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**Import Protection, Business Cycles,  
and Exchange Rates: Evidence from  
the Great Recession**

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# Import Protection, Business Cycles, and Exchange Rates: Evidence from the Great Recession

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## Abstract

This paper estimates the impact of macroeconomic fluctuations on import protection policies over 1988:Q1-2010:Q4 for five industrialized economies - the United States, European Union, Australia, Canada and South Korea. We find evidence of a strong countercyclical trade policy response in the pre-Great Recession period of 1988:Q1 – 2008:Q3 during which increases in domestic unemployment rates, real appreciations in bilateral exchange rates, and declines in the GDP growth rates of bilateral trading partners led to substantial increases in new temporary trade barriers. We then apply this pre-Great Recession empirical model to realized macroeconomic data from 2008:Q4-2010:Q4 and find it predicts a surge of new import protection during the Great Recession – e.g., for the US and EU, the model predicts new trade barriers would cover an additional 15 percentage points of nonoil imports, well above the baseline level of 2-3 percent of import coverage immediately preceding the crisis. Finally, we examine why the realized trade policy response differed from model predictions. While exchange rate movements played an important role in limiting new import protection during the Great Recession, we provide evidence of one particularly important change in trade policy responsiveness; i.e., in this period, governments refrained from imposing new temporary trade barriers against foreign trading partners experiencing their own weak or negative economic growth.

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*We underscore the critical importance of rejecting protectionism and not turning inward in times of financial uncertainty. In this regard, within the next 12 months, we will refrain from raising new barriers to investment or to trade in goods and services, imposing new export restrictions, or implementing World Trade Organization (WTO) inconsistent measures to stimulate exports.*

- G20 Declaration, November 15, 2008

## **1. Introduction**

The imposition of the Smoot-Hawley tariffs during the early days of the Great Depression has since established a widespread presumption that import tariffs and other forms of trade protection rise during periods of macroeconomic weakness. During the Great Recession, the fear of new import restrictions led to pre-emptive statements like the G20 Declaration of November 2008.

This paper uses quarterly data for the United States, European Union, Australia, Canada, and South Korea to estimate the impact of macroeconomic shocks on import protection policies over 1988-2010. We find evidence of a robust countercyclical trade policy response in the pre-Great Recession period of 1988:Q1-2008:Q3. For example, a one standard deviation increase in the change in the domestic unemployment rate is associated with a 52 percent increase in the number of imported products over which an economy initiates new temporary trade barrier investigations in the following quarter. Other macroeconomic factors also have important effects on trade policy; a one standard deviation appreciation in the bilateral real exchange rate leads to a 33 percent increase in import protection while a one standard deviation *decrease* in the growth rate of real GDP in a foreign trading partner results in a 60 percent increase. Finally, when we extend our analysis through 2010:Q4 so as to analyze the Great Recession, one noteworthy change is to the relationship between import protection and a *trading partner's* economic growth. During the Great Recession, governments refrained from imposing new temporary trade barriers against trading partners experiencing their own weak or negative economic growth.

Our evidence paints a complex picture of the role that macroeconomic shocks play in determining trade policy for countries bound by the WTO. In particular, our results indicate the empirical relationships between macroeconomic shocks and trade policy are changing over time and across trading partners in ways that ultimately impact the worldwide distribution of import protection beyond that which takes place through tariff liberalization negotiations and trade agreements. To document this phenomenon, our approach is to analyze determinants of *temporary trade barriers*

(TTBs) – the relatively substitutable import restrictions under antidumping, countervailing duty, global safeguards, and the China-specific safeguard policies – because these are the predominant means through which industrialized countries have implemented *new* protection under the GATT and WTO since the 1980s.<sup>1</sup> Quantitatively, these restrictions have been economically important; e.g., the European Union and United States subjected 4-6 percent of their imported products at the 6-digit Harmonized System level to these policies at various points during our sample period (Bown 2011a; Prusa, 2011). We focus on five economies – the United States, European Union, Australia, Canada and South Korea – for three reasons. First, they are economically important - together they constituted more than 40 percent of world imports and more than half of world GDP in 2010. Second, we can accurately track and consistently measure trade policy changes over time and at high frequency (i.e., quarterly) due to the similarity of their trade policy institutions and international commitments. Third, these economies have high quality macroeconomic data at the quarterly frequency over a relatively long time series which facilitates an examination of business cycles.

Given the severity of macroeconomic shocks that took place during the Great Recession, an open research question is why was the trade policy response so mild relative to expectations? Our formal analysis tackles this question by proceeding in three steps. Our first step is to estimate a model of macroeconomic determinants of import protection for these five policy-imposing economies over the pre-crisis period of 1988:Q1 – 2008:Q3. Figure 1 shows for each economy the time series of real exchange rate fluctuations, changes to domestic unemployment rates, and counts of imported products subject to new TTB policies in the quarterly data over 1988-2010.

Our second step is to use the model estimates from 1988:Q1-2008:Q3 to generate out-of-sample predictions for trade policy responses during 2008:Q4-2010:Q4, given the macroeconomic shocks that arose during the Great Recession. The model predicts a surge in import protection for the United States and European Union in particular in 2009:Q3. In terms of trade values, back of the envelope calculations put the forecasted *new* TTB import protection during 2008:Q4-2010:Q4 as

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<sup>1</sup> A reasonable question is the extent to which our singular focus on TTB policies fully captures the new import protection activity during 2008-2010 by the five economies in our sample. According to data from the Global Trade Alert, TTBs are by far the predominant trade policy instruments through which these economies directly erected new import-restricting trade barriers in 2008-2010. Appendix Table I lists the *only other* examples from these economies that the Global Trade Alert characterizes as “red” – i.e., the measure has been implemented and almost certainly discriminates against foreign commercial interests - and is directed at imports. From this list, it appears that only a South Korean increase in tariffs on 16 different products in January 2009 would be characterized as a substantial protectionist import restriction that is not captured by our focus on TTBs.

covering up to an additional 15 percent and 14 percent of non-oil imports in the US and EU, respectively. This projected new coverage would have added roughly five to seven times as much import protection as the entire US and EU stock of imports cumulatively covered by TTBs immediately prior to the crisis (Bown, 2011a).

Finally, in order to understand why the predicted surge of import protection did not materialize, our third step is to re-estimate the empirical model on data that includes 2008:Q4-2010:Q4. This enables us to compare how the responsiveness of import protection policies to macroeconomic shocks changed during the crisis, relative to the earlier period. First, we find robust evidence that policy-imposing economies refrained from imposing new import restrictions against those trading partners with weak GDP growth. This contrasts strongly with TTB determination before 2008, and it is an important force for dampening the overall incidence of import protection during the Great Recession given that so many trading partners were undergoing periods of macroeconomic contraction. Second, our estimates indicate that bilateral real appreciations are typically associated with more TTBs. Thus, for the United States and European Union, sharp real currency depreciations, especially in late 2009 through early 2010, likely contributed to a dampening of the trade policy response throughout 2010.

This paper contributes to the empirical literature on the determinants of import tariffs and other trade restrictions. Trefler (1993), Golberg and Maggi (1999), and Gawande and Bandyopadhyay (2000) pioneered empirical investigations into political-economic theories of endogenous trade policy formation (Hillman, 1982; Grossman and Helpman, 1994). While the evidence indicated that lobbying for protection impacts trade policy; the quantitative effect of such political-economic determinants was perhaps smaller than had been expected. More recent empirical research explores classical economic theories regarding the role of the terms of trade in tariff determination (Bagwell and Staiger 1990, 1999). For example, Broda, Limão and Weinstein (2008) directly test the optimal tariff theory in a cross-section of hundreds of imported products for a set of countries that faced no internationally-binding external constraints in setting trade policy. Their evidence supports the theory that governments set higher tariffs when export supply is more inelastic. In a different setting, Bagwell and Staiger (2011) find broad empirical support for terms-of-trade models of international agreements through a cross-sectional examination of negotiated tariff reductions for countries acceding to the WTO. Finally, Bown and Crowley (forthcoming) analyze a panel of time-varying US trade policy

decisions and find tariff increases are more likely in sectors with larger potential terms-of-trade gains, a theoretical prediction arising from dynamic models of self-enforcing trade agreements.

The current paper further informs our understanding of import tariffs by providing a detailed investigation into the macroeconomic determinants of time-varying trade policy. While there is an empirical presumption that import protection rises during recessions, with the exception of papers like Bagwell and Staiger (2003) and Crowley (2010) there is surprisingly little economic theory articulating the channels through which the countercyclical relationship between new import restrictions and macroeconomic shocks arise.<sup>2</sup> Thus, one purpose of this paper is to provide, in as much detail as possible, evidence on the explicit linkages between macroeconomic shocks and import protection.

Our paper is most closely related to the literature on the macroeconomic determinants of antidumping protection that includes Feinberg (1989), Knetter and Prusa (2003), and Crowley (2011).<sup>3</sup> Relative to that work, our approach makes a number of advances, extensions and refinements by taking advantage of newly available and detailed data at the product-level from the World Bank's *Temporary Trade Barriers Database* (Bown, 2011b). First, we examine not just antidumping policy, but we also consider use of other, relatively substitutable forms of import protection that have taken on particular importance in the first decade of the 2000s, such as global safeguards, China-specific safeguards, and countervailing duties. Second, we focus our analysis on precise, bilateral measures of

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<sup>2</sup> In their theoretical paper, Bagwell and Staiger (2003, pp. 1-2) best articulate the failure of “political” or “distributional” theories for trade policy to explain the countercyclical relationship between business cycles and import protection policies with

“...a common argument is that tariffs are higher in recessions, because the political pressure from import-competing firms is then most pronounced. This explanation, however, is incomplete, since it ignores the political influence of other production sectors that might press for *less* protection in recessions...In light of these competing political influences, the common argument for countercyclical tariffs fails to be convincing, as it does not explain why the political pressures from import-competing sectors dominate in recessions but not in booms.”

Bagwell and Staiger (2003) also contains extensive reference to a number of empirical papers from earlier periods documenting the countercyclical relationship between business cycles and import protection.

<sup>3</sup> Feinberg (1989) focused on the 1982-1987 period for the United States and found evidence that more antidumping cases were associated with dollar depreciations. Knetter and Prusa (2003) examine annual data for the US, Canada, Australia and the EU over 1980-1998 and find strong evidence of a relationship between antidumping cases and local currency appreciations over this longer time series of data. Crowley (2011) uses a cross-country, cross-industry panel from 1980-2001 and finds that the US imposed antidumping against foreign trading partners with weakness in manufacturing sectors.

import protection – i.e., between a policy-imposing economy and a particular trading partner. This bilateral emphasis is important given the discriminatory (i.e., trading partner-specific) nature of import protection.<sup>4</sup> Third, we construct our trade barrier measures at the quarterly frequency and use quarterly macroeconomic data. This allows us to better address the relationship between business cycles, exchange rates, and import restrictions and capture the precise timing of any trade policy changes taking place during the Great Recession.<sup>5</sup>

The rest of the paper proceeds as follows. Section 2 presents the predictions of the theoretical literature on temporary trade barrier policies such as antidumping, safeguards, and countervailing duties, the empirical model, and the panel dataset that is used to estimate the model. Section 3 presents our basic results regarding the relationship between trade restrictions and macroeconomic fluctuations based on historical data leading up to the Great Recession. Section 4 analyzes the import protection response after the onset of the worldwide financial crisis. Section 5 concludes.

## **2. Theory, Empirical Model and Data**

### **2.1. Theoretical models of temporary trade barriers and macroeconomic shocks**

A large theoretical literature examines the role of temporary trade barriers in international agreements such as the GATT and WTO. Nevertheless, despite substantial research documenting the countercyclical nature of business cycles and import protection dating back to at least the Great Depression (Irwin, 2011a,b), there is not one universal theory linking imposition of new import restrictions to macroeconomic shocks. Bagwell and Staiger (2003), Crowley (2010) and Knetter and Prusa (2003) are the theoretical contributions that inform our basic empirical approach.

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<sup>4</sup> Antidumping is explicitly a bilateral policy. Although it was often imposed simultaneously on multiple foreign trading partners in the 1980s and 1990s (see Hansen and Prusa, 1996), there is less evidence of this more recently (e.g., Bown, 2010).

<sup>5</sup> Other papers on trade policy during the Great Recession include Kee, Neagu and Nicita's (forthcoming) study of Overall Trade Restrictiveness Indices, Gawande, Hoekman and Cui's (2011) examination of applied MFN tariffs for emerging economies, Bown's (2011a) work on TTB measurement and trade policy churning, and economy-specific case studies by Prusa (2011), Vandenbussche and Viegelahn (2011), Ludema and Mayda (2011) and Kang and Park (2011).

