azevedo 2011).

Quality of Government Dataset is employed which in turn contains information from sources such as the United Nations Statistics Division and Gleditsch (2002).[14] The data provided by *Gapminder World* are also consulted for a very few observations.[15] Summary statistics are provided in Table A1 in the Appendix.

Before proceeding, a few comments are warranted. First, using independence and dissolution dates of countries from the Central Intelligence Agency's *World Factbook*, we restrict the sample to only include countries that existed between 1960 and 2001.[16] Second, for most agreements, the data report country-specific actions which enable ratifications to be further classified into sub-categories. For example, although Kenya ratified the African Nuclear Weapon Free Zone Treaty in 2000, the instrument of ratification was deposited in 2001. Moreover, both actions may be used to identify ratification. In such cases, the earliest date of ratification is recognized. Also, some MEAs assign multiple dates of signature or entry into force for the same country (without any intermediate withdrawals). Again, the earliest dates are considered. Finally, an open agreement is considered to remain so for the entire sample period. As stated in Barrett (2003, p. 147), although "an agreement is open for signature for a fixed period ... provisions are usually made for eligible countries to accede at any time."

4   Results

4.1   Baseline Analysis

The baseline results for the full sample are presented in Figures 1-3 and Table 1. Figure 1 and Panel I in Table 1 define the outcome as equal to one if the country signs at least one new MEA in a given year, zero otherwise. Figure 2 and Panel II in Table 1 use an indicator depicting any form of new participation (i.e., signature, ratification, or entry into force) as the outcome. Lastly, the binary outcome in Figure 3 and Panel III of Table 1 denotes whether the country currently participates in any MEA regardless of the original participation date. In each figure, the left panel compares the sharp bounds on the ATE obtained under the assumption of exogenous selection to those obtained under no assumption on selection as Q varies from zero to five percent. The right panel reports the bounds under different combinations of the monotonicity assumptions concerning selection under the no false positives assumption concerning misclassification. The bounds in Table 1 (and the right panel in the figures) are obtained after imposing the no false positives assumption. To address the uncertainty arising from sampling variability, the table also reports Imbens-Manski (2004) 95% confidence intervals obtained using 100 bootstrap repetitions.

Turning to the results, several findings stand out. First, under the assumptions of exogenous selection (column 1 in Table 1) and no misclassification error, the ATE is positive and statistically significant for all three outcomes. In the case of MEA participation based on signatures only, WTO membership is associated with a 19.0% increase (CI: [16.9%, 21.1%]) in the probability of a country becoming a new signatory to an open MEA in a given year. In the case of participation determined from signatures, ratifications, or instances of entry into force, WTO membership is

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[14]The World Bank's real GDP per capita data are in 2005 US dollars. Since some of the data from other sources are in 2000 US dollars, a conversion factor based on US GDP values (obtained from the Bureau of Economic Analysis) is utilized. More precisely, the values in 2000 US dollars are divided by 0.89 obtained from:

$$\frac{\text{Nominal GDP in 2000/Real GDP in 2000 (base 2009)}}{\text{Nominal GDP in 2005/Real GDP in 2005 (base 2009)}}.$$

[15]See http://www.gapminder.org/data/.

[16]See https://www.cia.gov/library/publications/the-world-factbook/index.html.

associated with a 21.1% increase (CI: [18.7%, 23.6%]) in the probability of new MEA participation in a given year. Finally, WTO membership is associated with a 17.0% increase (CI: [15.8%, 18.3%]) in the probability of a country being a party to at least one open MEA in a given year.

Second, the impact of misclassification error is significant. If WTO membership status is incorrectly measured for even five percent of the control group, the widths of the bounds increase markedly and the sign of the ATE can no longer be determined in Panel III. Given Tomz et al.'s (2007, p. 2005) claim that formal membership into the WTO incorrectly classifies the true membership status for "a large proportion of countries," this is a striking result. Moreover, the bounds under exogenous selection are sensitive to the amount of measurement error allowed for. For instance, in case of MEA participation based on signatures only (Panel I), the bounds vary from $[0.179, 0.219]$ to $[0.133, 0.343]$ as Q increases from one to five percent. Thus, the width of the bounds increase by more than a factor of five.

Third, the worst-case bounds (column 2 in Table 1) are of width one and necessarily include zero under the assumption of no measurement error (as discussed above). Nonetheless, the bounds are useful in excluding extreme values of the ATE. For example, the lower bound in all three panels in Table 1 exceeds -0.45. Thus, any chilling effect of WTO membership cannot exceed 45%. In other words, without imposing any assumptions other than the absence of measurement error, we can state that WTO membership cannot reduce the probability of MEA participation by more than one-half. These bounds, however, do widen as greater amounts of misclassification are allowed. Nonetheless, we continue to find that WTO membership cannot reduce the probability of MEA participation by more than one-half even if five percent of the sample is misclassified.

Fourth, the monotonicity assumptions are quite powerful in terms of tightening the worst-case bounds. MTS results in significant shrinkage of the upper bounds; MIV further reduces the upper bounds and raises the lower bounds. That said, even in the absence of measurement error, the bounds include zero in all cases across. Nonetheless, a considerable range of values of the ATE, particularly in the positive domain, are ruled out. Moreover, when the outcome is measured by current MEA participation regardless of when the action was taken (Panel III), we can rule out a chilling effect greater than approximately 30%.

Finally, it is worth noting that even upon invoking the various monotonicity assumptions, even small rates of measurement error widen the bounds. For instance, in case of MEA signatures (Panel I), the joint MTS-MIV bounds vary from $[-0.398, 0.163]$ to $[-0.448, 0.294]$ as Q increases from zero to five percent. Panels II and III produce similar changes. Thus, researchers ought to be cautious about dismissing the implications of misclassification errors under the thought that the rate is too low to matter.

In summary, we find that it is not possible to sign the relationship between WTO membership and MEA participation, with or without misclassification of WTO membership status, absent the assumption of exogenous selection into the WTO or more stringent assumptions concerning the nature of the non-random selection than those considered here. Thus, the results illustrate the difficulty in not only narrowing the range of plausible values for the ATE, but even estimating its sign, for the full sample in the absence of strong assumptions regarding the nature of the selection process and the extent of measurement error in the data.

4.2 Subpopulation Analysis

As shown in (1), bounds can be obtained by conditioning on covariates, X. To explore the possibility of heterogeneity in the ATE across different subpopulations, we condition on time period and/or OECD status.

Tables 2 and 3 condition on time period, with Table 2 presenting bounds for the pre-WTO period, 1960-1994, and Table 3 presenting the corresponding bounds for the WTO period, 1995-2001. The corresponding graphs for the MTS and MTS-MIV bounds are shown in Figures A1-A3 in the Appendix. Note, Panel III is missing in Table 3 due to a lack of variation in the outcome in the WTO period. That said, the results for the bounds for the two outcomes in Panels I and II are not qualitatively different across the periods representing a change from the GATT to the WTO. Moreover, comparing Panel III in Tables 1 and 2 (i.e., the full sample versus only the pre-WTO period) also does not indicate any substantive changes in the bounds.

Tables 4, along with the left panel of Figures A4-A6 in the Appendix, provide separate bounds for non-OECD countries over the entire sample period.[17] While the bounds obtained under exogenous selection as well as no selection assumptions are largely similar across Tables 1 and 4, the MTS-MIV bounds differ to an extent. More precisely, the upper bounds corresponding to new participation (Panels I and II) are smaller for non-OECD countries. Under the assumption of no misclassification, the MTS-MIV bounds for non-OECD countries are $[-0.331, 0.036]$ and $[-0.306, 0.028]$ in Panels I and II (Table 4), respectively. For the full sample, the corresponding bounds are $[-0.398, 0.163]$ and $[-0.366, 0.191]$. Thus, while the ATE cannot be signed for either group, we can rule out the possibility of a substantial increase in the propensity of non-OECD countries to enter into new MEAs resulting from accession into the WTO. This is a meaningful result, obtained under relatively minor assumptions, as it implies that integrating lesser developed countries into the global economy will do little to facilitate cooperation on international environmental issues.[18]

Table 5 and Figures 4 and 5 display the final set of results for non-OECD countries in the WTO period, 1995-2001.[19] Only Panels I and II are included as there is insufficient variation in the data when using the third measure of MEA participation. Here, we obtain a stark finding. Under the assumption of no misclassification, the MTS-MIV bounds are now strictly negative in both panels; they are strictly negative in Panel II even as the maximum possible misclassification rate increases to five. The bounds are $[-0.293, -0.025]$ and $[-0.202, -0.113]$ in Panels I and II, respectively.[20] While the exclusion of zero from the bounds occurs only under the assumption of no misclassification in Panel I, this is more plausible in the WTO period. As discussed in Tomz et al. (2007, p. 2008), the creation of the WTO "eliminated" the group of *de facto* members by requiring newly independent countries "to accede or lose benefits." Thus, under relatively minor assumptions, we find strong evidence of a chilling effect of WTO membership

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[17]Results for OECD countries are unavailable due to insufficient variation in the data.

