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Numbers for Pascal: Explaining differences in the estimated benefits of the Doha Development Agenda

Sebastian Hess, Stephan von Cramon-Taubadel and Stefan Sperlich

Abstract: Economists use partial and general equilibrium trade simulation models to estimate the impact of changes in domestic policies and international trade rules. During the WTO Doha Development Agenda (DDA) negotiations economists have produced many different estimates of the gains that would result from global trade liberalisation scenarios. However, these estimates differ quite widely even for apparently similar liberalisation scenarios. The result is confusion about the true magnitude of the gains from trade liberalisation, and a reduction in the perceived credibility of the theories and models that economists use. We apply meta-analysis to a dataset extracted from 110 studies that present simulated assessments of global trade liberalisation scenarios under the DDA. Initial meta-regression analysis demonstrates that covariates that capture model characteristics, the nature of the data used in the modelling exercise, and the nature of the simulated liberalisation scenarios can explain roughly one-third of the variance in the dependent variable ‘simulated global welfare change’. We test whether additional explanatory power can be obtained by adding information about the authors of the simulation studies. We find significant fixed effects for the top 20 authors in the field. We interpret this as evidence that leading authors in the field employ model specifications that reflect their individual preferences and beliefs about how economies function and the impact of liberalisation, specifications that are hidden in the complex interactions of simulations models and therefore difficult to capture in a meta-analysis. We use these results to generate a confidence interval for the gains that would result from trade liberalisation under the DDA.

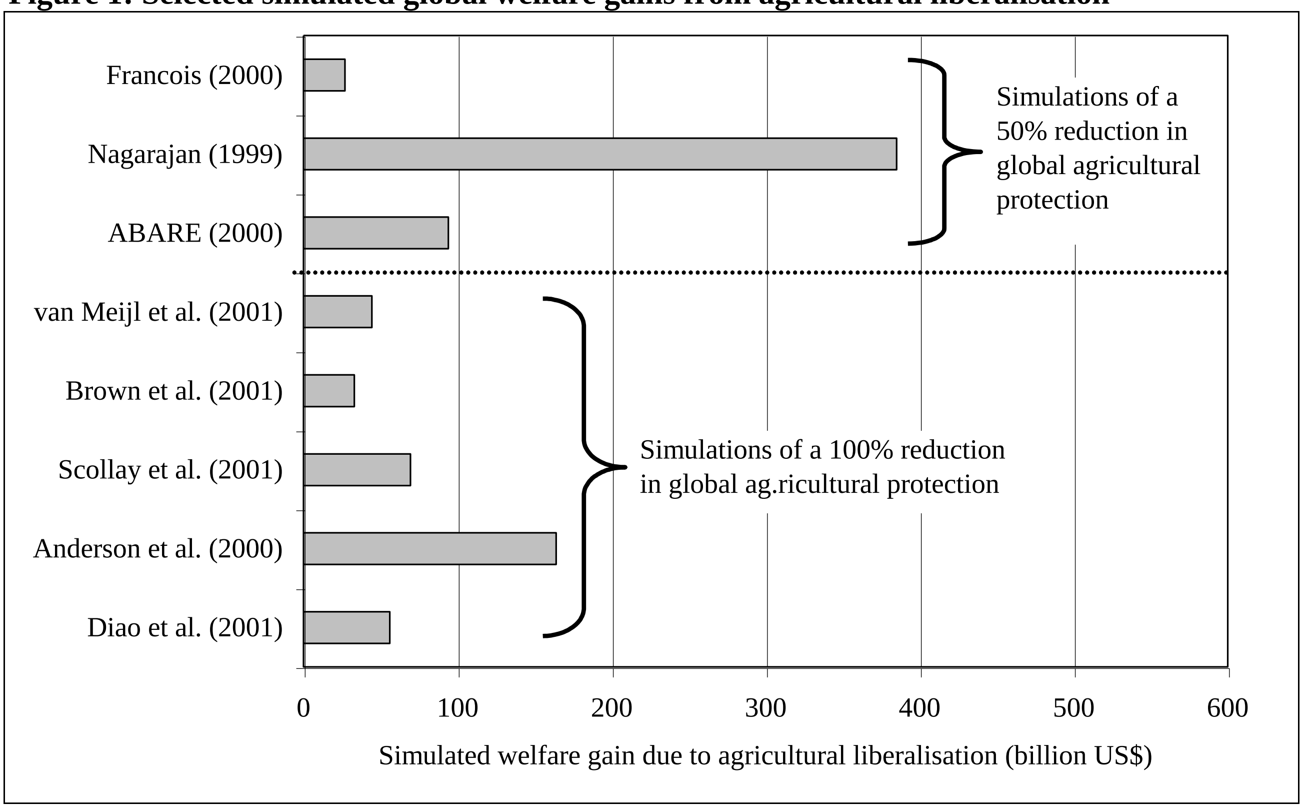
Keywords: Trade Liberalisation, Global Welfare Gain, Applied Trade Model, Meta-Analysis