Bagwell and Staiger (2003) model dynamic, self-enforcing trade agreements that are characterized by trade policy that fluctuates in response to macroeconomic conditions.<sup>6</sup> They relate business cycles to tariff increases in a model with serially correlated shocks to growth. In this rich model, two large symmetric countries play a trade policy game in which each period's one-shot game for every traded product is characterized by a terms-of-trade-driven prisoner's dilemma. An international business cycle is modeled as fluctuations in the rate of growth of new product entry, and the international economy moves between periods of high growth and low growth according to two Markov-switching processes. Because of the possibility of terms-of-trade gains, the static welfare gain of a tariff hike increases with trade volume, and this would otherwise result in tariff increases being pro-cyclical. However, in the presence of the kind of positive, serially correlated growth shocks that give rise to recessions, cooperation to maintain low tariffs is more difficult in periods in which the expected rate of future trade growth is low. Thus, unilateral tariff increases are less costly in welfare terms during recessions with persistently underperforming growth because it is precisely then that the cost of a trade war is relatively low. This basic intuition generates the key empirical prediction of the model: import restrictions increase during recessions.

We turn to two partial equilibrium models (Crowley, 2010 and Knetter and Prusa, 2003) for guidance regarding two macroeconomic variables that exhibit considerable bilateral variation – real foreign GDP growth and real bilateral exchange rates. Crowley (2010) builds from the seminal, reciprocal dumping model of Brander and Krugman (1983) to show that import restrictions increase in response to macroeconomic weakness abroad. This theory focuses on the international rules regarding antidumping, one of the policies of particular emphasis for our empirical analysis. In a model of imperfect competition in which domestic and foreign firms have capacity constraints, the foreign firm increases its exports to the domestic market at a “dumped” price when the foreign country's own demand for the product falls. In this environment, it is welfare-improving for the importing country to impose import restrictions against the foreign country that is trying to export its way out of a recession. The cross-sectional empirical prediction of this model is that an importer will

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<sup>6</sup> Bagwell and Staiger (2003) build from an earlier model (Bagwell and Staiger, 1990) of self-enforcing trade agreements that links changes in trade policy to *iid* trade volume shocks. Bown and Crowley (forthcoming) use a sample of annual US data from 1997-2006 to provide evidence from much more disaggregated, industry-level relationships in support of the Bagwell and Staiger (1990) theory.



impose trade restrictions against those trading partners that are experiencing negative demand shocks in their own markets.<sup>7</sup>

Finally, Knetter and Prusa (2003) develop a stylized model of pricing behavior in a market with imperfect competition. Their focus is on understanding how international rules regarding dumping, i.e. pricing below average cost, are impacted by exchange rate fluctuations. In their model of a foreign firm that prices to market, an appreciation of the domestic currency leads to a decline in the foreign firm's marginal cost in terms of the importing country's domestic currency. At the same time, pricing to market under imperfect competition implies a relatively smaller decline in the domestic currency price of the foreign good. Thus, the foreign firm will simultaneously increase its sales in the domestic market (increasing the likelihood of injury to the domestic import-competing industry) and be less likely to be guilty of dumping. Because an exchange rate movement has opposite effects on the two criteria for dumping, the model gives ambiguous empirical predictions regarding the relationship between an exchange rate appreciation and new antidumping import restrictions.<sup>8</sup>

In summary, the literature on macroeconomic fluctuations suggests that temporary trade barriers increase when domestic macroeconomic conditions are weak (Bagwell and Staiger, 2003) and foreign macroeconomic conditions are weak (Bagwell and Staiger, 2003; Crowley, 2010). An appreciation of the domestic currency relative to a trading partner's currency implies more import restrictions if a national authority's antidumping investigation places more weight on the criterion of injury to the domestic industry than it places on the criterion of dumping (Knetter and Prusa, 2003).

## **2.2 Empirical model**

This section presents an empirical model of the determinants of the number of imported products from a particular trading partner that a policy-imposing economy subjects to new temporary trade barrier investigations. The model relates the number of products under an antidumping, global safeguard, China safeguard, or countervailing duty investigation in a given quarter to the first lag

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<sup>7</sup> Crowley (2011) examines US antidumping data for industries over 1980-2001 and finds evidence in support of this theory at the relatively disaggregated level.

<sup>8</sup> While Knetter and Prusa (2003) acknowledge the ambiguous theoretical predictions of their model, they find strong empirical evidence at the annual frequency for 1980-1998 linking exchange rate appreciations to aggregated counts of antidumping filings for a sample that includes data from the US, EU, Australia and Canada.

(quarter  $t-1$ ) of the percent change in the bilateral real exchange rate, the change in the domestic unemployment rate, and foreign real GDP growth.

The dependent variable is the number of products that economy  $j$  (United States, European Union, South Korea, Australia, Canada) imported from trading partner  $i$  in quarter  $t$  that is subjected to a new TTB investigation. Empirically, the dependent variable is a non-negative count which exhibits over-dispersion in that the variance of the number of investigations per time period exceeds the mean (see Table 1).

We formally model temporary trade barrier formation as generated by a negative binomial distribution (Hausman, Hall and Griliches, 1984). In this model, the number of imported products under TTB investigations,  $y_{ijt}$ , follows a Poisson process after conditioning on the explanatory variables,  $x_{ijt}$ , and unobserved heterogeneity,  $u_{ijt} > 0$ . Specifically,

$$y_{ijt} | x_{ijt}, u_{ijt} \sim \text{Poisson}(u_{ijt} m(x_{ijt}, \beta)) \text{ , where } u_{ijt} \sim \text{gamma}(1, \alpha) \text{ .}$$

Thus, the distribution of counts of products subject to temporary trade barriers,  $y_{ijt}$ , given  $x_{ijt}$  follows a negative binomial with conditional mean and variance

$$E(y_{ijt} | x_{ijt}) = m(x_{ijt}, \beta) = \exp(x_{ijt} \beta) \text{ and } \text{Var}(y_{ijt} | x_{ijt}) = \exp(x_{ijt} \beta) + (\alpha \exp(x_{ijt} \beta))^2 \text{ .}$$

We estimate the model using maximum likelihood with pair-wise fixed effects for importing country-foreign trading partner combinations. The model is identified off both inter-temporal and cross-sectional variation in domestic unemployment rates, bilateral real exchange rates, and foreign trading partner GDP growth rates.

### 2.3 Data and variable construction

There are a number of innovations in our data and modeling approach relative to the previous literature (e.g., see Knetter and Prusa, 2003).

Our first innovation concerns how to measure time-varying import protection. We construct quarterly series of bilateral trade policy actions at the universally-defined, 6-digit Harmonized System

(HS-06) product level from 1988:Q1-2010:Q4.<sup>9</sup> Specifically, our dependent variable is the count of HS-06 imported products on which the government of economy  $j$  conducts a *new* temporary trade barrier investigation against trading partner  $i$  in quarter  $t$  and against which there is not already an existing TTB in place.<sup>10</sup> Inclusion of all forms of temporary import restrictions is important because more recent episodes of import protection – including the 2001-3 global safeguard on steel products imposed by the US, EU, and a number of other countries, and the 2009 China-specific safeguard the US imposed on imports of tires – took place under these alternative temporary trade barrier policies and would not be captured by an analysis restricted to antidumping.<sup>11</sup> In robustness checks, we also construct the count of products investigated under antidumping policy alone and we re-estimate the model using this dependent variable to illustrate the implications.

A second innovation in our approach is to examine data at the quarterly frequency; this is potentially important because macroeconomic shocks may cross calendar years. The key macroeconomic determinants of import protection in our model are bilateral real exchange rates, domestic unemployment rates, and the foreign trading partner's real GDP growth, with each of the variables reflecting year-over-year changes at the quarterly frequency.<sup>12</sup> We define the exchange rate

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<sup>9</sup> These series derive from data in the World Bank's *Temporary Trade Barriers Database* (Bown, 2011b). Because the Harmonized System has been in place and utilized across countries only since 1988, the time series dimension of our data begins in 1988:Q1.

<sup>10</sup> We focus on products subject to new investigations, given research from Staiger and Wolak (1994) which has shown that even an investigation can have trade-destroying effects. Nevertheless, in unreported results available from the authors, we confirm that the evidence below extends to a redefinition of the dependent variable to counts of products under investigations that only conclude with formal trade barriers being imposed.

<sup>11</sup> This measure is carefully constructed for each policy-imposing economy by trading partner and by quarter in a conservative way that does not allow for redundancy. At any point in time in the sample period under the Harmonized System, there are roughly 5000 HS-06 imported products that could be imported from any particular trading partner. In terms of policy, governments impose these import restrictions at the 8- or 10-digit product level; unfortunately the HS-06 level is the most finely disaggregated level of data that is comparable across countries. First, so as to avoid double counting in cases in which new import protection at the 8-digit level falls into the same HS-06 category as a previously imposed barrier, we do not include such products. Second, for our baseline import protection measure that expansively covers all four TTB policies, we also do not include products that were subject to a simultaneous or previously imposed barrier under a different policy. This phenomenon is particularly relevant for countervailing duties as most have been imposed simultaneously with antidumping duties on the same products against the same trading partners. For a discussion, see Bown (2011a).

<sup>12</sup> We are forced to use year-over-year changes in these variables as opposed to quarter-to-quarter changes due to how quarterly real GDP for China, one of the key trading partners in the analysis, is defined and available in the underlying data. Thus each of the key macroeconomic determinants is defined as a year-over-year change; i.e., quarter 1 of year  $t$  over quarter 1 of year  $t-1$ , quarter 2 of year  $t$  over quarter 2 of year  $t-1$ , etc.

variable as the percent change in the real bilateral exchange rate between the foreign and local currency, so that an increase indicates an *appreciation* of the local (policy-imposing economy's) currency.<sup>13</sup> The domestic unemployment variable is defined as the level change in the domestic unemployment rate. Our focus on unemployment follows Irwin (2005); in robustness checks we use domestic real GDP growth in lieu of unemployment and find that temporary trade barriers are typically more responsive to domestic unemployment changes than to real GDP growth.

The third innovation that we stress in our panel data approach is to focus on bilateral relationships between policy-imposing economies  $j$  and their key trading partners  $i$ .<sup>14</sup> This is potentially important for two reasons. First, industrialized economies frequently impose import restrictions through temporary trade barriers bilaterally.<sup>15</sup> Furthermore, we wish to examine whether import protection is applied against trading partners that are experiencing negative economic shocks at home. Thus a modeling approach that considered only the use of import protection aggregated over trading partners may not accurately capture the importance of bilateral shocks.

Table 1 presents summary statistics for the quarterly data used in the empirical analysis. The Appendix provides more information on the underlying sources of the data.

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<sup>13</sup> To coincide with the introduction of the euro in 1999, the estimates for the EU are based on a panel of data beginning only in 1999:Q1. Furthermore, there are a number of other issues associated with variable construction for the EU over this time period that merit discussion. The EU underwent a sizeable membership expansion during the period 1999-2010 – from 15 countries at the beginning of the period to 27 by the end of the sample. Once a country becomes a member of the EU it can no longer be targeted by EU antidumping, safeguard, or countervailing duty policies – as such, 12 countries that were significant EU trading partners (and hence potential antidumping targets) in 1999 cannot be included in the sample because they were part of the EU by 2007. Furthermore, the expanding membership means the definition of the economies comprising domestic employment and being subject to a common EU exchange rate are changing over time, which creates potential additional issues of measurement error.

<sup>14</sup> The Appendix provides a list of the fifteen trading partners included for each of the five policy-imposing economies' bilateral relationships. These trading partners cumulatively account for the source of 75 percent (EU) to 94 percent (Canada) of each policy-imposing economy's non-oil imports during the sample periods. We condition on trading partners targeted by TTBs because non-targeted trading partners would be dropped from the estimation given the nature of the included country fixed effects.

<sup>15</sup> Even in the case of the application of global safeguards – which are supposed to be applied on a nondiscriminatory basis against all import sources of a product – economies typically apply them in a discriminatory fashion to exclude PTA partners or some developing countries. For a discussion, see Bown and McCulloch (2003). The construction of the policy variables in our bilateral panel data set only counts global safeguards against trading partners that were included in the policy.

### 3 Baseline Estimates from the Pre-Crisis Period

Table 2 presents our first set of results for the “pre-crisis” period 1988:Q1 - 2008:Q3. We utilize a panel data set comprised of five economies  $j$  – the United States, the European Union, South Korea, Australia and Canada – and fifteen of each economy’s top trading partners  $i$ . The dependent variable is defined as the count of HS-06 imported products against which the government of economy  $j$  has newly initiated a temporary trade barrier investigation against trading partner  $i$  in quarter  $t$ .