[18]That said, the upper bound in Panels I and II in Table 4 is sensitive to misclassification. Moreover, the MTS-MIV bounds for non-OECD countries (Table 4) are obtained under the assumption that potential outcomes are decreasing in GDP per capita (or, equivalently, that potential outcomes are monotonically increasing in *minus* GDP per capita). In contrast, in the baseline analysis, we utilize GDP per capita (rather than minus GDP per capita) as the MIV. We do this in light of the literature on the environmental Kuznets curve (e.g., List et al. 2003) which suggests that economic growth is associated with lower environmental quality at low income levels. Table A2 in the Appendix displays the corresponding bounds using GDP per capita as the MIV for non-OECD countries. The lower bound is similar, however the upper bound increases to about 0.1 under the assumption of no misclassification (column 1, Table A2).

[19]Results for non-OECD countries in the pre-WTO period, 1960-1994, are provided in Table A3 and the right panel of Figures A4-A6 in the Appendix. The results differ little from the bounds in Table 4. No results are presented for OECD countries in the WTO period, 1995-2001, due to insufficient variation in the data.

[20]The corresponding bounds using GDP per capita, rather than minus GDP per capita, are given in Table A2 (column 3) in the Appendix.

on new MEA participation by non-OECD countries during the WTO period. This finding is consistent with the statement in Subramanian and Wei (2007, p. 152): "[D]eveloping countries that wanted to join the WTO after 1994 have been required to engage in serious trade liberalization. This sets them apart from the old developing members." The authors (p. 172) continue: "A non-member country that aspires to become a member has to make concessions and obtain approval from every existing member country. As a result, it is easier to demand that these new entrants reduce trade barriers to a greater extent than to do the same to the existing members... [P]ost-Uruguay Round accessions have indeed been qualitatively different in the sense of extracting more trade liberalizing concessions from prospective entrants." Again, this implies that integrating lesser developed countries into the global economy will do little to facilitate, and may actually impede, cooperation on international environmental issues.

5   Conclusion

As discussed in Horn and Mavroidis (2013, p. 1), while WTO members "are legally bound to respect negotiated reductions of barriers to trade," many members are also party to MEAs "that often impose rights or obligations for members to *restrict* trade." Thus, the relationship between the WTO and MEAs "has created significant controversy, since neither ... clarify the relationship between these sometimes, at least seemingly, contradictory undertakings." However, although Egger et al. (2011) examine the effect of international openness (as measured by trade and investment liberalization) on MEA membership, to our knowledge, the effect of WTO membership on participation in environmental agreements has yet to be explicitly analyzed. Accordingly, we explore the *causal* relationship between WTO membership and MEA participation while accounting for two important identification issues: non-random selection and measurement error in WTO membership. Here, we examine the impact of WTO membership on MEA participation, addressing both identification issues in a single partial identification framework proposed in Kreider et al. (2012). This nonparametric approach is especially suitable for this analysis given that obtaining consistent *point* estimates of an endogenous and mismeasured binary variable is not trivial (Black et al. 2000). Thus, while the partial identification approach is less satisfying than a straightforward point estimate, it is more credible as it highlights what we know without invoking perhaps untenable assumptions. As Manski (2013, p. 2-3) states: "Exact predictions are common, and expressions of uncertainty are rare. Yet policy predictions often are fragile. Conclusions may rest on critical unsupported assumptions or on leaps of logic. Then the certitude of policy analysis is not credible." Manski (2013, p. 3) advocates the "honest portrayal of partial knowledge."

In this vein, we impose several weak assumptions concerning the nature of the selection and measurement error processes to bound the causal impact of WTO membership. Using data on roughly 200 countries over 42 years, we assess the identifying power of these assumptions to determine what can be learned about the average treatment effect. While there are a host of interesting findings, the main finding is that, regardless of measurement error, the relationship between WTO membership and MEA participation cannot be signed for the full sample – under the assumptions considered here – as long as selection into the GATT/WTO is non-random. However, we obtain *strictly negative* bounds for the subsample of non-OECD countries in the WTO period (1995-2001). This is consistent with the stringent demands in terms of trade liberalization placed on developing countries in the post-Uruguay Round period in order to gain accession into the WTO.