"*What members have let slip through their fingers is a package worth more than $130 billion in tariff saving annually by the end of the implementation period, with $35 billion saving in agriculture and $95 billion in industrial goods. With developing countries contributing one third and benefiting from two thirds of the overall gains [this would be] a true development round ... with a rebalancing of the rules of the trading system in favour of developing countries.*" Pascal Lamy, Director-General of the WTO[1]

1. Introduction

Economists use partial and general equilibrium trade simulation models to estimate the impact of changes in domestic policies and international trade rules. Over the long and tortuous course of the WTO Doha Development Agenda (DDA) negotiations, economists have produced many different estimates of the gains that would result from global trade liberalisation scenarios.[2] However, these estimates differ quite widely even for apparently similar liberalisation scenarios. Figure 1 illustrates these differences for selected studies that simulate 50% and 100% reductions in agricultural protection.

Figure 1: Selected simulated global welfare gains from agricultural liberalisation



Source: UNCTAD (2003).

[1] See: *WTO: 2008 News Items – Summary 29 July – Day 9: Talks collapse despite progress on a list of issues*, www.wto.org/english/news_e/news08_e/meet08_summary_29july_e.htm, accessed January 28, 2010.
[2] For a recent example, see Adler et al. (2009).

The simulated global gains depicted in Figure 1 range from 30 to 380 billion US$, and are not uniformly higher for the larger liberalisation step. Experts who know the models and modellers in question can provide explanations for some of the differences observed in Figure 1, but for others both inside and outside the economics profession these differences generate confusion about the true magnitude of the gains from trade liberalisation, and reduce the perceived credibility of the theories and models that economists use.

To purpose of this study is to contribute to our understanding of the factors that underlie the large differences among estimates of the gains from trade liberalisation. To this end we apply meta-analysis to a dataset extracted from 110 studies that present simulated assessments of global trade liberalisation scenarios under the DDA. Hess and von Cramon-Taubadel (2008) demonstrate that a meta-regression that includes model characteristics (M), the nature of the data used in the modelling exercise (D), and the nature of the simulated liberalisation scenarios (L) as covariates produces plausible estimates, but explains only roughly one-third of the variance in the dependent variable 'simulated global welfare change'. However, trade simulation models are highly complex and embody many assumptions and parameters that are effectively hidden from the outside observer and therefore not amenable to inclusion in a meta-regression. Hertel (1999) refers in this context to the "model pre-selection" that modellers engage in before they produce simulation results. Even if modellers wanted to provide complete information on all aspects of this pre-selection, most publication outlets (journal articles, working papers, policy briefs, etc.) cannot provide the space that would be required to do so.

If pre-selection takes place, it could be expected to lead to author fixed effects in estimates of the gains from trade liberalisation. Each individual author could be expected to make similar sets of pre-selection decisions in the various simulation studies that he/she contributes to, and these studies would therefore all tend to report estimated gains that are higher or lower than the sample mean, all other things being equal. We test this hypothesis and find significant fixed effects for the top 23 authors in the field, who together have contributed to 77% of the 110 studies in the sample. We interpret this as evidence that leading authors in the field do indeed engage in model pre-selection that incorporates their individual beliefs about how economies function and how this should be modelled into their simulations.

2. Data and methodology

2.1 Data

Hess and von Cramon-Taubadel (2008) conduct a meta-analysis of the simulated welfare changes due to trade liberalisation scenarios that are reported in a representative literature sample of 110 studies. The literature sample was collected between December 2006 and August 2008 as outlined in Hess and von Cramon-Taubadel (2008). The sample covers the publication years 1996 through 2006 and includes not only peer-reviewed journal articles but also 'gray literature' such as reports and working papers by governments and NGOs that probably have more direct influence on policy makers and other stakeholders.[3] The 110 studies report on the results of 468 different simulation experiments and generate roughly 5800 individual measures of welfare gains at the country/region level. The meta-analysis reported in Hess and von Cramon-Taubadel (2008) regress these 5800 welfare gains on three sets of covariates that capture model characteristics (M), the nature of the data used in the modelling exercise (D) and the nature of the simulated liberalisation scenario (L).