As is common practice for negative binomial regression models, the tables report estimates for incidence rate ratios (IRRs) for the explanatory variables. That is, we report the ratio of counts predicted by the model when the first lag of an explanatory variable of interest is one unit above its mean value (and all other variables are at their means) to the counts predicted when all variables are at their means. An estimated IRR with a value that is statistically greater than 1 is evidence of a positive effect of the determinant of interest; i.e., the explanatory variable is associated with an increase in the number of imported products from trading partner  $i$  in quarter  $t$  that economy  $j$  subjects to a new TTB investigation. Conversely, an estimated IRR that is statistically less than 1 is evidence that an increase in the explanatory variable is associated with a reduction in the count of imported products subject to new import protection. The table also reports  $t$ -statistics (in parentheses) for whether the estimated IRR is statistically different from 1.

The three macroeconomic determinants of interest are the percent change in the bilateral real exchange rate, the change in the domestic unemployment rate, and the foreign trading partner’s real GDP growth. The baseline model also includes a time trend as well as importer and exporter combined (pair-wise) fixed effects to control for time-invariant, bilateral relationship-specific heterogeneity in policy treatment. For example, China’s designation as a non-market economy under antidumping provisions could affect the way that the United States treats China’s exporters relative to another economy’s exporters or relative to how Australia treats China’s exporters.

#### 3.1 Pre-crisis estimates for the full sample of policy-imposing economies

The baseline results in column (1) of Table 2 indicate a countercyclical trade policy response over 1988:Q1-2008:Q3. Increases in the domestic unemployment rate and declines in foreign GDP growth are associated with more trade barriers and the IRR estimates are statistically significant at the 1 percent level.

The IRR of 1.62 on the change in domestic unemployment rate in the second row of column (1) is greater than 1 and indicates that import protection increases when the domestic economy is weakening through rising unemployment. The IRR of 0.88 on foreign real GDP growth is evidence that additional import protection is used against trading partners that are going through their own periods of weak economic growth. Furthermore, an estimated IRR of 1.02 indicates that a real appreciation of the domestic currency is associated with increased import protection through TTBs. This evidence is consistent with related results from a 1980-1998 sample of data on antidumping policy use reported by Knetter and Prusa (2003). Finally, the time trend estimate of 0.99 indicates that, on average, import protection through these policies has been declining over the sample period.

Specification (2) provides our first sensitivity analysis by replacing the variable capturing the domestic macroeconomic shock – the change in the domestic unemployment rate – with a variable defined as the growth rate of domestic real GDP in  $t-1$ . Theory predicts an IRR that is less than 1; i.e., weak domestic growth is associated with a higher incidence of TTBs. The estimated IRR is 0.93 and statistically significant. The IRR estimates for the other determinants of interest are qualitatively unaffected by this alternative indicator of the health of the domestic macroeconomy.

Before proceeding with additional robustness checks, consider next the economic magnitude of the estimated IRRs; Figure 2 provides a graphical interpretation. We present the percent increase in the count of imported products per trading partner per quarter subject to new TTBs that are associated with a one standard deviation change in each macroeconomic determinant. Specifically, we compute the median of the model's predicted estimates of import protection evaluated using the sample data; and we then introduce (one at a time) a one standard deviation shock to each of the macroeconomic determinants of interest, holding everything else constant, and regenerate the model's predictions of import protection.

The grey bars of Figure 2 present estimates based on specification (1) of Table 2, whereas the black bars illustrate impacts based on specification (2). First note from Table 1 that a one standard deviation increase in the percent change of the bilateral real exchange rate is roughly a 15 percent appreciation. Figure 2 indicates this 15 percent appreciation is associated with a 33 (34) percent increase in imported products subject to TTB protection per trading partner per quarter according to specification (1) (alternatively, specification (2)). Next, the figure illustrates a sizeable estimated impact of domestic macroeconomic shocks. A one standard deviation increase to the change in the domestic unemployment rate – i.e., 0.86 or nearly one full percentage point (see again Table 1) - is associated with, per trading partner, a 52 percent increase in import protection. In specification (2),

when we use a one standard deviation decline in domestic real GDP growth – i.e., 2.3 percentage points – there is a significant, albeit smaller, 18 percent increase in import protection.<sup>16</sup> Finally, Figure 2 illustrates the importance of economic growth in foreign trading partner  $i$ . A one standard deviation reduction to a trading partner’s real GDP growth – i.e., 3.5 percentage points - is associated with a 60 percent increase in import protection against that partner based on specification (1) and a 70 percent increase based on specification (2).

The remaining columns of Table 2 examine the robustness of our results to alternative specifications of the underlying model.

Column (3) of Table 2 reports a specification with alternative fixed effects. Instead of importer  $j$  and exporter  $i$  pair-wise fixed effects, we introduce *separate* importer  $j$  and exporter  $i$  fixed effects. The qualitative pattern to the results is unchanged; the only distinction is a reduction to the estimated size differential (away from 1) of the IRRs on foreign real GDP growth and the statistical significance of the IRRs for foreign real GDP growth and the time trend being reduced to the ten percent level.

In column (4), we modify the baseline model by substituting the second lag of each of the macroeconomic variables for the first lag. The qualitative pattern to the results is unchanged; however, estimated magnitudes of the impact of the domestic unemployment rate change and the foreign trading partner’s real GDP growth are slightly smaller. We return to this issue of the timing of shocks in more detail in our economy-specific estimates discussed below.

Next we redefine the dependent variable in column (5) so that it includes only antidumping (AD) import protection. The estimated IRR on the impact of an appreciating domestic currency is no longer statistically different from 1. Furthermore, while the qualitative nature of the IRRs is similar to column (1), there is again a slight reduction to the size differential (away from 1) of the estimated IRRs for the domestic unemployment rate change and the foreign trading partner’s real GDP growth. This result stands in contrast to research covering earlier periods of data whereby an exclusive focus on TTBs through AD policy alone may have been sufficient to capture the relationship between macroeconomic shocks and import protection (e.g., Knetter and Prusa, 2003). One important implication of our results is that a sole focus on antidumping underestimates the relationship between macroeconomic shocks and time-varying import protection for these economies.

In specification (6), we introduce a new covariate to the baseline model – the *interaction* of the domestic unemployment rate change  $jt-1$  with real GDP growth of trading partner  $it-1$ . We

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<sup>16</sup> This is consistent with earlier results for the United States alone based on annual data (e.g., Irwin, 2005).

include this interaction term in addition to each variable entering independently. The interaction term examines the possibility that economy  $j$  may be less likely to impose new import protection against trading partner  $i$  – despite  $j$ 's own domestic economic contraction – if there is a simultaneous negative economic shock abroad. If this were the case, since a negative shock to the domestic economy is captured as an increase in the domestic unemployment rate, we would expect an estimated IRR that is less than 1 for the interaction term and a potentially insignificant IRR estimate for the domestic unemployment change variable. However, we find no evidence of these relationships for this time period and this sample of policy-imposing economies.<sup>17</sup>

Finally, in specifications (7) and (8), we address the issue that the five economies might face different choice sets of import restrictions. First, the extent to which WTO commitments restrict an economy's freedom to raise its applied most-favored-nation (MFN) tariff rates might vary across economies.<sup>18</sup> In specification (7), we control for this by introducing a new variable defined as the annual change in the share of economy  $j$ 's HS-06 products subject to strict WTO discipline, i.e., the share of products for which its applied MFN tariff is equal to (or above) its WTO legal maximum tariff binding.<sup>19</sup> We expect the IRR on this variable to be larger than 1 so that as more imported products

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<sup>17</sup> During the revision process, we became aware of a paper by Davis and Pelc (2012) that examines related questions on product-level data at the annual frequency for a heterogeneous sample of industrialized and developing economies for 1997-2009. Over this sample period, the authors present evidence consistent with the idea that countries may be less likely to impose protection against partners undergoing a *simultaneous* contraction. While we present evidence of a similar result for the period covering the Great Recession in section 4.2 below, here we examine whether such a relationship existed in the pre-Great Recession period. As column (6) indicates, we fail to find evidence of this relationship in data from *prior to* the Great Recession; i.e., countries were no more or less likely to impose new bilateral import restrictions during a domestic downturn if that was synchronized with the trading partner's downturn.

<sup>18</sup> We anticipate that this issue does not matter much across these particular industrialized economies as they each have applied MFN tariff rates relatively close to their WTO tariff bindings. By design, this institutional similarity influenced the focus of this paper to these five policy-imposing economies. Put differently, one contributing explanation as to why we deliberately chose not to include a number of emerging economies in the empirical analysis is because there is substantial variation across those countries, products, and time as to the extent to which WTO commitments discipline their trade policies. We speculate that a much more serious treatment of the choice set of available trade policy instruments is required to analyze the impact of macroeconomic shocks on the import protection for such policy-imposing countries; thus we leave it to future research.

<sup>19</sup> The variable is constructed from HS-06 data on WTO maximum tariff bindings and applied MFN tariffs deriving from WITS; the data are available from only 1995-2010. Note that we define this variable as equal to *or above* (as opposed to simply equal to) because the early WTO period involved many of these economies phasing in reductions to their applied tariffs to levels that were only eventually at or below their bindings. We have also considered other modifications to the definition of this variable – e.g., defining it more flexibly as a product's applied tariff being within a 1, 5 or 10 percentage point cutoff of the binding – and we obtain similar results. One key drawback to this variable worth noting is that data availability is limited to the *annual* frequency. This



fall under WTO discipline, the restricted policy choice set induces more substitution of import protection toward TTB policies. The estimated IRR of 1.04 on this variable in specification (7) is larger than 1 as expected, though it is not statistically significant. Second, we also introduce a TTB “stock” variable defined as the count of HS-06 products over which the policy-imposing economy  $j$  already had a TTB in effect against trading partner  $i$  in  $t-1$ . We expect an IRR that is less than 1 for this variable; i.e., the more imported products already subject to a TTB, the less scope for the economy to impose new TTBs. The estimated IRR is 0.99 and statistically significant.<sup>20</sup>

The downside to including these two variables is that it restricts our sample to the post-1995 period, further limiting the business cycle variation in the data.<sup>21</sup> Therefore, to understand how our results are affected by omitting these controls for the available policy choice set, specification (8) re-estimates the baseline model on the smaller sample of data used in specification (7). A comparison of specification (7) to (8) reveals very little change to the IRRs for the key macroeconomic determinants. We conclude that omitting controls for the trade policy choice set does not appear to affect the results for these policy-imposing economies over this time period.

To summarize Table 2, we present evidence from 1988:Q1-2008:Q3 that macroeconomic shocks impact import protection through temporary trade barriers.<sup>22</sup> First, there is strong evidence of a countercyclical relationship between negative shocks to domestic employment (and to a lesser extent, domestic real GDP growth) and new import protection. Second, our comprehensive temporary

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lack of inter-temporal variation, relative to all of the other variables included in the estimation which are defined at the *quarterly* frequency, in addition to the lack of trading-partner variation, is likely a contributing explanation to the statistically insignificant IRR estimate described in the text.

<sup>20</sup> In unreported results available from the authors, we have also estimated versions of the model in which we introduce each of these two variables separately, and the broad pattern of results does not change.

<sup>21</sup> First, the required data on WTO tariff bindings is only relevant and available for the post-1995 period. Second, the TTB stock variable is only constructed for TTBs imposed since the HS system has been in effect beginning in 1988. The implication is that earlier in our sample, the stock measure based on available HS data would severely underestimate the actual TTBs in effect as it is not able to consider all of the TTBs imposed prior to 1988 that were still effect in the early 1990s. This is important for the historical users of TTBs such as Australia, Canada, European Union, and the United States. Thus the TTB stock measure constructed from HS-06 data becomes more accurate over our sample period as (unaccounted for) TTBs that governments imposed prior to 1988 are increasingly removed.

<sup>22</sup> A related research question is whether government decisions on TTB *removals* are symmetrically affected by macroeconomic conditions. For example, when a government examines its previously-imposed antidumping import restrictions under the WTO’s guidelines for Sunset Reviews, is it less likely to remove such a measure if the domestic economy is undergoing a period of weak growth or a high rate of unemployment? This is an important and unaddressed question that we leave for future research, as it is beyond the scope of the current analysis for data limitation reasons.

trade barrier (TTB) measure exhibits greater measured co-movement with macroeconomic variables than the antidumping measure used in the prior literature. Estimates on antidumping alone fail to capture the true impact of these shocks on import protection, especially with respect to movements in bilateral real exchange rates. The third point worth highlighting is that the estimated IRR for foreign real GDP growth is less than 1 in all specifications of Table 2. This is evidence that, on average, these economies tended to impose new import protection on trading partners that were themselves undergoing a period of weak economic growth or an economic contraction. This result is particularly important for understanding the *differential* government policy responses during the Great Recession, as we discuss in section 4.