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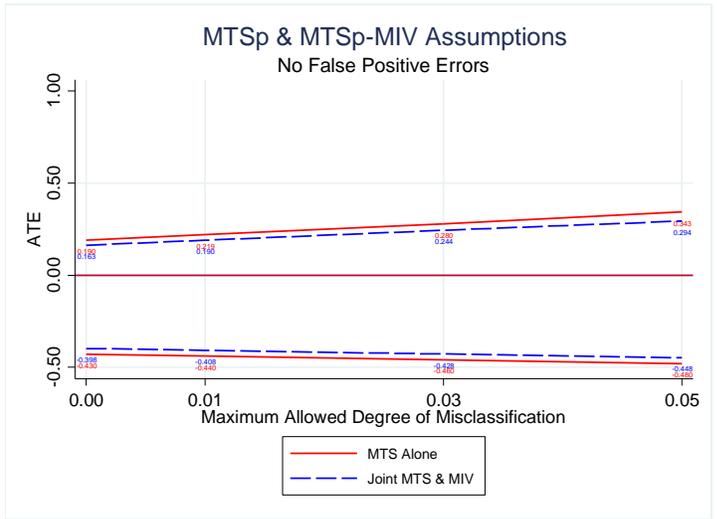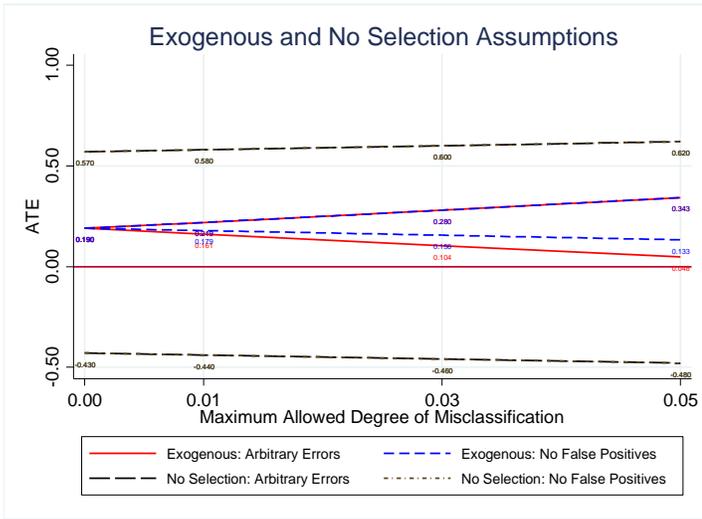
Figure 1. Sharp Bounds on the ATE of WTO Membership on MEA Participation: Signature (Full Sample)
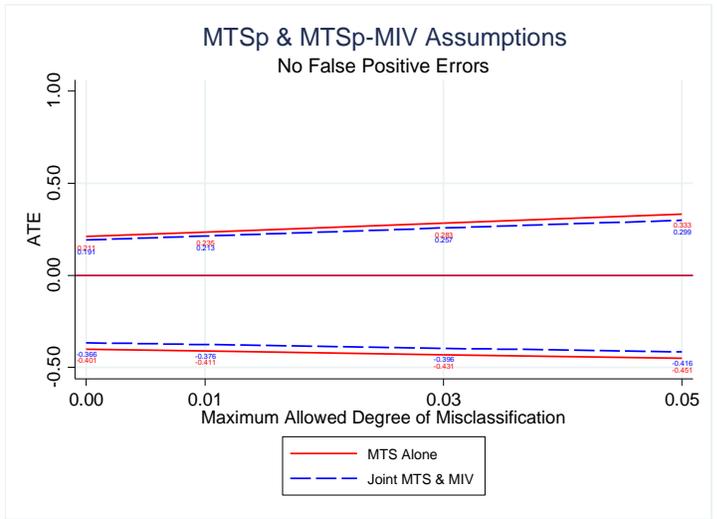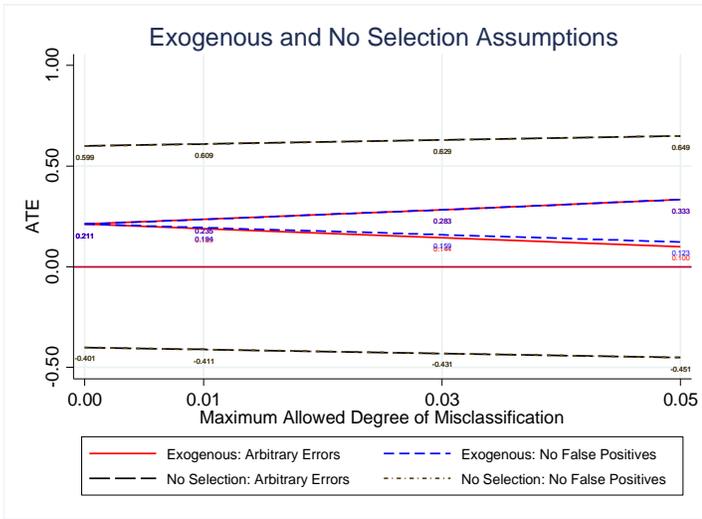
Figure 2. Sharp Bounds on the ATE of WTO Membership on MEA Participation: Signature, Ratification, or Entry Into Force (Full Sample)
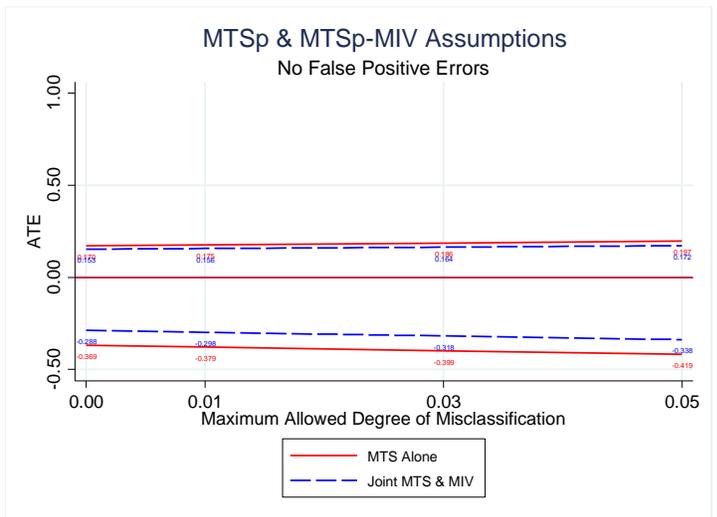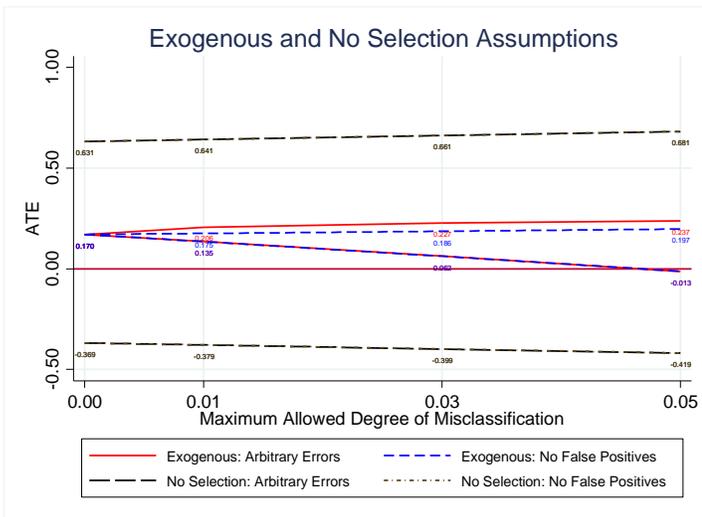
Figure 3. Sharp Bounds on the ATE of WTO Membership on MEA Participation: Any Participation (Full Sample)
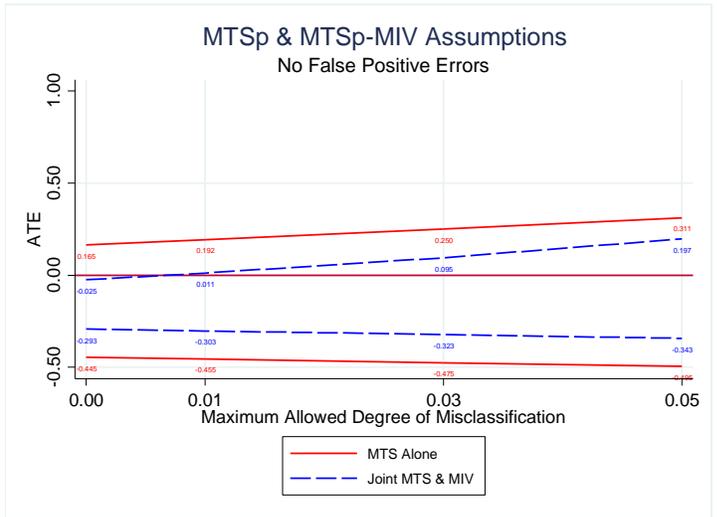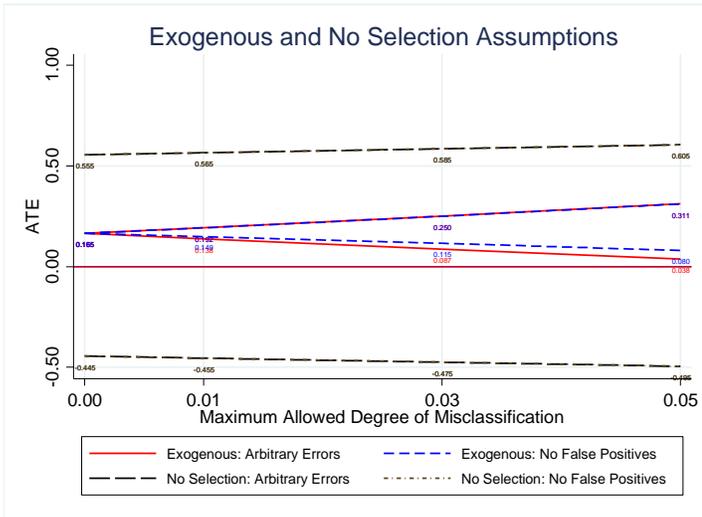
Figure 4. Sharp Bounds on the ATE of WTO Membership on MEA Participation: Signature (Non-OECD Countries, 1995-2001)
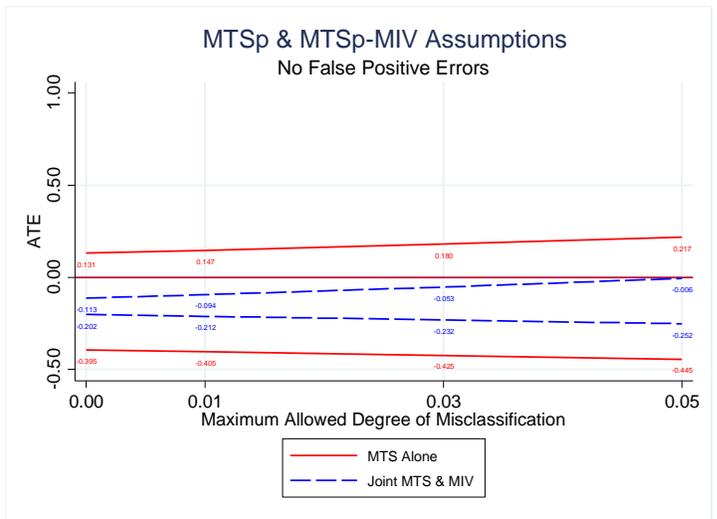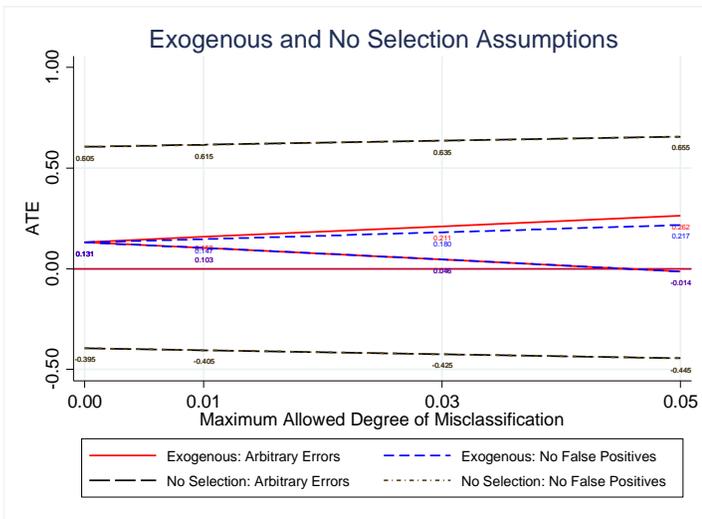
**Figure 5. Sharp Bounds on the ATE of WTO Membership on MEA Participation: Signature, Ratification, or Entry Into Force (Non-OECD Countries, 1995-2001)**