2.2 The basic model

In this study we focus on global rather than national or regional welfare changes due to trade liberalisation scenarios. While policy makers will be primarily interested in estimates of the impact of trade liberalisation on welfare in their respective countries', large aggregate estimates of global welfare changes have been frequently cited by proponents of liberalisation to underline the case for global free trade. Hence, the meta-regression estimated in this study takes the general form:

$$GWC = f(M, D, L) + u \qquad (1)$$

where GWC = global welfare change, M, D and L are the categories of covariates defined above, and u is a random error term. Various specifications of this general equation are estimated using the results of the 468 simulation experiments reported on in the 110 studies in our literature sample.

2.3 Specification of the dependent variable and the covariates

The studies in the literature sample report the dependent variable GWC in one of three different manners: (i) absolute change in GDP; (ii) percentage change in GDP, and (iii) percentage change in equivalent variation. We include dummy variables on the right hand side (RHS) of equation (1) to account for any systematic difference in these measures, with percentage change in GDP being the default. An additional dummy variable is included to identify studies that report a partial equilibrium (PE) measure of welfare plus government revenue. The following covariates are included in the categories M, D and L (descriptive statistics in Table 1):

<u>Model characteristics (M)</u>: This category begins with a set of eleven dummy variables that distinguish between different types of general equilibrium (GE) models. These dummies indicate whether a GE model is single- or multi-country; whether it is comparative static or dynamic; whether it allows for capital stock accumulation; whether it assumes constant or increasing returns to scale (CRTS or IRTS); and whether it include low or high so-called Armington elasiticies, where 'low' means that standard values from the Global Trade Analysis Project (GTAP) are used, and 'high' refers to any model that either assumes higher Armington elasticities or does not make the Armington assumption at all (thereby implicitly assuming perfect substitution and infinite Armington elasticities – see Sarker and Surry, 2006). Many combinations of these model characteristics are possible, but some do not occur in the literature sample, so only eleven are

[3] A detailed bibliography of the studies included in the literature sample is available from the authors on request.

included on the RSH of equation (1). Although the interactions between these characteristics are complex, dynamics, IRTS, capital accumulation and high Armington elasticities are expected to lead to higher simulated welfare gains. Most single-country GE models assume fixed trade balances and exchange rates, and most do not allow for endogenous capital inflows. Hence they are expected to generate lower welfare gains that multi-country models.

Table 1: Descriptive statistics

Category					Variable	Mean	Median	Min.	Max.	Std. Dev.
					Dependent Variable: Simulated global welfare change in mill. US$	64118	17004	-98119	2587180	192120
					Dependent. variable is absolute change in GDP (2001US$)	0.120	0	0	1	0.325
					Dependent variable is % of baseline EV	0.103	0	0	1	0.304
					Dependent variable is sum of PE surplus and government revenue	0.098	0	0	1	0.298
Category M (model characteristics)	Multi-country GE	Comp. static	CRTS	Capital accum.	Armingtons high 3*	0.034	0	0	1	0.182
			CRTS		Armingtons low	0.135	0	0	1	0.342
			CRTS		Armingtons high	0.013	0	0	1	0.113
			IRTS	Fixed	Armingtons low	0.032	0	0	1	0.176
			IRTS	Capital accum.	Armingtons low	0.073	0	0	1	0.260
			IRTS		Armingtons high	0.019	0	0	1	0.137
		Dynamic	CRTS	Capital fixed	Armingtons high	0.006	0	0	1	0.080
			CRTS		Armingtons low	0.132	0	0	1	0.339
			CRTS	Accum.	Armingtons high	0.047	0	0	1	0.212
	Single-country	Capital fixed			Armingtons low	0.028	0	0	1	0.165
		Capital accumulation			Armingtons low	0.006	0	0	1	0.080
	PE	Some primary factors modelled	Short run		No Armington	0.011	0	0	1	0.103
					With Armington	0.077	0	0	1	0.267
			Long run		With Armington	0.032	0	0	2	0.199
		...none modelled			No Armington	0.006	0	0	1	0.080
	One or more countries' trade balance fixed					0.094	0	0	1	0.292
	Length of dynamic simulation run					5.222	0	0	28	6.983
	[Length of dynamic simulation run]²					75.927	0	0	784	144.102
	Length of pre-simulation projection of database					1.395	0	0	14	3.360
	Number of regions depicted					22.049	16	1	161	32.077
	Number of Sectors depicted					18.100	18	1	78	12.041
	Ad hoc modifications to elasticities					0.021	0	0	1	0.145
	Own econometric estimates of elasticities					0.024	0	0	1	0.152
Category L (liberalisation scenario)	Changes in tariff protection					-356045	-73279	-2801190	59342	557926
	Changes in export subsidies					-28113	-343	-747241	148378	73025
	Changes in blue and green box policies					-63953	0	-1409680	76670	186303
	Changes in non-tariff barriers based on gravity models					-14317500	0	-1007890000	0.000	97711200
	Changes in non-tariff barriers based on customs docs.					-39763300	0	-3023660000	0.000	274399000
	Changes in non-tariff barriers based on price wedges					-2193	0	-438839	0.000	27535
	Shocks to technical change or related variables					-2184	0	-618492	15455	32859
Category D (database)	Database GTAP-3					0.143	0	0	1	0.351
	Database GTAP-4					0.147	0	0	1	0.355
	Database GTAP-5					0.342	0	0	1	0.475
	Database GTAP-6					0.167	0	0	1	0.373
	Non-GTAP database with bound tariffs					0.171	0	0	1	0.377
	Non-GTAP database with applied tariffs					0.030	0	0	1	0.171