### 3.2 Pre-crisis estimates for subsamples of the US, EU and smaller economies

Table 3 presents estimation results from the 1988:Q1-2008:Q3 period restricted to subsamples of data based on policy-imposing economies. We consider three subsamples in particular: estimates for the United States, European Union, and a combined sample of data jointly covering Australia, Canada, and South Korea. For each subsample of data, we present results from three different specifications. Columns (1), (4) and (7) of Table 3 present the same baseline model specification as Table 2, specification (1). We then consider robustness checks in columns (2), (5) and (8) in which we substitute the explanatory variables at the second lag ( $t-2$ ) for the first lag. Finally, in columns (3), (6) and (9), we consider the impact of these determinants on the antidumping policy alone, as opposed to the more comprehensive dependent variable that covers all TTBs.

The results for the United States in Table 3 are consistent with the overall results reported in Table 2. Import protection through TTBs is associated with a real appreciation of the US dollar, an increase in the US unemployment rate, and a decline in trading partner real GDP growth. Furthermore, while importer  $j$  and exporter  $i$  combined fixed effects were also included as part of the model estimates in Table 2, we did not report them to conserve space. We report one fixed effect estimate in Table 3 in order to highlight the policy-imposing economy's relationship with China. In specification (1), the IRR of 22.66 is evidence that China was substantially more likely than the omitted trading partner (in this case, Australia) to face US import protection.<sup>23</sup> As has been well

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<sup>23</sup> The IRRs for the other trading partners are not reported in the table but are available from the authors upon request. In terms of scale, the estimated IRR for China in the US models, for example, is typically twice as large as that for the second-highest trading partner.

documented (e.g., Bown, 2010), this China phenomenon is pervasive across policy-imposing economies. Next, in specification (2), when we substitute the macroeconomic determinants at the second lag (quarter  $t-2$ ) for the first lag, there is a reduction to the estimated size differential (away from 1) of the IRRs on the US unemployment rate change and the foreign trading partner's real GDP growth compared to the baseline. Finally, specification (3) confirms for the US a finding in the full sample of data (Table 2 column 5). Limiting the dependent variable to antidumping yields an insignificant estimate of the relationship between real bilateral US dollar fluctuations and new import protection.

Consider next the Table 3 results for the European Union, which we have noted are estimated on a shorter time series of data (1999:Q1-2008:Q3) to coincide with the introduction of the euro in 1999. Estimates of the baseline EU model in column (4) are also in line with the theory. When we substitute the second lag for the first lag of the macroeconomic determinants in specification (5), the estimated IRR for the change in EU unemployment rate drops considerably, and it is no longer statistically significant. There is no qualitative change to the other key determinants. Finally, when the dependent variable is defined as antidumping *alone* in specification (6), there is no statistically significant evidence of a relationship between macroeconomic shocks and import protection. This specification notably omits an extensive set of import restrictions on steel products through the EU's global safeguards policy in 2002.

Figure 3 provides information on the magnitudes of the estimated IRRs for the US and EU samples of data. The US panel is based on specifications (1) and (2), and the EU panel is based on specifications (4) and (5). The figure follows the approach of Figure 2 by presenting the percent increase in the count of imported products per trading partner per quarter subject to new TTBs that are associated with a one standard deviation change in each macroeconomic determinant. For the United States, a one standard deviation appreciation of the dollar is 16 percent (see Table 1) and is associated with a 21 (99) percent increase in imported products being subject to TTBs per trading partner per quarter, relative to the model's estimates in specification (1) (specification (2), respectively) at the means of the data. For the EU, a one standard deviation appreciation of the euro is 13 percent and it leads to 49 (85) percent more protection according to specification (4) (specification (5), respectively). A one standard deviation increase in the domestic unemployment rate leads to 41 (65) percent more protection for the United States, and 26 (221) percent more protection for the EU. Finally, a one standard deviation decline in trading partner real GDP growth is

associated with 25 (70) percent more US import protection and 43 (95) percent more EU import protection.

Returning to Table 3, the remaining columns apply the modeling approach and robustness checks to the subsample of the relatively smaller economies of Australia, Canada, and South Korea. On average for these three countries, the estimated IRRs are in line with the theory; however, the IRRs are not consistently statistically significant across different specifications. Thus the estimated trade policy response through these TTBs to macroeconomic shocks appears to be somewhat weaker for smaller industrialized countries than for the United States and European Union.<sup>24</sup> One likely contributing explanation is that these economies are less frequent users of TTBs, on average, than the US and EU (see again Table 1).<sup>25</sup>

## **4 Import Protection during the Great Recession**

### **4.1 Protectionist expectations**

During the early period of the Great Recession, a widespread fear of “protectionism” among policymakers led to the coordinated, G20 declaration of November 2008 cited above. Furthermore, policymakers asked major multilateral institutions to establish new trade policy surveillance initiatives in order to monitor and report on national changes in policies that could impact international trade.<sup>26</sup>

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<sup>24</sup> An interesting empirical question is whether the South Korean experience during the Asian Financial crisis of 1997-1998 foreshadowed what would happen in the US and EU during the Great Recession. Like the US and EU during 2008-2010 that we detail below, South Korea did not turn to heavy TTB use during 1997-1998. However, in other regards the two crises appear more different than similar. While South Korea did experience a sharp increase in its unemployment rate, the behavior of its real exchange rate and of the GDP growth of foreign trading partners was markedly different from the analogous variables facing the US and EU during the Great Recession. In contrast to the real US dollar, which appreciated sharply at the start of the more recent global financial crisis, the real Korean won depreciated sharply in 1997. Further, the Asian Financial Crisis did not lead to a slowdown in GDP growth around the world. Thus, the applicability of the South Korean experience to later financial crises in industrialized economies is limited.

<sup>25</sup> In unreported results, we have also investigated whether including the WTO disciplines variable – introduced in section 3.1 and included in Table 2, specification (7) – improves upon the estimates for this subsample of countries. It does not, which suggests that the main impact captured by the WTO disciplines variable in Table 2, specification (7) is due to variation across the five policy-imposing economies – e.g., the US and EU have relatively more products bound by WTO disciplines than do Australia, Canada and South Korea – and not from inter-temporal variation within one of these policy-imposing economies.

<sup>26</sup> Bown (2011c) provides a discussion of the World Bank’s initiatives, as well as efforts by the World Trade Organization Secretariat and the establishment of the high-profile Global Trade Alert.

Figure 4 provides one explanation for the increased concern over “protectionism” and the associated response. The left panels of Figure 4 take the US and EU model estimates from Table 3 – i.e., based on pre-crisis data – and generate the *predicted* import protection response over 2008:Q4-2010:Q4 given the realized macroeconomic data from this period. The historical models for the US and EU predict a sharp increase in import protection beginning in 2009:Q2 and lasting through 2010:Q1, peaking in 2009:Q3. To provide some context, the median number of products subject to new US TTBs against these 15 trading partners per quarter between 1988:Q1 and 2008:Q3 was 12. The model’s US prediction for 2008:Q4-2010:Q4 peaks at *647 products* being subject to new TTBs in 2009:Q3. The median number of products subject to new EU TTBs against these 15 trading partners per quarter between 1999:Q1 and 2008:Q3 was 9. The model’s EU prediction for new TTBs peaks at *264 products* in 2009:Q3.

To provide additional context, our back-of-the-envelope calculations suggest the historical models forecast an upper bound of roughly 15 percent of US and EU nonoil imports becoming subject to *new* import protection during the Great Recession. In particular, the US model predicted that cumulatively 1558 new imported product – trading partner combinations would become subject to new TTB investigations during the period of 2008:Q4 through 2010:Q4. If we multiply the value of imports for a relevant target in 2007 by the predicted number of TTBs, we arrive at an upper estimate that 15.4 percent of US non-oil imports could expect to face new US TTBs.<sup>27</sup> Similarly for the EU, the cumulative effect of its predicted 623 imported product – trading partner TTBs (see again Figure 4) translate into 14.0 percent of EU non-oil imports.<sup>28</sup> Estimates from Bown (2011a) put the trade-weighted share of US and EU imports subject to the existing stock of TTBs at only 2-3 percent immediately preceding the crisis in 2007. The implication is that TTB coverage of imports was predicted to increase 5-7 times above pre-crisis levels.

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<sup>27</sup> To clarify the thought experiment, the import data used to construct these shares are all taken from 2007, to remove any potential contamination associated with the 2008-9 trade collapse. Nevertheless, the products in focus would not become subject to TTB policies until 2008:Q4-2010:Q4. The mean value of annual imports in 2007 for one of the 94 product – trading partner combinations that were actually confronted with new US TTBs between 2008:Q4 and 2010:Q4 was \$133.4 million. The estimate of 15.4 percent is derived by taking this \$133.4 million, multiplying it by 1558 product – trading partner combinations, and dividing by \$1.34 trillion – i.e., the total US non-oil imports from these 15 trading partners in 2007. The estimate is an upper limit given that product – trading partner combinations affected by US TTBs in the data (\$133.4 million) are much higher than the mean product – trading partner combination in the entire sample (\$30.2 million) which includes non-TTB affected products.

<sup>28</sup> Even though the EU had a much lower predicted count of TTBs (623 versus 1558), the mean value of EU annual imports in 2007 for the 84 relevant product – trading partner combinations was \$247.3 million. Finally, EU non-oil imports from its sample of 15 trading partners in 2007 were \$1.1 trillion.

The reasons for the predicted run-up in new import protection illustrated in Figure 4 are clear given the results of Table 3 for the US and EU and the magnitude of the worldwide recession – i.e., new import protection was historically associated with rising domestic unemployment and economic contraction abroad. The unemployment rate rose significantly in both economies. The simultaneity of the recession *across the world* implied that virtually every US and EU trading partner was also undergoing a sharp decline in real GDP growth during this period. These factors combined to create a perfect storm of conditions for a large increase in new import protection, given the way policymakers in the US and EU had historically responded, as documented in Table 3.

Nevertheless, as the solid line of the right panel of Figure 4 illustrates, the realization of new import protection for the US and EU was different from the model predictions. While the timing of the predicted US peak in 2009:Q3 corresponds with the realized peak of TTBs, the *magnitude* of the realized increase was much smaller. Cumulatively across the 15 trading partners under study, the US responded with 16 times fewer TTBs than the pre-crisis model estimates predicted. Similarly, the EU responded with nearly 8 times fewer new TTBs than the model predicted. US TTBs affected 0.9 percent of nonoil imports, far less than the forecasted upper limit of 15.4 percent. EU TTBs affected 1.9 percent of nonoil imports, also far less than its forecasted upper limit of 14.0 percent. Furthermore, for the EU, the difference between the left panel and the solid line of the right panel also illustrates that the *timing* of new import protection was delayed by three quarters (from 2009:Q3 to 2010:Q2) relative to the pre-crisis model's predictions.

#### **4.2 Why did so little import protection arise?**

Given the severity of macroeconomic shocks that took place during the Great Recession, a fundamental question is what explains the import protection that did and did not arise? To address this question systematically, we re-estimate our preferred specifications from Tables 2 and 3 on a time series of data that extends through the crisis period of 2010:Q4. We introduce pre-crisis (1988:Q1-2008:Q3) and crisis (2008:Q4-2010:Q4) dummy variables to interact with the three key macroeconomic determinants so that we can test for whether import protection responded to macroeconomic shocks *differentially* across the two sub-periods.<sup>29</sup> We consider three different samples of data; the full sample of all five policy-imposing economies, and then two subsamples in

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<sup>29</sup> The qualitative pattern to our results does not change if we move the definition of the beginning of the crisis period by 1 or 2 quarters.

which the United States or the European Union is the policy-imposing economy. Table 1 again provides summary statistics that highlight the differences in means and standard deviations of the underlying data series across the two sub-periods.

Table 4 presents our results under this approach. First consider the estimates on the full sample of data. For the 1988:Q1-2008:Q3 period, the estimated IRRs for each of the three macroeconomic determinants are close to the size of the corresponding estimates in Table 2 that we discussed in Section 3.1.<sup>30</sup>

How did the trade policy responsiveness to macroeconomic fluctuations *change* during 2008:Q4-2010:Q4? According to the baseline specification (1), in which the macroeconomic determinants are each defined at one lag ( $t-1$ ), the Chi-squared test statistics with one degree of freedom (reported in square brackets) indicate that there is a statistically significant change in each of the estimated IRRs between the pre-crisis and post-2008:Q3 period. The IRR estimate of 1.00 on the bilateral real exchange rate is statistically different from the pre-crisis IRR estimate of 1.02, the IRR estimate of 1.06 on the domestic unemployment change is statistically different from the pre-crisis IRR estimate of 1.63, and the IRR estimate of 1.03 on foreign GDP growth is statistically different from the pre-crisis IRR estimate of 0.88. However, not all of these changes are robust to slight modifications to the baseline model. In specification (2), for example, if we redefine the determinants to each be at the second lag ( $t-2$ ) instead of the first lag, then the statistically significant differential for the domestic unemployment rate change is eliminated. Specification (3) introduces one additional explanatory variable, defined as the growth rate in bilateral imports.<sup>31</sup> This variable is included to address the concern that import protection through TTBs is typically associated with substantial import growth; thus the muted import protection response during 2008:Q4-2010:Q4 could be due to the global collapse in trade flows that took place in 2008-9 (Baldwin and Evenett, 2009).<sup>32</sup> The estimated IRR on this variable for the pre-crisis period is not statistically different from 1; more

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<sup>30</sup> The estimates for the 1988:Q1-2008:Q3 period in Table 4 are not identical to the corresponding Table 2 or Table 3 estimates because the empirical models embed an assumption that the importer  $i$  and exporter  $j$  combined fixed effects are the same across both the 1988:Q1-2008:Q3 and 2008:Q4-2010:Q4 sub-periods.