Table 1. Sharp Bounds on the ATE of WTO Membership on MEA Participation

Q	Assumptions Regarding Selection			
	Exogenous Selection	**Worst-Case**	**MTS**	**MTS & MIV**
	(1)	**(2)**	**(3)**	**(4)**
I. Sign a New MEA				
0.00	[0.190, 0.190] p.e.	[-0.430, 0.570] p.e.	[-0.430, 0.190] p.e.	[-0.398, 0.163] p.e.
	[0.169, 0.211] CI	[-0.439, 0.580] CI	[-0.439, 0.208] CI	[-0.414, 0.188] CI
0.01	[0.179, 0.219] p.e.	[-0.440, 0.580] p.e.	[-0.440, 0.219] p.e.	[-0.408, 0.190] p.e.
	[0.161, 0.237] CI	[-0.449, 0.590] CI	[-0.449, 0.237] CI	[-0.424, 0.215] CI
0.03	[0.156, 0.280] p.e.	[-0.460, 0.600] p.e.	[-0.460, 0.280] p.e.	[-0.428, 0.244] p.e.
	[0.138, 0.298] CI	[-0.469, 0.610] CI	[-0.469, 0.298] CI	[-0.444, 0.269] CI
0.05	[0.133, 0.343] p.e.	[-0.480, 0.620] p.e.	[-0.480, 0.343] p.e.	[-0.448, 0.294] p.e.
	[0.115, 0.361] CI	[-0.489, 0.630] CI	[-0.489, 0.361] CI	[-0.464, 0.320] CI
II. Sign, Ratify, or Enter in Force a New MEA				
0.00	[0.211, 0.211] p.e.	[-0.401, 0.599] p.e.	[-0.401, 0.211] p.e.	[-0.366, 0.191] p.e.
	[0.187, 0.236] CI	[-0.411, 0.610] CI	[-0.411, 0.232] CI	[-0.383, 0.213] CI
0.01	[0.194, 0.235] p.e.	[-0.411, 0.609] p.e.	[-0.411, 0.235] p.e.	[-0.376, 0.213] p.e.
	[0.173, 0.256] CI	[-0.421, 0.620] CI	[-0.421, 0.256] CI	[-0.393, 0.235] CI
0.03	[0.159, 0.283] p.e.	[-0.431, 0.629] p.e.	[-0.431, 0.283] p.e.	[-0.396, 0.257] p.e.
	[0.138, 0.304] CI	[-0.441, 0.640] CI	[-0.441, 0.304] CI	[-0.413, 0.279] CI
0.05	[0.123, 0.333] p.e.	[-0.451, 0.649] p.e.	[-0.451, 0.333] p.e.	[-0.416, 0.299] p.e.
	[0.101, 0.355] CI	[-0.461, 0.660] CI	[-0.461, 0.355] CI	[-0.433, 0.322] CI
III. Currently Participate in a MEA				
0.00	[0.170, 0.170] p.e.	[-0.369, 0.631] p.e.	[-0.369, 0.170] p.e.	[-0.288, 0.153] p.e.
	[0.158, 0.183] CI	[-0.377, 0.640] CI	[-0.377, 0.181] CI	[-0.305, 0.172] CI
0.01	[0.135, 0.175] p.e.	[-0.379, 0.641] p.e.	[-0.379, 0.175] p.e.	[-0.298, 0.156] p.e.
	[0.124, 0.186] CI	[-0.387, 0.650] CI	[-0.387, 0.186] CI	[-0.315, 0.176] CI
0.03	[0.062, 0.186] p.e.	[-0.399, 0.661] p.e.	[-0.399, 0.186] p.e.	[-0.318, 0.164] p.e.
	[0.050, 0.197] CI	[-0.407, 0.670] CI	[-0.407, 0.197] CI	[-0.335, 0.184] CI
0.05	[-0.013, 0.197] p.e.	[-0.419, 0.681] p.e.	[-0.419, 0.197] p.e.	[-0.338, 0.172] p.e.
	[-0.025, 0.209] CI	[-0.427, 0.690] CI	[-0.427, 0.209] CI	[-0.355, 0.193] CI

Notes: p.e. = point estimates; CI = confidence Interval. Imbens-Manski (2004) 95% CIs obtained using 100 bootstrap repetitions. Q = maximum rate of misclassification of WTO status. Assumption of no false positives is imposed. MIV is GDP per capita. Number of observations = 6739. See text for further details.

Table 2. Sharp Bounds on the ATE of WTO Membership on MEA Participation: 1960-1994

Q	Assumptions Regarding Selection			
	Exogenous Selection	Worst-Case	MTS	MTS & MIV
	(1)	(2)	(3)	(4)
I. Sign a New MEA				
0.00	[0.164, 0.164] p.e.	[-0.431, 0.569] p.e.	[-0.431, 0.164] p.e.	[-0.385, 0.133] p.e.
	[0.144, 0.184] CI	[-0.441, 0.579] CI	[-0.441, 0.181] CI	[-0.404, 0.157] CI
0.01	[0.154, 0.194] p.e.	[-0.441, 0.579] p.e.	[-0.441, 0.194] p.e.	[-0.395, 0.162] p.e.
	[0.137, 0.211] CI	[-0.451, 0.589] CI	[-0.451, 0.211] CI	[-0.414, 0.186] CI
0.03	[0.134, 0.255] p.e.	[-0.461, 0.599] p.e.	[-0.461, 0.255] p.e.	[-0.415, 0.221] p.e.
	[0.117, 0.272] CI	[-0.471, 0.609] CI	[-0.471, 0.272] CI	[-0.434, 0.245] CI
0.05	[0.113, 0.318] p.e.	[-0.481, 0.619] p.e.	[-0.481, 0.318] p.e.	[-0.435, 0.277] p.e.
	[0.096, 0.335] CI	[-0.491, 0.629] CI	[-0.491, 0.335] CI	[-0.454, 0.301] CI
II. Sign, Ratify, or Enter in Force a New MEA				
0.00	[0.187, 0.187] p.e.	[-0.412, 0.588] p.e.	[-0.412, 0.187] p.e.	[-0.369, 0.150] p.e.
	[0.162, 0.211] CI	[-0.423, 0.598] CI	[-0.423, 0.207] CI	[-0.387, 0.181] CI
0.01	[0.171, 0.212] p.e.	[-0.422, 0.598] p.e.	[-0.422, 0.212] p.e.	[-0.379, 0.174] p.e.
	[0.151, 0.232] CI	[-0.433, 0.608] CI	[-0.433, 0.232] CI	[-0.397, 0.205] CI
0.03	[0.140, 0.262] p.e.	[-0.442, 0.618] p.e.	[-0.442, 0.262] p.e.	[-0.399, 0.224] p.e.
	[0.120, 0.283] CI	[-0.453, 0.628] CI	[-0.453, 0.283] CI	[-0.417, 0.253] CI
0.05	[0.109, 0.314] p.e.	[-0.462, 0.638] p.e.	[-0.462, 0.314] p.e.	[-0.419, 0.273] p.e.
	[0.089, 0.335] CI	[-0.473, 0.648] CI	[-0.473, 0.335] CI	[-0.437, 0.301] CI
III. Currently Participate in a MEA				
0.00	[0.192, 0.192] p.e.	[-0.384, 0.616] p.e.	[-0.384, 0.192] p.e.	[-0.292, 0.159] p.e.
	[0.173, 0.210] CI	[-0.395, 0.627] CI	[-0.395, 0.207] CI	[-0.312, 0.181] CI
0.01	[0.157, 0.197] p.e.	[-0.394, 0.626] p.e.	[-0.394, 0.197] p.e.	[-0.302, 0.164] p.e.
	[0.141, 0.213] CI	[-0.405, 0.637] CI	[-0.405, 0.213] CI	[-0.322, 0.186] CI
0.03	[0.087, 0.208] p.e.	[-0.414, 0.646] p.e.	[-0.414, 0.208] p.e.	[-0.322, 0.173] p.e.
	[0.071, 0.225] CI	[-0.425, 0.657] CI	[-0.425, 0.225] CI	[-0.342, 0.195] CI
0.05	[0.016, 0.221] p.e.	[-0.434, 0.666] p.e.	[-0.434, 0.221] p.e.	[-0.342, 0.182] p.e.
	[-0.001, 0.238] CI	[-0.445, 0.677] CI	[-0.445, 0.238] CI	[-0.362, 0.205] CI

Notes: p.e. = point estimates; CI = confidence Interval. Imbens-Manski (2004) 95% CIs obtained using 100 bootstrap repetitions. Q = maximum rate of misclassification of WTO status. Assumption of no false positives is imposed. MIV is GDP per capita. Number of observations = 5402. See text for further details.