** Models that depict three primary production factors.*
Source: Own calculations with literature sample.

Four analogous dummy variables are included to distinguish between different types of PE models depending on: whether primary factors are modelled or not; whether the model is used to simulate short-run or long-run reactions to liberalisation scenarios; and whether the model is based on the Armington assumption. Short-run simulations and the use of the Armington assumption are generally expected to lead to lower welfare gains, as are most simulations that explicitly model primary factors, because this usually involves the imposition of land or labour constraints.

Additional covariates in the category M include whether or not one or more countries' trade balances are assumed to be fixed, which is expected to lead to lower simulated welfare gains. The length in years of a dynamic simulation run is included to test the hypothesis that longer simulations generate larger welfare gains (van der Mensbrugghe, 2006). This variable is also included in quadratic form to allow for non-linearity, and for comparative static models the length of the simulation run is assumed to be zero. The length in years of any database projections that are undertaken prior to a simulation run is also included in category M; such projections are often undertaken to incorporate the impact of liberalisation steps that are assumed will take place prior to the liberalisation experiment that is the actual subject of the simulation. For example, before simulating of a DDA liberalisation scenario, a modeller working with a 2000 database might have projected this database ahead to incorporate the anticipated impact of the 'Fischler Reform' measures (support price reductions and the decoupling of direct payments to farmers) that the EU adopted in 2003. Such 'prior' liberalisation steps are expected to increase the welfare gains that result from a given DDA liberalisation scenario. The number of regions and the number of sectors depicted in a model are included as covariates in category M to test the hypothesis that aggregation is associated with averaging and weighing problems that lead to lower simulated welfare gains (Martin et al, 2003). Finally, one dummy variable indicates whether the authors of a study report that they have made *ad hoc* modifications to elasticities that they have taken from the literature or that are part of the modelling platform that they employ, and another similar dummy indicates whether the authors report using elasticities that they have estimated themselves. Authors can be expected to make such adjustments if they believe that 'standard' values are too large or too small. The impact of these covariates on simulated welfare gains is therefore ambiguous.

<u>Liberalisation scenarios (L)</u>: It is not an easy matter to quantify liberalisation scenarios. Studies that claim to simulate the same reduction in tariffs, for example, can differ depending on whether bound or applied tariffs are considered, on the underlying aggregation, and on how preferences and tariff rate quotas are treated. These questions cause headaches not only for modellers but have also bedevilled the actual DDA negotiations on market access.

To quantify the size of liberalisation steps, we use a procedure described in detail in Hess and von Cramon-Taubadel (2008). According to this procedure the regional and product aggregation underlying each simulation in our literature sample is re-created using a comprehensive historical reference database on applied and bound tariffs, production volumes and trade flows. Consider a study that simulates the impact of an X% reduction in tariffs. We first use the reference database to derive the initial *ad valorem* MFN tariffs for all countries/regions and products/aggregate products covered in a study. The value of production for each product/product aggregate is multiplied by the corresponding initial tariff to generate a monetary measure of the value of the each tariff. This in turn is multiplied by the X% reduction and summed over all products/aggregate products to create a standardised measure of the magnitude of the tariff reduction that the study simulates. Tariff reductions are expected to lead to welfare gains, *ceteris paribus*.