<sup>31</sup> Due to a lack of quarterly data on trading-partner specific import price indices, these data are in nominal terms. However, because this variable is also constructed from year-over-year data, we are not concerned with potential seasonality issues.

<sup>32</sup> In principle, a necessary legal condition under WTO rules for applying each of the TTB policies is that the domestic industry should be injured *because of* imports – whether they be dumped (antidumping), subsidized (countervailing duties) or surging (safeguards). In theory, evidence that imports had recently been in decline could make it more difficult for government authorities to impose TTBs.

importantly, controlling for imports does not affect either the qualitative nor quantitative nature of our results for the pre-crisis estimates of the other macroeconomic determinants of interest. However, inclusion of this variable in specification (3) does eliminate the statistically significant *differential* (across sub-periods) for the variable defined as the percent change in the bilateral real exchange rate. On balance, the model estimates are not sufficiently robust across specifications to allow us to conclude that there was a change in the relationship between trade policy and the exchange rate or between trade policy and domestic unemployment during the Great Recession.<sup>33</sup>

Nevertheless, the one variable for which there is an important estimated change is foreign real GDP growth. For example, the pre-crisis IRR estimate of 0.88 in specification (1) indicates that policy-imposing economies had used import protection against trading partners with weak economic growth. In contrast, the estimated IRR on foreign real GDP growth is 1.03 during 2008:Q4-2010:Q4. While this second IRR was not statistically greater than 1, the pre-crisis and crisis IRRs are statistically different *from one another*, thus signaling a change in behavior. Therefore, these economies switched toward implementation of new TTB import protection against those trading partners that were experiencing relatively stronger economic growth during the Great Recession. This is a particularly important contributor to the low levels of import protection that arose during this period.

Columns (4) through (7) confirm this result for the United States and the European Union. In fact, the only statistically significant estimated IRR change that is robust across these two sub-periods for both the United States in specifications (4) and (5) and the European Union in specifications (6) and (7) is the differential on foreign real GDP growth. As in the full sample of data, there is evidence that the US and EU switched away from imposing import protection on trading partners that were experiencing macroeconomic weakness, as had been the historical pattern, and toward those that were growing. With so many US and EU trading partners undergoing economic contraction during 2008:Q4-2010:Q4, the implication of this effect was to reduce new US and EU import protection overall relative to pre-crisis predictions.

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<sup>33</sup> During the revision process, we became aware of a paper by Rose (2012) that challenges the idea that import protection is countercyclical. Rose analyzes a number of trade policy indicators at the annual frequency – including a coarse measure of antidumping cases rather than a count of affected HS-06 products – for thirty economies through 2009. In results available upon request, we estimate our baseline model on annual data and find that trade policy is countercyclical prior to the Great Recession (over 1988-2007) regardless of whether trade policy is measured as products subject to all TTBs or antidumping alone and for domestic business cycle measures including both lagged changes in unemployment (our preferred measure) and real GDP growth (Rose’s measure). In our model, when using the change in the unemployment rate at the annual frequency for data extended through 2009, the point estimate for the IRR continues to show evidence of a countercyclical



Consider next the two other macroeconomic determinants of interest for each of the subsamples of data in Table 4. For the United States, the estimated IRRs for these two determinants did not change during the crisis in statistically meaningful ways away from the 1988:Q1-2008:Q3 estimates. For example, in specification (4), the IRR estimate of 1.06 on the bilateral real exchange rate is not statistically different from the pre-crisis IRR estimate of 1.03, and the IRR estimate of 1.87 on the domestic unemployment change is not statistically different from the pre-crisis IRR estimate of 2.16. The same pattern holds when we redefine the macroeconomic determinants at  $t-2$  in specification (5). Furthermore, results from the European Union sample are like the United States in that the IRR estimate on the domestic unemployment rate change during 2008:Q4-2010:Q4 is not consistently different from the IRR estimate from prior to the crisis. While specification (6) presents evidence of a differential, this is not robust to redefining the macroeconomic determinants at two lags. As described earlier, the estimated IRR for the unemployment rate change appears particularly sensitive to the relatively shorter time series of available data for the EU sample.

However, there is one other robust differential between estimated IRRs from the European Union sample. The estimated IRRs for the EU's bilateral real exchange rate for 2008:Q4-2010:Q4 are less than 1 and they are statistically less than the EU's IRR estimate for the earlier period. Thus there is some evidence of a change in that the EU imposed fewer TTBs in response to the euro appreciation early in the crisis period (see again Figure 1), given the EU's 1999:Q1-2008:Q3 IRR estimate which indicated that an appreciation of the euro currency historically led to more TTBs.

Nevertheless, a final contributing explanation for the lack of a major import protection response by the United States or the European Union during 2008:Q4-2010:Q4 is related to the movements in each economy's bilateral real exchange rates over the period. The historical evidence for the EU and US is that real currency appreciations led to more import protection through TTBs. As the grey line in Figure 1 again illustrates for the EU, for much of the 2008-2010 period the euro is depreciating. Furthermore, shortly after the sharp appreciation of the US dollar in 2009:Q1, the dollar *depreciated* by a nearly identical amount, and then continued a period of weakening throughout 2009-2010. These real depreciations suggest another dampening effect on new EU and US import protection.

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relationship, although the IRR is less precisely estimated. When using real GDP growth at the annual frequency in data extended through 2009, the point estimate for the IRR is no longer precisely estimated.

### 4.3 Model predictions for import protection during other recessions

In light of the evidence from the last section that IRR estimates changed for the Great Recession relative to 1988:Q1-2008:Q3, one last question we investigate is the ability of the model to predict new TTB import protection during *earlier* cyclical downturns. Here we consider the question in the context of the United States. Our approach is to estimate the US model with data from 1988:Q1-2000:Q4 and to then use the estimated IRRs to predict out-of-sample TTBs for 2001:Q1-2007:Q4, given the realizations of aggregate variables during that period.<sup>34</sup> We continue to implement a basic model that also allows for trading partner-specific channels of aggregate fluctuations to bilateral real exchange rates and foreign real GDP growth to affect the formation of new TTBs. Nevertheless, the exercise can also be viewed as examining whether identification of the model's parameters for a period that includes only one major US recession - i.e., the 1990-1991 downturn – can be used to predict trade policy activity alongside the subsequent domestic recession of 2001.

The estimated IRRs for the model for 1988:Q1-2000:Q4 are qualitatively similar to the full sample of IRR estimates for the period of 1988:Q1-2008:Q3 in Table 3. They continue to align with theoretical expectations although the IRR for the real exchange rate is smaller in magnitude and it is not precisely estimated in the limited sample.<sup>35</sup>

Figure 5 illustrates the predicted amount of new TTBs over 2001:Q1-2007:Q4 using the US model estimates based on the 1988:Q1 – 2000:Q4 data and the realized macroeconomic data for this later period. We illustrate predictions in comparison to the actual US TTBs taking place during that period.

As Figure 5 illustrates, the model does a reasonable job at predicting the quantity of protection over several quarters. First, the model predicts a general increase in TTBs for the period of 2001:Q1-2003:Q2. Over that time period, the model predicts 989 total new TTBs would arise; the US initiated 1209 in practice. The increase in TTBs taking place during this period is related to the sharp appreciation of the US dollar and the rising unemployment rate. However, as Figure 1 again illustrates, note that the largest quarterly increase in the real exchange rate was in 2001:Q1, whereas

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<sup>34</sup> We estimate the same specification as that presented in Figure 4, i.e., Table 3, specification (2), in which the determinants are each defined at two lags.

<sup>35</sup> We do not present the estimates in a table so as to conserve space. Nevertheless the estimated IRRs (and t-statistics) for the key determinants for the 1988:Q1-2000:Q4 period are: 1.01 (1.06) for the real exchange rate, 2.01 (3.42) for the change in unemployment, and 0.90 (2.91) for the foreign trading partner real GDP growth rate.

the peak quarterly increase in the unemployment rate was considerably later in 2001:Q4. Second, the model also predicts *low* levels of TTBs over the period 2004:Q2 through 2007:Q4; this compares well with the realized data on new TTBs.

On the other hand, the model cannot match the magnitude of the spike in realized US TTBs in 2001:Q2. These were almost entirely associated with one single policy decision, i.e., the US steel safeguard initiation in June 2001. However, the US steel safeguard had a number of unique properties, from the perspective of this modeling exercise. First, it was a single action covering hundreds of products. Furthermore, and despite the exclusions and exemptions which pierced the full nondiscriminatory nature of the policy (Bown, 2004), the import restriction still covered many trading partners, a number of which may not have been substantial suppliers of US steel import products. Finally, in the quarterly data, the singular timing of this policy action also ends up being recorded as quite different from a set of similar (in the aggregate) antidumping actions in 1991-92, for example. Because those many separate antidumping actions fell over a couple of different quarters (e.g., 1992:Q2, 1992:Q3) there was not as large a spike in any one quarter as was recorded during the 2001 recession.

## **5 Conclusion**

This paper uses quarterly data for the United States, European Union, and three other industrialized economies to estimate the impact of macroeconomic shocks on import protection over 1988:Q1-2010:Q4. Estimates from a data sample taken before the Great Recession exhibit evidence of three key relationships. First, there is strong evidence of a countercyclical relationship between domestic macroeconomic shocks – increases in domestic unemployment rates or reductions in domestic real GDP growth – and governments initiating new temporary trade barrier investigations over significantly more imported products per trading partner per quarter. Second, we find these economies used such bilateral import restrictions against trading partners that were going through their own periods of weak economic growth. Third, a real appreciation of the bilateral exchange rate defined in terms of the domestic currency is associated with increases to these forms of import protection. Overall, we find this evidence is especially strong for import protection by the United States and European Union, and the evidence is weaker for smaller economies such as Australia, Canada, and South Korea.

In a second exercise, we use estimates from the pre-Great Recession model to then show the expected trade policy response during 2008:Q4-2010:Q4 given the realized macroeconomic shocks. The historical models for the US and EU in particular predicted a sharp increase in import protection taking place beginning in 2009:Q2 and lasting through 2010:Q1, peaking in 2009:Q3. While the increase in import protection during the Great Recession was not as large as the potential additional 15 percentage point coverage of imports that some historical models predicted, arguably the fear of this realization contributed to the pre-emptive “anti-protectionism” G20 declaration of November 2008 and a number of initiatives to actively monitor trade policy (by the WTO, World Bank, and Global Trade Alert) beginning in early 2009.

Third, we re-estimate the models on data from the Great Recession period in order to explain deviations to the realized protectionist response away from historical behavior. We do not find robust evidence of a change to the countercyclical relationship between *domestic* unemployment and new import protection. However, we do provide evidence that these policy-imposing economies “switched” from their historical behavior; during the Great Recession they shifted new import protection away from those trading partners that were contracting and toward those experiencing relatively stronger economic growth. This evidence, in addition to the sharp and persistent real depreciations of the US dollar and euro after their initial run-up in 2009, were particularly important contributors to the relatively low levels of import protection that arose given that so many trading partners were themselves experiencing periods of severe economic contraction during 2008-2010.

Finally, our results contribute to a substantial literature that has evolved to explain the role of trade agreements and the use of temporary trade barriers under the WTO. Our paper identifies the importance of bilateral channels through which new trade barriers arise, and how these channels differed in 2008-2010 relative to periods before the Great Recession. Nevertheless, even this research is just one additional step in understanding the role of trade agreements, including the potential limits to what trade agreements can accomplish in maintaining trade policy cooperation across countries. Indeed, economies like the United States and European Union are no longer the “biggest” users of temporary trade barrier policies. Whether the major new emerging economy users of these policies – India, China, Brazil, Argentina, and Turkey, for example – respond similarly to macroeconomic shocks remains an open question.

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## Appendix: Data Description

**Temporary trade barrier** data under antidumping, countervailing duty, global safeguards, and the China-specific safeguard policies at the Harmonized System 6-digit level by trading partner for 1988-2010 is compiled by the authors from the World Bank's *Temporary Trade Barriers Database* (Bown, 2011b) which is publicly available at <http://econ.worldbank.org/ttbd/>.

**Bilateral real exchange rate series** come from the USDA's Agricultural Exchange Rate Dataset. For each quarterly observation we use the value as of the last month of the quarter.