Table 3. Sharp Bounds on the ATE of WTO Membership on MEA Participation: 1995-2001

Q	Exogenous Selection (1)	Worst-Case (2)	MTS (3)	MTS & MIV (4)
Assumptions Regarding Selection				
I. Sign a New MEA				
0.00	[0.212, 0.212] p.e.	[-0.424, 0.576] p.e.	[-0.424, 0.212] p.e.	[-0.424, 0.174] p.e.
	[0.162, 0.262] CI	[-0.445, 0.597] CI	[-0.445, 0.254] CI	[-0.445, 0.236] CI
0.01	[0.194, 0.241] p.e.	[-0.434, 0.586] p.e.	[-0.434, 0.241] p.e.	[-0.434, 0.197] p.e.
	[0.152, 0.284] CI	[-0.455, 0.607] CI	[-0.455, 0.284] CI	[-0.455, 0.260] CI
0.03	[0.157, 0.305] p.e.	[-0.454, 0.606] p.e.	[-0.454, 0.305] p.e.	[-0.454, 0.245] p.e.
	[0.113, 0.349] CI	[-0.475, 0.627] CI	[-0.475, 0.349] CI	[-0.475, 0.311] CI
0.05	[0.116, 0.375] p.e.	[-0.474, 0.626] p.e.	[-0.474, 0.375] p.e.	[-0.474, 0.295] p.e.
	[0.070, 0.422] CI	[-0.495, 0.647] CI	[-0.495, 0.422] CI	[-0.495, 0.363] CI
II. Sign, Ratify, or Enter in Force a New MEA				
0.00	[0.166, 0.166] p.e.	[-0.354, 0.646] p.e.	[-0.354, 0.166] p.e.	[-0.354, 0.132] p.e.
	[0.108, 0.224] CI	[-0.376, 0.669] CI	[-0.376, 0.215] CI	[-0.376, 0.192] CI
0.01	[0.136, 0.183] p.e.	[-0.364, 0.656] p.e.	[-0.364, 0.183] p.e.	[-0.364, 0.148] p.e.
	[0.086, 0.233] CI	[-0.386, 0.679] CI	[-0.386, 0.233] CI	[-0.386, 0.209] CI
0.03	[0.072, 0.221] p.e.	[-0.384, 0.676] p.e.	[-0.384, 0.221] p.e.	[-0.384, 0.184] p.e.
	[0.020, 0.272] CI	[-0.406, 0.699] CI	[-0.406, 0.272] CI	[-0.406, 0.247] CI
0.05	[0.003, 0.262] p.e.	[-0.404, 0.696] p.e.	[-0.404, 0.262] p.e.	[-0.404, 0.224] p.e.
	[-0.052, 0.316] CI	[-0.426, 0.719] CI	[-0.426, 0.316] CI	[-0.426, 0.286] CI

Notes: p.e. = point estimates; CI = confidence Interval. Imbens-Manski (2004) 95% CIs obtained using 100 bootstrap repetitions. Q = maximum rate of misclassification of WTO status. Assumption of no false positives is imposed. MIV is GDP per capita. Number of observations = 1337. See text for further details.

Table 4. Sharp Bounds on the ATE of WTO Membership on MEA Participation: Non-OECD Countries

Q	Assumptions Regarding Selection			
	Exogenous Selection	Worst-Case	MTS	MTS & MIV
	(1)	(2)	(3)	(4)
I. Sign a New MEA				
0.00	[0.131, 0.131] p.e.	[-0.428, 0.572] p.e.	[-0.428, 0.131] p.e.	[-0.331, 0.036] p.e.
	[0.111, 0.152] CI	[-0.438, 0.581] CI	[-0.438, 0.148] CI	[-0.354, 0.077] CI
0.01	[0.121, 0.161] p.e.	[-0.438, 0.582] p.e.	[-0.438, 0.161] p.e.	[-0.341, 0.065] p.e.
	[0.103, 0.178] CI	[-0.448, 0.591] CI	[-0.448, 0.178] CI	[-0.364, 0.105] CI
0.03	[0.100, 0.220] p.e.	[-0.458, 0.602] p.e.	[-0.458, 0.220] p.e.	[-0.361, 0.125] p.e.
	[0.083, 0.237] CI	[-0.468, 0.611] CI	[-0.468, 0.237] CI	[-0.384, 0.163] CI
0.05	[0.079, 0.280] p.e.	[-0.478, 0.622] p.e.	[-0.478, 0.280] p.e.	[-0.381, 0.188] p.e.
	[0.062, 0.297] CI	[-0.488, 0.631] CI	[-0.488, 0.297] CI	[-0.404, 0.225] CI
II. Sign, Ratify, or Enter in Force a New MEA				
0.00	[0.163, 0.163] p.e.	[-0.416, 0.584] p.e.	[-0.416, 0.163] p.e.	[-0.306, 0.028] p.e.
	[0.137, 0.190] CI	[-0.427, 0.595] CI	[-0.427, 0.185] CI	[-0.334, 0.072] CI
0.01	[0.146, 0.186] p.e.	[-0.426, 0.594] p.e.	[-0.426, 0.186] p.e.	[-0.316, 0.051] p.e.
	[0.124, 0.209] CI	[-0.437, 0.605] CI	[-0.437, 0.209] CI	[-0.344, 0.094] CI
0.03	[0.113, 0.233] p.e.	[-0.446, 0.614] p.e.	[-0.446, 0.233] p.e.	[-0.336, 0.097] p.e.
	[0.091, 0.255] CI	[-0.457, 0.625] CI	[-0.457, 0.255] CI	[-0.364, 0.140] CI
0.05	[0.080, 0.281] p.e.	[-0.466, 0.634] p.e.	[-0.466, 0.281] p.e.	[-0.356, 0.145] p.e.
	[0.058, 0.303] CI	[-0.477, 0.645] CI	[-0.477, 0.303] CI	[-0.384, 0.189] CI
III. Currently Participate in a MEA				
0.00	[0.169, 0.169] p.e.	[-0.426, 0.574] p.e.	[-0.426, 0.169] p.e.	[-0.364, 0.159] p.e.
	[0.153, 0.186] CI	[-0.436, 0.584] CI	[-0.436, 0.183] CI	[-0.384, 0.179] CI
0.01	[0.134, 0.174] p.e.	[-0.436, 0.584] p.e.	[-0.436, 0.174] p.e.	[-0.374, 0.163] p.e.
	[0.120, 0.187] CI	[-0.446, 0.594] CI	[-0.446, 0.187] CI	[-0.394, 0.183] CI
0.03	[0.062, 0.183] p.e.	[-0.456, 0.604] p.e.	[-0.456, 0.183] p.e.	[-0.394, 0.170] p.e.
	[0.048, 0.197] CI	[-0.466, 0.614] CI	[-0.466, 0.197] CI	[-0.414, 0.191] CI
0.05	[-0.009, 0.192] p.e.	[-0.476, 0.624] p.e.	[-0.476, 0.192] p.e.	[-0.414, 0.178] p.e.
	[-0.024, 0.207] CI	[-0.486, 0.634] CI	[-0.486, 0.207] CI	[-0.434, 0.200] CI

Notes: p.e. = point estimates; CI = confidence Interval. Imbens-Manski (2004) 95% CIs obtained using 100 bootstrap repetitions. Q = maximum rate of misclassification of WTO status. Assumption of no false positives is imposed. MIV is minus GDP per capita. Number of observations = 5735. See text for further details.