Changes in export subsidies are quantified in a similar manner using the reference database; the production value of the product in question is multiplied by the corresponding tariff rate (on the assumption that the price gap bridged by export subsidies can be approximated by the tariff that applies to the good in question) and the simulated percentage reduction in export subsidies. Reducing export subsidies is also expected to lead to welfare gains. Changes in blue and green box policies are approximated by multiplying the relevant production value by the reported proportional change in policy levels. Some PE models depict blue and green box policies in a more sophisticated manner, but our simple method reflect the simple way in which most GE models depict these policies. While reducing blue box policies is expected to increase welfare, green box policies are generally considered to be either welfare neutral (decoupled payments) or welfare enhancing (investments in productivity, infrastructure, etc.). Hence the combined impact of reducing blue and green box policies is ambiguous *a priori.*

Quantifying the size of a simulated reduction in non-tariff barriers (NTBs) is especially challenging, because most studies that analyse NTB reduction provide little information on the baseline NTB levels that they assume. The studies that do analyse NTB reductions in our literature sample all use one of three basic approaches to quantify NTBs: gravity models; reviews of customs documents; and observed price wedges (e.g. between cif and fob prices). We multiply the production values of the products in question with the proportional NTB reductions reported in a study as well as one of three dummy variables, one for each of the basic approaches to quantifying NTBs mentioned above. Reducing NTBs is expected to increase welfare, but the magnitude of this impact might differ according to how authors have quantified NTBs in the first place.

Finally in the category L we include a variable that captures exogenous shocks to technology or productivity that are assumed in some studies. This variable is defined as the product of the assumed proportional change in productivity and the production value of the affected products, and this variable is expected to be positively correlated with welfare gains.

<u>Data (D)</u>: Six dummy variables are included to capture the impact of the different databases that modellers use. These are GTAP-3 through GTAP-6, and non-GTAP databases with bound and non-GTAP databases with applied tariffs. Due to progressive reductions in protection worldwide, earlier databases (e.g. GTAP-3) depict a world with higher protection. Hence, a given proportional liberalisation step simulated using such a database is expected to lead to higher welfare gains than the same step simulated using a later database (such as GTAP-6).

3. Results

3.1 Base model

Table 2 presents the results of the OLS estimation of the model in equation (1) using the covariates outlined in the previous section. Since the Breush-Pagan Test rejects the assumption of homoskedasticity ($p < 0.01$), we report White's robust standard errors. The first set of columns provides estimates for the entire literature sample of 110 publications, while the second set of columns provides estimates for a reduced sample of 107 publications from which three outliers (identified using Cook's distance measure) have been removed. The three 'outlier' studies report simulated global welfare gains from liberalisation that are up to four times as large as any others in our literature sample and based on either Brown et al. (2002) or Lodefalk and Kinnman (2006). The former model is characterised by a unique combination of features (IRTS and imperfect competition together with a fixed capital stock and high Armington elasticities, own estimates of NTBs and endogenous flows of foreign direct investment), while the latter employ an approach to modelling monopolistic competition in GTAP that, according to Hertel et al. (2006, p. 10), makes the model "less stable".

The results in Table 2 generally confirm the theoretical expectations formulated above. Models that employ high values of the Armington elasticities tend to simulate larger welfare gains from liberalisation. Longer dynamic simulation runs lead to larger estimates of welfare gains, while pre-simulation projections have the opposite effect. Larger tariff and export subsidy reductions are associated with larger welfare gains, as are simulation runs which include exogenous shocks to technical change. Models that employ earlier databases also simulate larger welfare gains. Overall, these results confirm those reported in Hess and von Cramon-Taubadel (2008). However, their analysis is based on roughly 5800 observations of simulated welfares change at the country/region level rather than 468 simulations of global welfare change as is the case here. The aggregation of country/region observations to global observations leads to loss of information and a considerable reduction in degrees of freedom, which explains why many coefficients in Table 2, despite having the expected signs, are not statistically significant.