**Domestic unemployment rate change** is calculated at the quarterly frequency as the year-over-year changes with data from the International Labor Organization.

**Real GDP growth** is calculated as the year-over-year changes. There are a total of 18 economies from which we require data on real GDP growth. Unless otherwise noted, each economy had data available for 1988:Q1-2010:Q4 in the form of a seasonally adjusted, quarterly real GDP series taken from OECD. The EU (EU27) and Israel's series begin in 1995:Q1. Turkey's series begins in 1998:Q1. Furthermore, series for Brazil (beginning in 1996:Q1), Japan, Indonesia (beginning in 1990:Q1), and India (beginning in 1996:Q2) are from Haver OECD MEI. Mexico and South Africa's series are from IFS. China's quarterly year-on-year real GDP growth series are from official government statistics and begin in 1992:Q1. Taiwan's series are from official government statistics.

**Change in the share of imported products under WTO discipline.** This variable is calculated at the annual frequency for 1995-2010 based on HS-06 applied MFN tariffs and WTO bindings data available from UNCTAD (TRAINS) and the WTO's Integrated Database through WITS.

**Trading Partners:** For each of the five policy-imposing economies  $j$ , with the exception of South Korea, the bilateral relationship is with one of 15 its trading partners  $i$ . The 15 partners are determined as the most frequent targets against which each economy used such import protection over the sample period, conditional on availability of that trading partner's macroeconomic data at the quarterly frequency. The trading partners for each are:



- **United States (15):** Australia, Brazil, Canada, China, European Union, India, Indonesia, Japan, Mexico, New Zealand, South Africa, South Korea, Switzerland, Taiwan, China; Turkey. These economies were the source of 85 percent of non-oil imports during this period.
- **European Union (15):** Australia, Brazil, China, India, Indonesia, Japan, Mexico, New Zealand, Norway, South Africa, South Korea, Switzerland, Taiwan, China; Turkey, United States. These economies were the source of 75 percent of non-oil imports during this period.
- **South Korea (10):** Canada, China, European Union, India, Indonesia, Japan, New Zealand, Switzerland, Taiwan, China, United States. These economies were the source of 79 percent of non-oil imports during this period.
- **Australia (15):** Brazil, Canada, China, European Union, India, Indonesia, Israel, Japan, Mexico, Norway, South Africa, South Korea, Taiwan, China; Turkey, United States. These economies were the source of 81 percent of non-oil imports during this period.
- **Canada (15):** Australia, Brazil, China, European Union, India, Indonesia, Japan, Mexico, New Zealand, South Africa, South Korea, Switzerland, Taiwan, China; Turkey, United States. These economies were the source of 94 percent of non-oil imports during this period.

**Table 1. Summary Statistics, 1988:Q1-2010:Q4**

Variables	Policy-imposing economy...			
	Full sample	US only	EU‡ only	Australia, Canada, Korea only
<b>Dependent Variables</b>				
All temporary trade barrier initiations <i>ijt</i> (products per quarter per trading partner), 1988:Q1-2008:Q3	1.25 (6.41)	2.76 (10.28)	1.98 (9.13)	0.51 (2.41)
All temporary trade barrier initiations <i>ijt</i> (products per quarter per trading partner), 2008:Q4-2010:Q4	0.37 (1.65)	0.70 (2.87)	0.62 (1.56)	0.16 (0.81)
Antidumping initiations only <i>ijt</i> (products per quarter per trading partner), 1988:Q1-2008:Q3	0.76 (3.46)	1.81 (5.93)	0.53 (1.73)	0.40 (2.09)
<b>Explanatory Variables</b>				
Percent change in bilateral real exchange rate <i>ijt</i> , 1988:Q1-2008:Q3	0.85 (14.70)	0.24 (15.87)	1.47 (12.38)	0.96 (14.69)
Percent change in bilateral real exchange rate <i>ijt</i> , 2008:Q4-2010:Q4	-1.35 (14.37)	-0.28 (15.69)	-5.87 (13.19)	-0.06 (13.97)
Domestic unemployment rate change <i>jt</i> , 1988:Q1-2008:Q3	-0.13 (0.86)	-0.02 (0.66)	-0.35 (0.51)	-0.13 (0.97)
Domestic unemployment rate change <i>jt</i> , 2008:Q4-2010:Q4	1.06 (1.35)	1.82 (1.73)	1.75 (1.04)	0.51 (0.99)
Domestic real GDP growth <i>jt</i> , 1988:Q1-2008:Q3	3.41 (2.30)	2.92 (1.41)	2.45 (1.02)	3.80 (2.65)
Real GDP growth of trading partner <i>it</i> , 1988:Q1-2008:Q3	4.08 (3.50)	4.06 (3.56)	4.11 (3.10)	4.09 (3.56)
Real GDP growth of trading partner <i>it</i> , 2008:Q4-2010:Q4	2.18 (5.42)	2.19 (5.40)	2.19 (5.37)	2.17 (5.45)
Import growth from trading partner <i>ijt</i> , 1988:Q1-2008:Q3	11.50 (23.03)	8.46 (11.69)	11.80 (14.21)	12.60 (27.32)
Import growth from trading partner <i>ijt</i> , 2008:Q4-2010:Q4	0.96 (29.87)	0.14 (25.74)	-7.09 (20.59)	4.29 (33.50)
Observations	5036	1195	719	3122

Notes: sample means reported with standard deviations reported below in parentheses. ‡EU is defined throughout as EU-27, its data are for 1999:Q1-2010:Q4 only.

**Table 2. Negative Binomial Model Estimates of Macroeconomic Determinants of Import Protection, 1988:Q1-2008:Q3**

<b>Dependent variable: Bilateral (<i>ij</i>) count of products initiated under all temporary trade barrier policies in quarter <i>t</i></b>								
Explanatory variables	Baseline (1)	Substitute real GDP for un- employment (2)	Modify country fixed effects (3)	Substitute second lag for macro variables (4)	AD only (5)	Interaction of domestic and foreign shocks (6)	Add tariffs and TTB stock (7)	Same restricted subsample (8)
<b>Percent change in bilateral real exchange rate <i>ijt-1</i></b>	1.02 <sup>a</sup> (3.97)	1.02 <sup>a</sup> (3.98)	1.02 <sup>a</sup> (4.54)	1.02 <sup>a</sup> (4.92)	1.00 (0.29)	1.02 <sup>a</sup> (4.01)	1.02 <sup>a</sup> (3.60)	1.02 <sup>a</sup> (4.08)
<b>Domestic unemployment rate change <i>jt-1</i></b>	1.62 <sup>a</sup> (6.61)	--	1.62 <sup>a</sup> (6.57)	1.18 <sup>b</sup> (2.05)	1.36 <sup>a</sup> (4.30)	1.54 <sup>a</sup> (3.71)	1.81 <sup>a</sup> (5.14)	1.78 <sup>a</sup> (5.05)
<b>Domestic real GDP growth <i>jt-1</i></b>	--	0.93 <sup>b</sup> (2.28)	--	--	--	--	--	--
<b>Real GDP growth of trading partner <i>it-1</i></b>	0.88 <sup>a</sup> (6.13)	0.86 <sup>a</sup> (6.70)	0.97 <sup>c</sup> (1.96)	0.90 <sup>a</sup> (4.58)	0.93 <sup>a</sup> (3.82)	0.88 <sup>a</sup> (5.95)	0.90 <sup>a</sup> (3.91)	0.89 <sup>a</sup> (4.07)
<b>Time trend</b>	0.99 <sup>a</sup> (2.99)	0.99 <sup>a</sup> (3.84)	0.99 <sup>c</sup> (1.80)	0.99 <sup>a</sup> (2.95)	0.99 <sup>a</sup> (3.24)	0.99 <sup>a</sup> (2.99)	0.96 <sup>a</sup> (7.01)	0.96 <sup>a</sup> (7.20)
<b>Domestic unemployment rate change <i>jt-1</i> x Real GDP growth of trading partner <i>it-1</i></b>	--	--	--	--	--	1.01 (0.59)	--	--
<b>Change in the share of imported products under WTO discipline in <i>jt-1</i></b>	--	--	--	--	--	--	1.04 (1.58)	--
<b>Stock of TTBs against trading partner <i>ijt-1</i></b>	--	--	--	--	--	--	0.99 <sup>b</sup> (2.47)	--
Import and exporter combined fixed effects	yes	yes	no	yes	yes	yes	yes	yes
Importer and exporter separate fixed effects	no	no	yes	no	no	no	no	no
Observations	4406	4406	4406	4380	4406	4406	3218	3218

Notes: Policy-imposing economies *j* (Australia, Canada, EU, South Korea, US) vis-à-vis one of 15 trading partners *i* (listed in the Appendix) over 1988:Q1-2008:Q3. Data for the EU as policy imposer are restricted to 1999:Q1-2008:Q3 throughout. In (7) and (8), data for the other four policy-imposing economies are restricted to 1995:Q1-2008:Q3. Incidence Rate Ratios (IRRs) are reported in lieu of coefficient estimates, with t-statistics in parentheses. Model includes a constant term whose estimate is suppressed. Superscripts a, b, and c indicate statistical significance at the 1, 5, and 10 percent levels, respectively. AD=antidumping.

**Table 3. Economy-Specific Estimates of Macroeconomic Determinants of Import Protection, 1988:Q1-2008:Q3**

<b>Dependent variable: Bilateral (ij) count of products</b> <i>initiated under all temporary trade barrier policies or antidumping (AD) in quarter t by country(ies) listed below</i>									
Explanatory variables	United States			European Union‡			Australia, Canada, & South Korea		
	Baseline (1)	Second lag (macro variables) (2)	AD only (3)	Baseline (4)	Second lag (macro variables) (5)	AD only (6)	Baseline (7)	Second lag (macro variables) (8)	AD only (9)
<b>Percent change in bilateral real exchange rate <i>ijt-1</i></b>	1.03 <sup>a</sup> (3.53)	1.04 <sup>a</sup> (5.26)	1.00 (0.15)	1.03 <sup>b</sup> (2.28)	1.05 <sup>a</sup> (3.91)	1.02 (1.61)	1.00 (0.64)	1.00 (0.04)	1.00 (0.54)
<b>Domestic unemployment rate change <i>jt-1</i></b>	2.16 <sup>a</sup> (4.62)	1.69 <sup>a</sup> (2.72)	2.00 <sup>a</sup> (4.70)	10.80 <sup>a</sup> (6.33)	1.61 (1.17)	0.95 (0.16)	1.43 <sup>a</sup> (4.36)	1.12 (1.29)	1.27 <sup>a</sup> (2.61)
<b>Real GDP growth of trading partner <i>it-1</i></b>	0.86 <sup>a</sup> (4.69)	0.94 <sup>b</sup> (2.03)	0.88 <sup>a</sup> (4.01)	0.90 <sup>c</sup> (1.65)	0.81 <sup>a</sup> (2.65)	1.01 (0.29)	0.94 <sup>b</sup> (1.97)	0.94 <sup>b</sup> (2.13)	0.96 (1.16)
<b>Time trend</b>	0.98 <sup>a</sup> (3.74)	0.98 <sup>a</sup> (3.61)	0.98 <sup>a</sup> (4.42)	0.93 <sup>a</sup> (4.96)	0.95 <sup>a</sup> (3.33)	0.98 <sup>c</sup> (1.78)	1.00 (0.26)	1.00 (0.05)	1.00 (0.81)
<b>China as trading partner</b>	22.66 <sup>a</sup> (6.01)	10.58 <sup>a</sup> (4.52)	32.18 <sup>a</sup> (6.78)	65.66 <sup>a</sup> (5.02)	66.58 <sup>a</sup> (4.54)	72.85 <sup>a</sup> (4.78)	62.25 <sup>a</sup> (3.46)	66.15 <sup>a</sup> (3.48)	39.37 <sup>a</sup> (3.05)
Import and exporter combined fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1060	1053	1060	584	583	584	2762	2744	2762

Notes: The trading partners *i* of each importer *j* are listed in the Appendix. ‡Data for the EU as policy imposer *j* in specifications (4), (5) and (6) are restricted to 1999:Q1-2008:Q3. Incidence Rate Ratios (IRRs) are reported in lieu of coefficient estimates, with t-statistics in parentheses. Model includes a constant term whose estimate is suppressed. Superscripts a, b, and c indicate statistical significance at the 1, 5, and 10 percent levels, respectively. Each explanatory variable is lagged two quarters (at *t-2*) in lieu of one quarter (*t-1*) in specifications (2), (5), and (8). AD=antidumping.