Table 5. Sharp Bounds on the ATE of WTO Membership on MEA Participation: Non-OECD, 1995-2001

	Assumptions Regarding Selection			
Q	**Exogenous Selection**	**Worst-Case**	**MTS**	**MTS & MIV**
	(1)	**(2)**	**(3)**	**(4)**
I. Sign a New MEA				
0.00	[0.165, 0.165] p.e.	[-0.445, 0.555] p.e.	[-0.445, 0.165] p.e.	[-0.293, -0.025] p.e.
	[0.115, 0.215] CI	[-0.466, 0.576] CI	[-0.466, 0.207] CI	[-0.361, 0.103] CI
0.01	[0.149, 0.192] p.e.	[-0.455, 0.565] p.e.	[-0.455, 0.192] p.e.	[-0.303, 0.011] p.e.
	[0.107, 0.235] CI	[-0.476, 0.586] CI	[-0.476, 0.234] CI	[-0.371, 0.140] CI
0.03	[0.115, 0.250] p.e.	[-0.475, 0.585] p.e.	[-0.475, 0.250] p.e.	[-0.323, 0.095] p.e.
	[0.072, 0.293] CI	[-0.496, 0.606] CI	[-0.496, 0.293] CI	[-0.391, 0.221] CI
0.05	[0.080, 0.311] p.e.	[-0.495, 0.605] p.e.	[-0.495, 0.311] p.e.	[-0.343, 0.197] p.e.
	[0.036, 0.357] CI	[-0.516, 0.626] CI	[-0.516, 0.357] CI	[-0.411, 0.314] CI
II. Sign, Ratify, or Enter in Force a New MEA				
0.00	[0.131, 0.131] p.e.	[-0.395, 0.605] p.e.	[-0.395, 0.131] p.e.	[-0.202, -0.113] p.e.
	[0.081, 0.181] CI	[-0.415, 0.626] CI	[-0.415, 0.173] CI	[-0.261, 0.007] CI
0.01	[0.103, 0.147] p.e.	[-0.405, 0.615] p.e.	[-0.405, 0.147] p.e.	[-0.212, -0.094] p.e.
	[0.061, 0.189] CI	[-0.425, 0.636] CI	[-0.425, 0.189] CI	[-0.270, 0.028] CI
0.03	[0.046, 0.180] p.e.	[-0.425, 0.635] p.e.	[-0.425, 0.180] p.e.	[-0.232, -0.053] p.e.
	[0.002, 0.224] CI	[-0.445, 0.656] CI	[-0.445, 0.224] CI	[-0.290, 0.074] CI
0.05	[-0.014, 0.217] p.e.	[-0.445, 0.655] p.e.	[-0.445, 0.217] p.e.	[-0.252, -0.006] p.e.
	[-0.060, 0.262] CI	[-0.465, 0.676] CI	[-0.465, 0.262] CI	[-0.310, 0.127] CI

Notes: p.e. = point estimates; CI = confidence Interval. Imbens-Manski (2004) 95% CIs obtained using 100 bootstrap repetitions. Q = maximum rate of misclassification of WTO status. Assumption of no false positives is imposed. MIV is minus GDP per capita. Number of observations = 1135. See text for further details.

Appendix
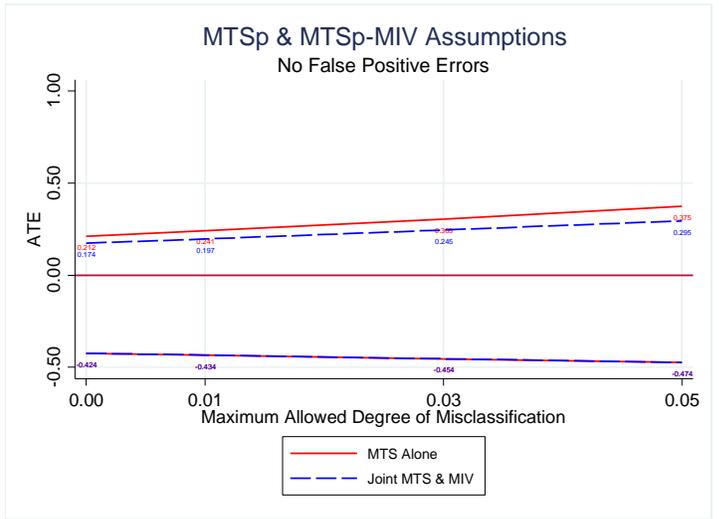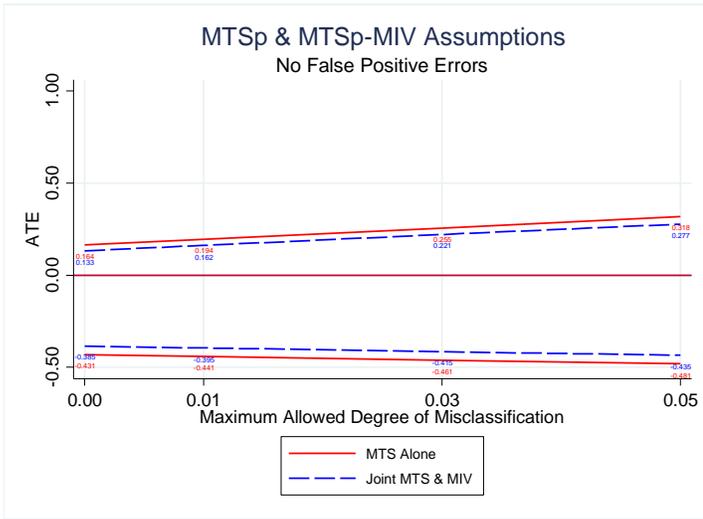
Figure A1. Sharp Bounds on the ATE of WTO Membership on MEA Participation by Time Period: Signature
Note: Left panel corresponds to 1960-1994; right panel to 1995-2001.
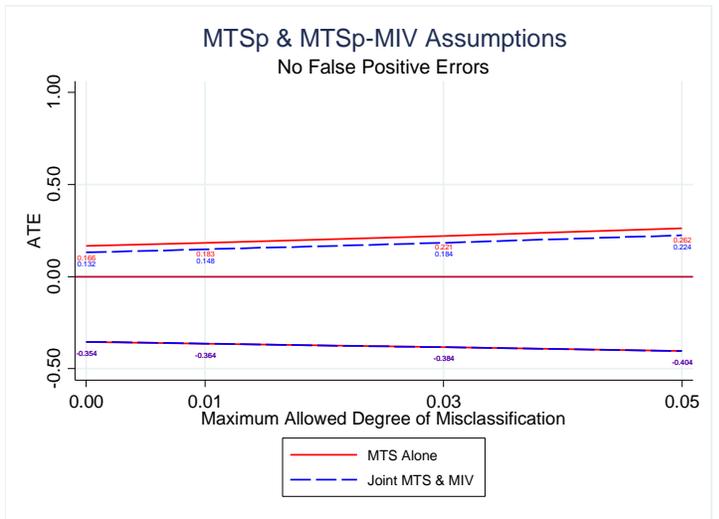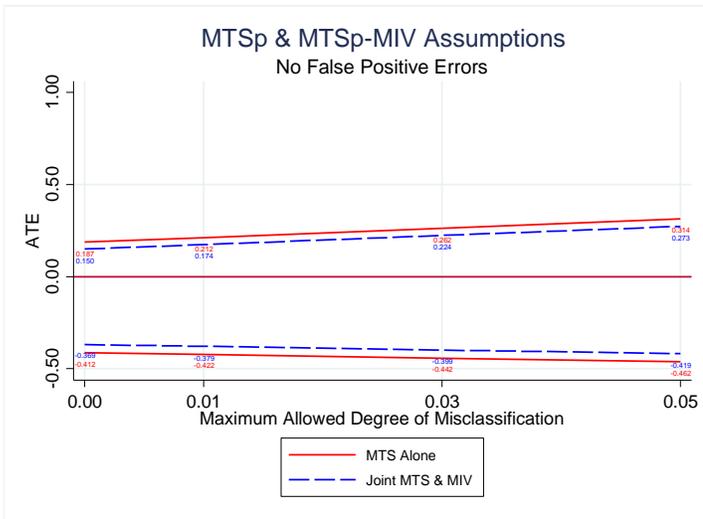
Figure A2. Sharp Bounds on the ATE of WTO Membership on MEA Participation by Time Period: Signature, Ratification, or Entry Into Force
Note: Left panel corresponds to 1960-1994; right panel to 1995-2001.
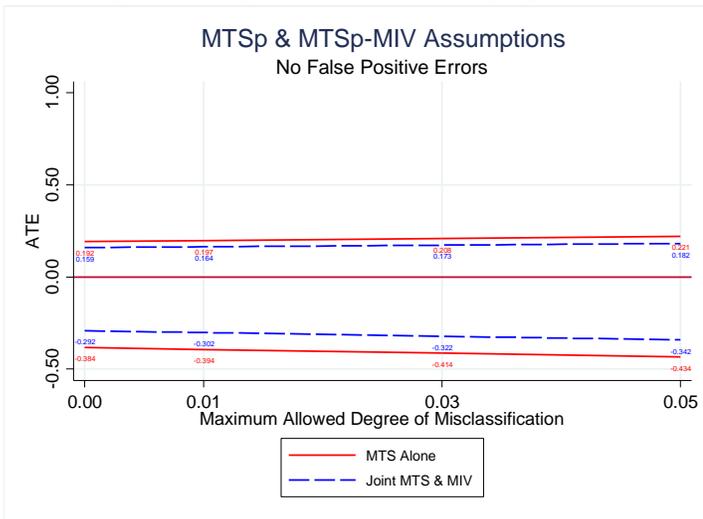