**Table 4. Differential Impacts on Policy Response during the Great Recession**

Dependent variable: <i>Bilateral count of products initiated under all temporary trade barrier policies in quarter t by country(ies) listed below</i>							
Explanatory Variables	All countries			United States		European Union	
	First lag (1)	Second lag (2)	Second lag (3)	First lag (4)	Second lag (5)	First lag (6)	Second lag (7)
<b>Percent change in bilateral real exchange rate <i>ijt-1</i>, 1988:Q1-2008:Q3</b>	1.02 <sup>a</sup> (4.23)	1.02 <sup>a</sup> (5.00)	1.02 <sup>a</sup> (5.03)	1.03 <sup>a</sup> (3.58)	1.04 <sup>a</sup> (5.31)	1.03 <sup>a</sup> (2.60)	1.05 <sup>a</sup> (4.45)
<b>Percent change in bilateral real exchange rate <i>ijt-1</i>, 2008:Q4-2010:Q4</b>	1.00 (0.26)	1.00 (0.34)	1.01 (0.90)	1.06 (1.59)	1.06 <sup>c</sup> (1.94)	0.93 <sup>b</sup> (2.46)	0.94 <sup>b</sup> (2.53)
[Test statistic]	[4.23] <sup>b</sup>	[3.17] <sup>c</sup>	[1.38]	[0.63]	[0.15]	[10.65] <sup>a</sup>	[16.84] <sup>a</sup>
<b>Domestic unemployment rate change <i>jt-1</i>, 1988:Q1-2008:Q3</b>	1.63 <sup>a</sup> (6.72)	1.17 <sup>b</sup> (2.01)	1.16 <sup>c</sup> (1.87)	2.16 <sup>a</sup> (4.55)	1.67 <sup>a</sup> (2.58)	10.00 <sup>a</sup> (6.60)	1.58 (1.19)
<b>Domestic unemployment rate change <i>jt-1</i>, 2008:Q4-2010:Q4</b>	1.06 (0.46)	1.16 (1.05)	0.96 (0.24)	1.87 <sup>b</sup> (2.56)	1.77 <sup>b</sup> (2.20)	0.59 (1.29)	2.31 <sup>c</sup> (1.94)
[Test statistic]	[8.34] <sup>a</sup>	[0.00]	[1.01]	[0.22]	[0.03]	[26.84] <sup>a</sup>	[0.44]
<b>Real GDP growth of trading partner <i>it-1</i>, 1988:Q1-2008:Q3</b>	0.88 <sup>a</sup> (6.41)	0.90 <sup>a</sup> (4.90)	0.90 <sup>a</sup> (4.64)	0.84 <sup>a</sup> (5.31)	0.92 <sup>a</sup> (2.62)	0.91 <sup>c</sup> (1.66)	0.85 <sup>b</sup> (2.46)
<b>Real GDP growth of trading partner <i>it-1</i>, 2008:Q4-2010:Q4</b>	1.03 (0.90)	1.01 (0.37)	1.04 (1.14)	1.09 (1.24)	1.08 (1.30)	1.08 (1.01)	1.09 (1.07)
[Test statistic]	[19.56] <sup>a</sup>	[10.70] <sup>a</sup>	[13.02] <sup>a</sup>	[12.17] <sup>a</sup>	[6.15] <sup>b</sup>	[4.34] <sup>b</sup>	[8.30] <sup>b</sup>
<b>Import growth from trading partner <i>it-1</i>, 1988:Q1-2008:Q3</b>	--	--	1.00 (0.48)	--	--	--	--
<b>Import growth from trading partner <i>it-1</i>, 2008:Q4-2010:Q4</b>	--	--	0.98 <sup>c</sup> (1.82)	--	--	--	--
[Test statistic]	--	--	[2.65]	--	--	--	--
Time trend included	yes	yes	yes	yes	yes	yes	yes
Import and exporter combined fixed effects	yes	yes	yes	yes	yes	yes	yes
Observations	5036	5010	5007	1195	1188	719	718

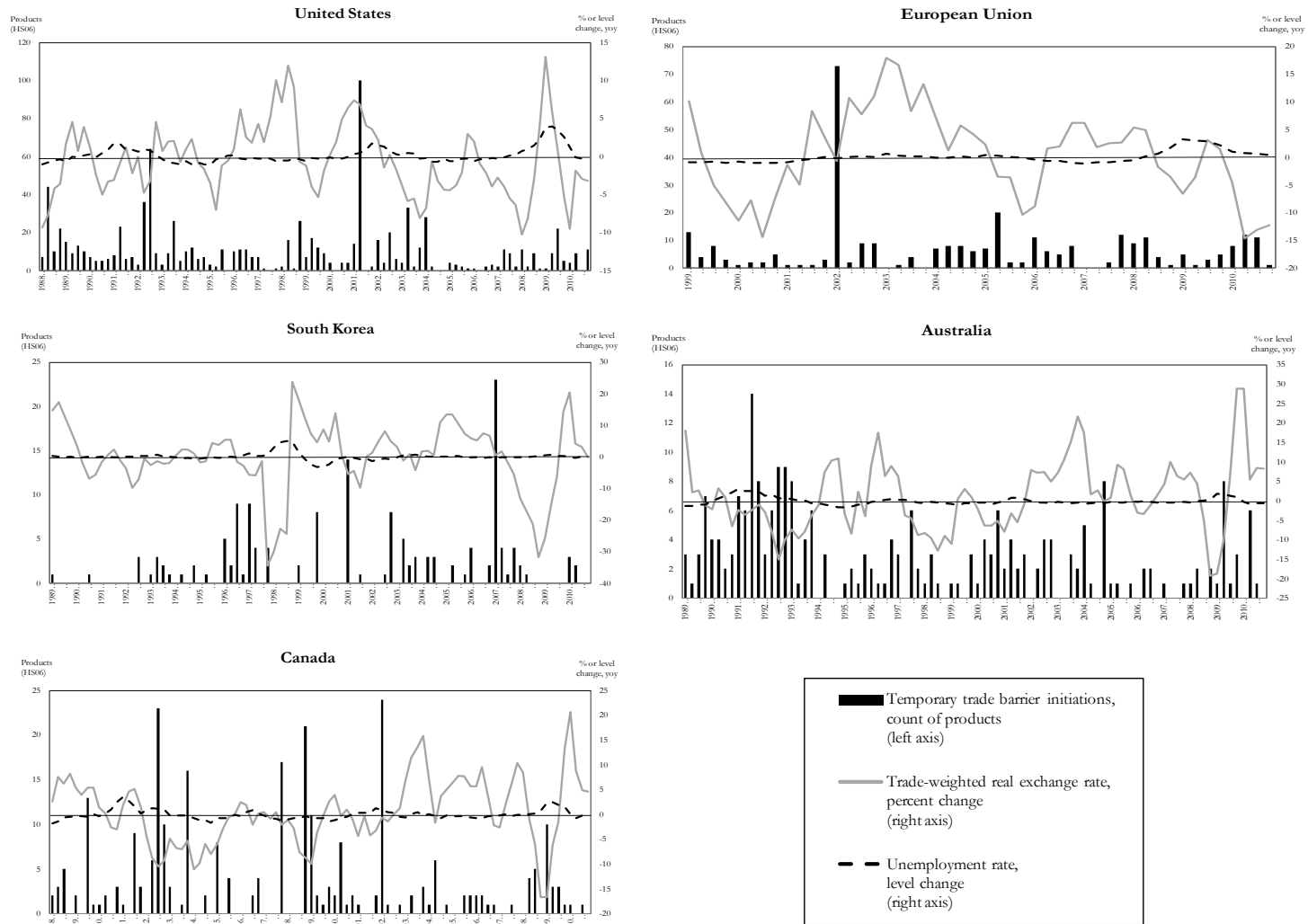
Notes: "All countries" includes the five economies *j* (Australia, Canada, EU, South Korea, US) vis-à-vis one of 15 trading partners *i* (listed in the Appendix) over 1988:Q1-2010:Q4. #Data for the EU as policy imposer are restricted to 1999:Q1-2010:Q4 throughout. Incidence Rate Ratios (IRRs) are reported in lieu of coefficient estimates, with t-statistics in parentheses. Chi-squared test statistics with one degree of freedom are reported in square brackets. Model includes a constant term whose estimate is suppressed. Superscripts a, b, and c indicate statistical significance at the 1, 5, and 10 percent levels, respectively. Each explanatory variable is lagged one quarter (at *t-1*) in specifications (1), (4), and (6) and two quarters (at *t-2*) in specifications (2), (3), (5), and (7).

**Appendix Table 1. The Only Other (Non-TTB) Import Restricting Policies for these Five Economies, 2008-2010**

Country, non-TTB Import-restricting policy	Date of Inception
<b>Australia</b>	
• Increase of excise rates on imports of tobacco	April 30, 2010
• Customer price index adjustment for alcohol and tobacco products	August 2, 2010
<b>Canada</b>	
• Temporary tariff-rate quota on milk protein substitutes	March 1, 2009
• Lower threshold for delisting wines in provincial liquor stores	July 20, 2009
<b>South Korea</b>	
• Increased tariffs for 16 selected products	January 1, 2009
• Restoration of tariff on imports of crude oil to 3%	March 1, 2009
<b>United States</b>	
• Reclassification subjecting certain solar panels to a 2.5% tariff	January 9, 2009
• Ban on poultry imports from China	March 11, 2009
• Adoption of a ban against imports of Mexican shrimp	April 20, 2010
• Ban on the importation of Asian carp	December 14, 2010

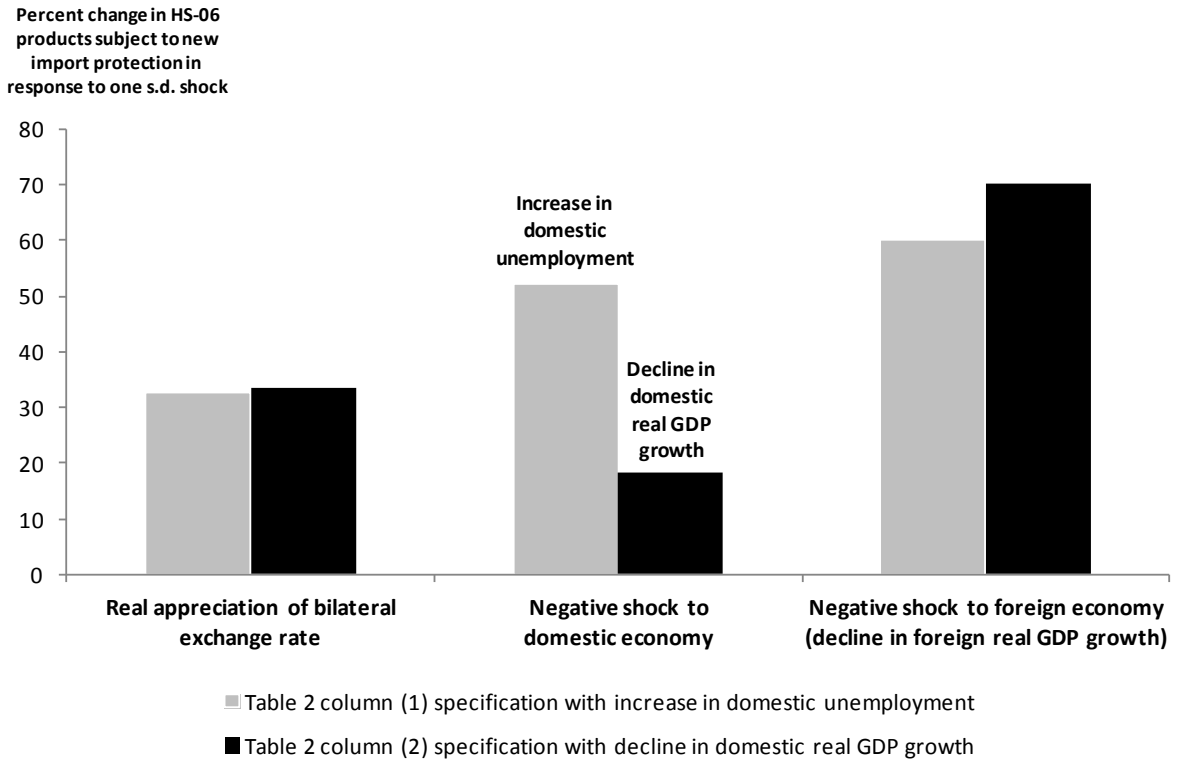
Source: compiled by the authors from Global Trade Alert at [www.globaltradealert.org](http://www.globaltradealert.org), last accessed 29 February 2012. See discussion in footnote 1.

**Figure 1. Import Protection, Real Exchange Rates, and Unemployment, 1988:Q1-2010:Q4**



Source: constructed by the authors from quarterly data from OECD, USDA, and IMF and Bown (2011b). Increases in the real exchange rate series reflect appreciations of the domestic currency. EU data for 1999:Q1-2010:Q4 only.

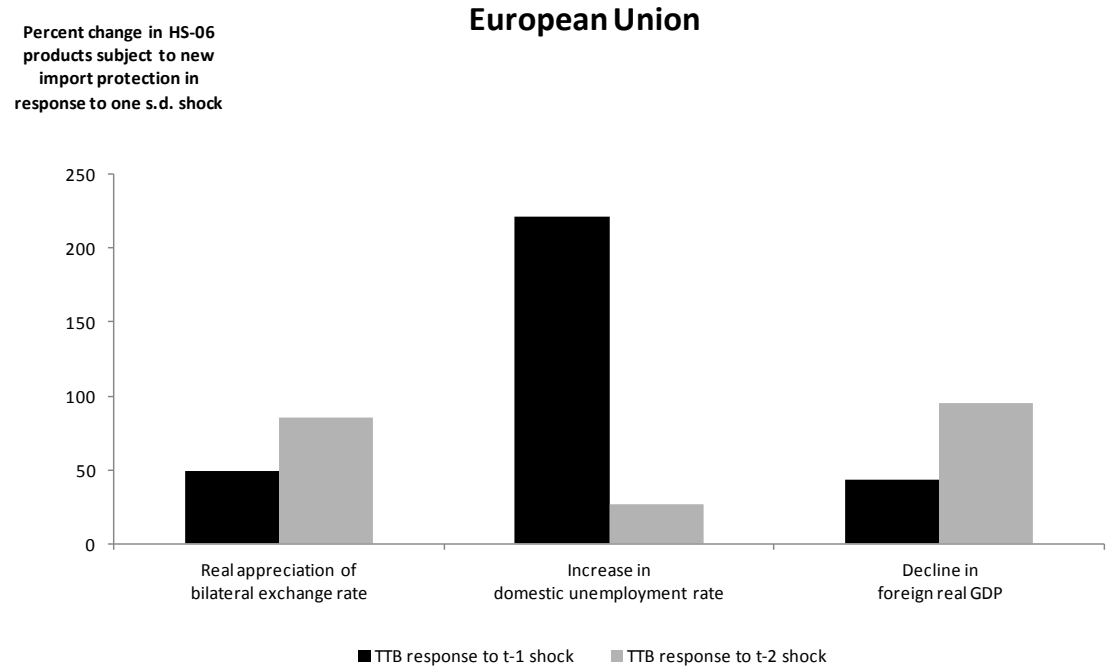
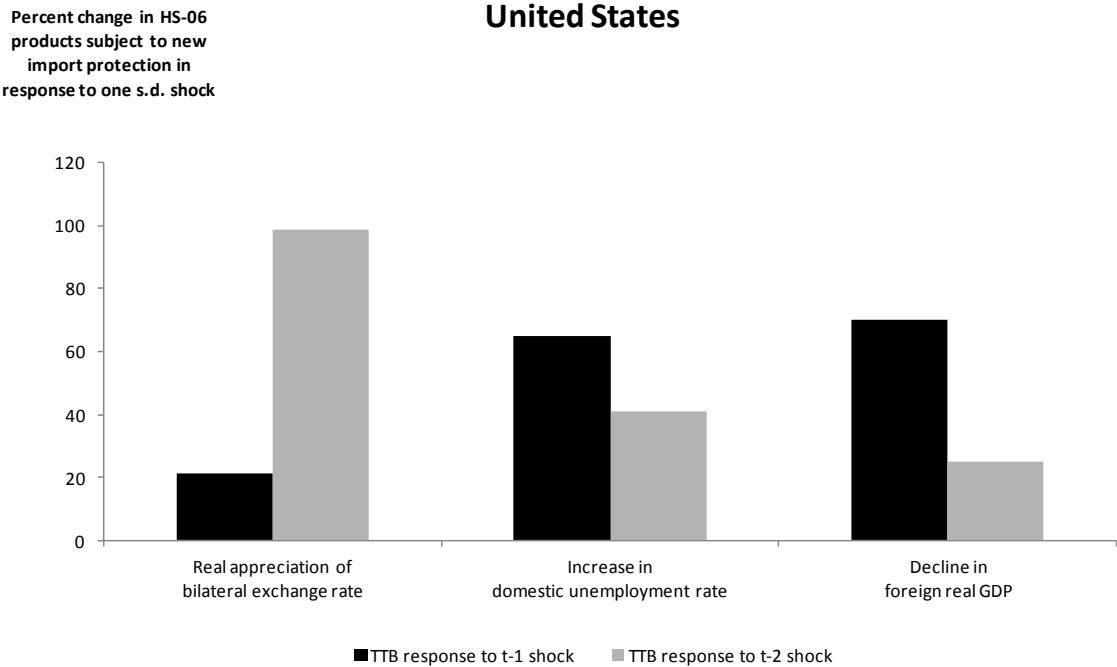
**Figure 2. Trade Policy Responsiveness to Macroeconomic Shocks, Pre-Crisis**



Notes: Percent increase in HS-06 products subject to new import protection per quarter per trading partner. Based on table 2 model estimates and a one standard deviation change in each explanatory variable away from the sample mean, holding all other variables constant.

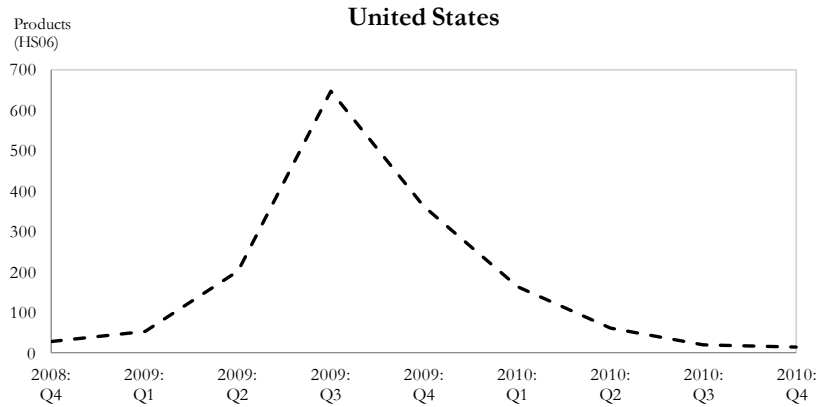


**Figure 3. US and EU Trade Policy Responsiveness to Macroeconomic Shocks, Pre-Crisis**

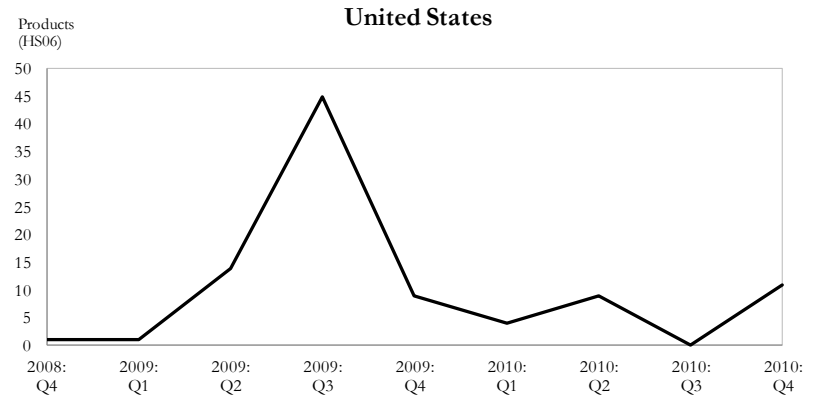


Notes: Percent increase in HS-06 products subject to new import protection per quarter per trading partner. Based on table 3 model estimates and a one standard deviation change in each explanatory variable away from the sample mean, holding all other variables constant.

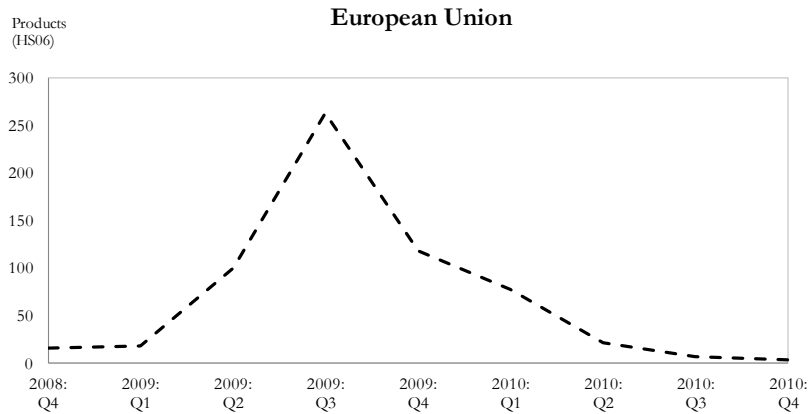
**Figure 4. United States and European Union:  
Predicted versus Realized Trade Policy Response to Macroeconomic Shocks during 2008:Q4 – 2010:Q4**



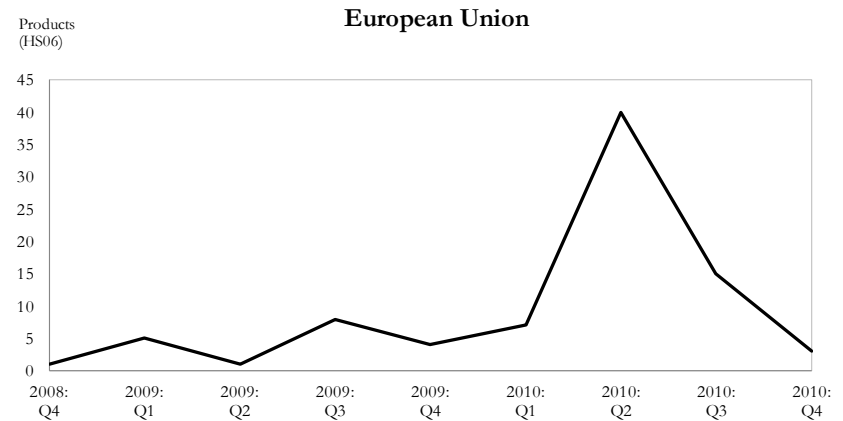
--- Prediction from pre-crisis sample only (total products = 1558)



— Actual (total products = 94)



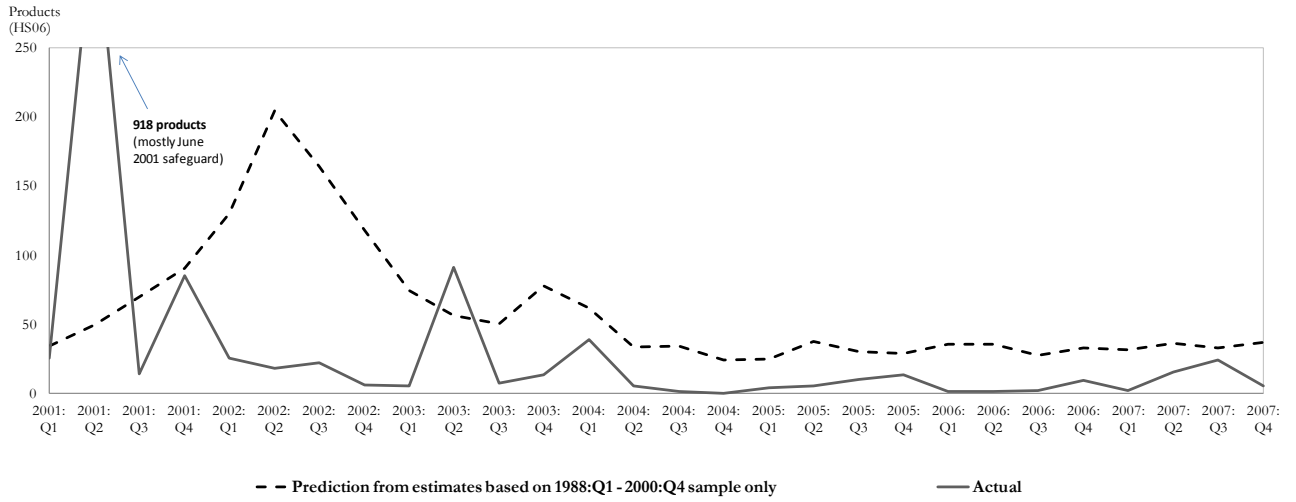
--- Prediction from pre-crisis sample only (total products = 623)



— Actual (total products = 84)

Notes: Prediction of number of imported products from 15 trading partners per quarter subject to new TTBs from the pre-crisis sample based on estimates from Table 3 specification (2) for the US and specification (5) for the EU. For context, the median number of products subject to new US TTBs against these 15 trading partners per quarter between 1988:Q1 and 2008:Q3 was 12, for the EU between 1999:Q1 and 2008:Q3 the median was 9.

**Figure 5. Out-of-Sample Model Predictions for United States TTBs, 2001:Q1-2007:Q4**



Notes: Prediction of number of imported products from 15 trading partners per quarter subject to new TTBs from the 1988:Q1 – 2000:Q4 data sample based on the same model specification as Table 3, column (2). The estimated IRRs are reported in footnote 36.

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