Figure A3. Sharp Bounds on the ATE of WTO Membership on MEA Participation by Time Period: Any Participation
Note: Left panel corresponds to 1960-1994. 1995-2001 analysis not feasible.
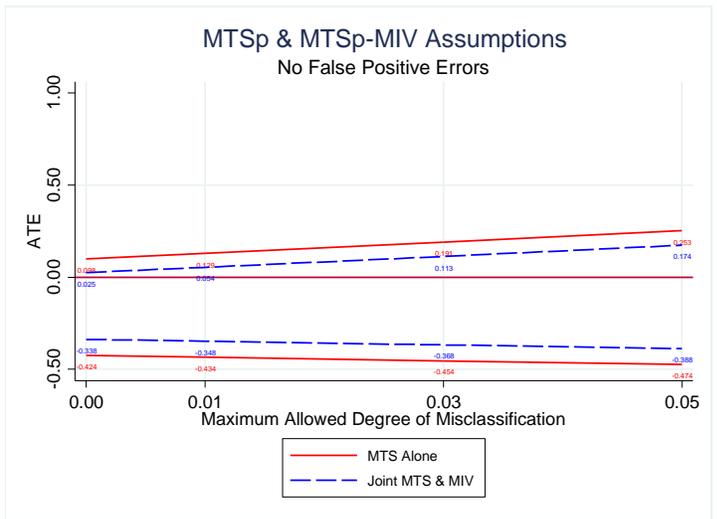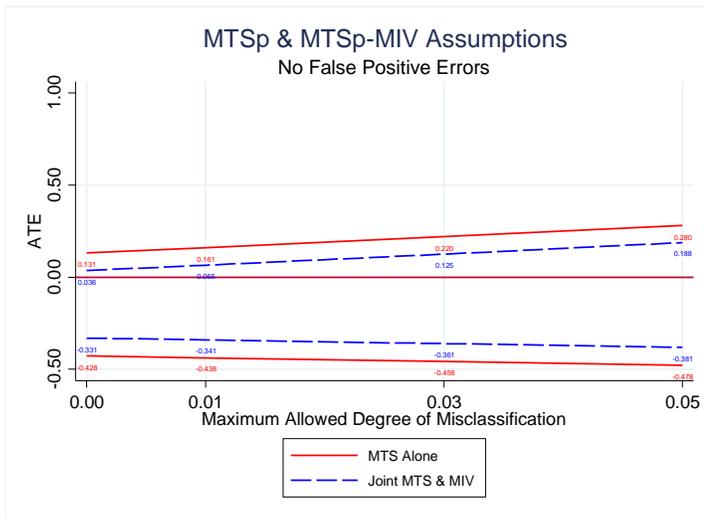
Figure A4. Sharp Bounds on the ATE of WTO Membership on MEA Participation: Signature (Non-OECD Countries)
Note: Left panel corresponds to 1960-2001; right panel to 1960-1994.
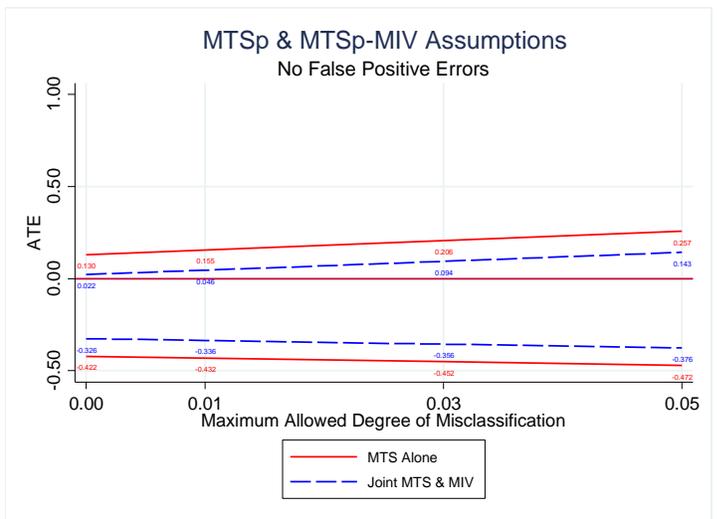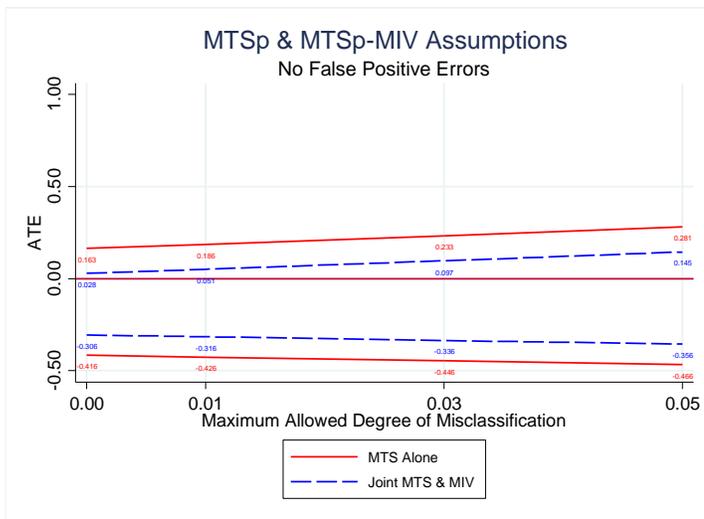
**Figure A5. Sharp Bounds on the ATE of WTO Membership on MEA Participation: Signature, Ratification, or Entry Into Force (Non-OECD Countries)**
Note: Left panel corresponds to 1960-2001; right panel to 1960-1994.
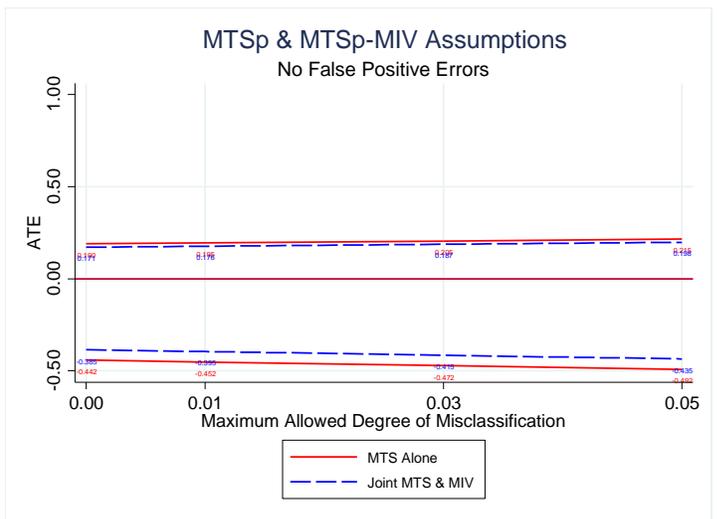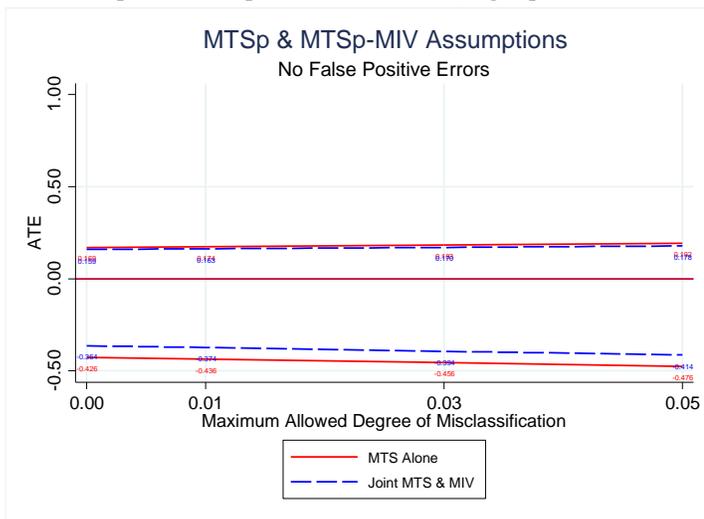

Figure A6. Sharp Bounds on the ATE of WTO Membership on MEA Participation: Any Participation (Non-OECD Countries)
Note: Left panel corresponds to 1960-2001; right panel to 1960-1994.

Table A1. Summary Statistics

Variable	Mean	SD	Minimum	Maximum
WTO Membership (1 = Yes)	0.559	0.497	0	1
New MEA Signature (1 = Yes)	0.304	0.460	0	1
New MEA Signature, Ratification, or Entry into Force (1 = Yes)	0.457	0.498	0	1
Current MEA Participation (1 = Yes)	0.901	0.299	0	1
Year	1982.257	11.901	1960	2001
OECD (1 = Yes)	0.149	0.356	0	1
GDP Per Capita)	7661.842	13444.440	50.0	124015.4

Notes: N = 6739.

Table A2. Sharp Bounds on the ATE of WTO Membership on MEA Participation: Non-OECD Countries

Q	1960-2001 MTS & MIV	1960-1994 MTS & MIV	1995-2001 MTS & MIV
	(1)	(2)	(3)
I. Sign a New MEA			
0.00	[-0.323, 0.100] p.e.	[-0.310, 0.086] p.e.	[-0.354, 0.060] p.e.
	[-0.348, 0.132] CI	[-0.336, 0.118] CI	[-0.406, 0.160] CI
0.01	[-0.333, 0.131] p.e.	[-0.320, 0.119] p.e.	[-0.364, 0.092] p.e.
	[-0.358, 0.163] CI	[-0.346, 0.149] CI	[-0.416, 0.191] CI
0.03	[-0.353, 0.196] p.e.	[-0.340, 0.185] p.e.	[-0.384, 0.163] p.e.
	[-0.378, 0.227] CI	[-0.366, 0.212] CI	[-0.436, 0.260] CI
0.05	[-0.373, 0.263] p.e.	[-0.360, 0.250] p.e.	[-0.404, 0.247] p.e.
	[-0.398, 0.294] CI	[-0.386, 0.274] CI	[-0.456, 0.343] CI
II. Sign, Ratify, or Enter in Force a New MEA			
0.00	[-0.307, 0.134] p.e.	[-0.303, 0.103] p.e.	[-0.299, 0.027] p.e.
	[-0.332, 0.167] CI	[-0.330, 0.145] CI	[-0.356, 0.113] CI
0.01	[-0.317, 0.157] p.e.	[-0.313, 0.133] p.e.	[-0.309, 0.044] p.e.
	[-0.342, 0.191] CI	[-0.340, 0.175] CI	[-0.366, 0.132] CI
0.03	[-0.337, 0.206] p.e.	[-0.333, 0.193] p.e.	[-0.329, 0.080] p.e.
	[-0.362, 0.239] CI	[-0.360, 0.230] CI	[-0.386, 0.172] CI
0.05	[-0.357, 0.257] p.e.	[-0.353, 0.250] p.e.	[-0.349, 0.121] p.e.
	[-0.382, 0.289] CI	[-0.380, 0.281] CI	[-0.406, 0.215] CI
III. Currently Participate in a MEA			
0.00	[-0.285, 0.150] p.e.	[-0.263, 0.163] p.e.	
	[-0.316, 0.174] CI	[-0.298, 0.190] CI	
0.01	[-0.295, 0.154] p.e.	[-0.273, 0.168] p.e.	
	[-0.326, 0.178] CI	[-0.308, 0.195] CI	
0.03	[-0.315, 0.161] p.e.	[-0.293, 0.178] p.e.	
	[-0.346, 0.185] CI	[-0.328, 0.205] CI	
0.05	[-0.335, 0.169] p.e.	[-0.313, 0.190] p.e.	
	[-0.366, 0.193] CI	[-0.348, 0.217] CI	

Notes: p.e. = point estimates; CI = confidence Interval. Imbens-Manski (2004) 95% CIs obtained using 100 bootstrap repetitions. Q = maximum rate of misclassification of WTO status. Assumption of no false positives is imposed. MIV is GDP per capita. Number of observations = 6739. See text for further details.

Table A3. Sharp Bounds on the ATE of WTO Membership on MEA Participation: Non-OECD, 1960-1994

Q	Exogenous Selection (1)	Worst-Case (2)	MTS (3)	MTS & MIV (4)
	Assumptions Regarding Selection			
I. Sign a New MEA				
0.00	[0.098, 0.098] p.e.	[-0.424, 0.576] p.e.	[-0.424, 0.098] p.e.	[-0.338, 0.025] p.e.
	[0.071, 0.126] CI	[-0.437, 0.589] CI	[-0.437, 0.121] CI	[-0.365, 0.069] CI
0.01	[0.089, 0.129] p.e.	[-0.434, 0.586] p.e.	[-0.434, 0.129] p.e.	[-0.348, 0.054] p.e.
	[0.066, 0.152] CI	[-0.447, 0.599] CI	[-0.447, 0.152] CI	[-0.375, 0.097] CI
0.03	[0.071, 0.191] p.e.	[-0.454, 0.606] p.e.	[-0.454, 0.191] p.e.	[-0.368, 0.113] p.e.
	[0.048, 0.213] CI	[-0.467, 0.619] CI	[-0.467, 0.213] CI	[-0.395, 0.155] CI
0.05	[0.053, 0.253] p.e.	[-0.474, 0.626] p.e.	[-0.474, 0.253] p.e.	[-0.388, 0.174] p.e.
	[0.030, 0.275] CI	[-0.487, 0.639] CI	[-0.487, 0.275] CI	[-0.415, 0.214] CI
II. Sign, Ratify, or Enter in Force a New MEA				
0.00	[0.130, 0.130] p.e.	[-0.422, 0.578] p.e.	[-0.422, 0.130] p.e.	[-0.326, 0.022] p.e.
	[0.102, 0.158] CI	[-0.434, 0.591] CI	[-0.434, 0.154] CI	[-0.355, 0.069] CI
0.01	[0.115, 0.155] p.e.	[-0.432, 0.588] p.e.	[-0.432, 0.155] p.e.	[-0.336, 0.046] p.e.
	[0.092, 0.179] CI	[-0.444, 0.601] CI	[-0.444, 0.179] CI	[-0.365, 0.093] CI
0.03	[0.086, 0.206] p.e.	[-0.452, 0.608] p.e.	[-0.452, 0.206] p.e.	[-0.356, 0.094] p.e.
	[0.062, 0.230] CI	[-0.464, 0.621] CI	[-0.464, 0.230] CI	[-0.385, 0.142] CI
0.05	[0.057, 0.257] p.e.	[-0.472, 0.628] p.e.	[-0.472, 0.257] p.e.	[-0.376, 0.143] p.e.
	[0.034, 0.281] CI	[-0.484, 0.641] CI	[-0.484, 0.281] CI	[-0.405, 0.190] CI
III. Currently Participate in a MEA				
0.00	[0.190, 0.190] p.e.	[-0.442, 0.558] p.e.	[-0.442, 0.190] p.e.	[-0.385, 0.171] p.e.
	[0.170, 0.210] CI	[-0.454, 0.570] CI	[-0.454, 0.207] CI	[-0.407, 0.199] CI
0.01	[0.155, 0.195] p.e.	[-0.452, 0.568] p.e.	[-0.452, 0.195] p.e.	[-0.395, 0.176] p.e.
	[0.137, 0.212] CI	[-0.464, 0.580] CI	[-0.464, 0.212] CI	[-0.417, 0.204] CI
0.03	[0.085, 0.205] p.e.	[-0.472, 0.588] p.e.	[-0.472, 0.205] p.e.	[-0.415, 0.187] p.e.
	[0.067, 0.222] CI	[-0.484, 0.600] CI	[-0.484, 0.222] CI	[-0.437, 0.214] CI
0.05	[0.015, 0.215] p.e.	[-0.492, 0.608] p.e.	[-0.492, 0.215] p.e.	[-0.435, 0.198] p.e.
	[-0.003, 0.233] CI	[-0.504, 0.620] CI	[-0.504, 0.233] CI	[-0.457, 0.226] CI

Notes: p.e. = point estimates; CI = confidence Interval. Imbens-Manski (2004) 95% CIs obtained using 100 bootstrap repetitions. Q = maximum rate of misclassification of WTO status. Assumption of no false positives is imposed. MIV is minus GDP per capita. Number of observations = 4600. See text for further details.