Furthermore, the explanatory power of the base model reported in Table 2 is rather limited. The coefficient of determination for the full sample indicates that only about one third of the variance in simulated global welfare changes can be explained by the covariates included in the base model (adjusted $R^2 = 0.32$). This improves to 56% after the three outlier studies have been removed. In either case, a considerable proportion of the variation in simulated global welfare gains in our literature sample remains unexplained.

Table 2: OLS results for the estimation of equation (1)

Variable						Base model (110 studies)					Outliers removed (107 studies)				
						Coefficient	Standard error	t-value	p-value		Coefficient	Standard error	t-value	p-value	
Dependent. variable is absolute change in GDP (2001US$)						50643.6	15374.1	3.29	0.00	***	47525.4	14487.9	3.28	0.00	***
Dependent variable is % of baseline EV						52354.9	19325.5	2.71	0.01	***	55305.5	14410.8	3.84	0.00	***
Dependent variable is sum of PE surplus and government revenue						22265.9	27843.2	0.80	0.42		32339.1	14539.1	2.22	0.03	**
Category M (model characteristics)	Multi-country GE	Comp. static	CRTS	Capital accum.	Armingtons high 3	107821.0	103305.0	1.04	0.30		162603.0	58716.1	2.77	0.01	***
			CRTS		Armingtons low	-26993.0	15898.2	-1.70	0.09	*	-15511.2	8155.8	-1.90	0.06	*
			CRTS		Armingtons high	-141797.0	73610.3	-1.93	0.05	*	14306.3	19260.5	0.74	0.46	
			IRTS	Fixed	Armingtons low	-122742.0	71017.1	-1.73	0.08	*	-593.9	17701.7	-0.03	0.97	
			IRTS	Capital accum.	Armingtons low	-74030.4	39293.1	-1.88	0.06	*	13909.6	13186.1	1.05	0.29	
			IRTS		Armingtons high	137178.0	72633.6	1.89	0.06	*	76551.6	42652.5	1.79	0.07	*
		Dynamic	CRTS	Capital fixed	Armingtons high	8407.9	61796.9	0.14	0.89		66300.7	46650.9	1.42	0.16	
			CRTS		Armingtons low	-88980.3	42288.2	-2.10	0.04	**	-14319.0	16336.2	-0.88	0.38	
			CRTS	Accum.	Armingtons high	-52655.6	43082.8	-1.22	0.22		30203.4	18235.9	1.66	0.10	*
	Single-country GE	Capital fixed			Armingtons low	-16485.9	24687.5	-0.67	0.50		-21700.7	10916.5	-1.99	0.05	**
		Capital accumulation			Armingtons low	-30634.6	19578.4	-1.56	0.12		-37713.7	25211.4	-1.50	0.14	
	PE	Some primary factors modelled		Short run	No Armington	-43953.8	36974.1	-1.19	0.24		-25940.9	16180.8	-1.60	0.11	
					With Armington	-52635.9	38656.3	-1.36	0.17		-38939.8	21179.0	-1.84	0.07	*
				Long run	With Armington	-13919.5	22607.6	-0.62	0.54		-12821.0	12656.0	-1.01	0.31	
		...none modelled			No Armington	-29238.6	35763.7	-0.82	0.41		-5461.8	14361.5	-0.38	0.70	
	One or more countries' trade balance fixed					84155.6	89189.1	0.94	0.35		-23242.4	15308.2	-1.52	0.13	
	Length of dynamic simulation run					10988.6	4981.5	2.21	0.03	**	1586.2	1973.9	0.80	0.42	
	[Length of dynamic simulation run]²					-603.7	223.7	-2.70	0.01	***	-194.0	127.8	-1.52	0.13	
	Length of pre-simulation projection of database					-4364.4	2062.4	-2.12	0.03	**	-4255.1	978.6	-4.35	0.00	***
	Number of regions * number of sectors					2.3	32.9	0.07	0.94		1.3	10.6	0.12	0.90	
	Ad hoc modifications to elasticities					-33339.2	43649.5	-0.76	0.45		-3752.3	15180.3	-0.25	0.80	
	Own econometric estimates of elasticities					-13214.3	19158.4	-0.69	0.49		10750.3	9690.4	1.11	0.27	
Category L (liberalisation scenario)	Changes in tariff protection					-0.16	0.08	-2.12	0.03	**	-0.06	0.01	-5.22	0.00	***
	Changes in export subsidies					-0.46	0.44	-1.03	0.30		-0.29	0.12	-2.48	0.01	**
	Changes in blue and green box policies					0.09	0.06	1.55	0.12		0.01	0.02	0.51	0.61	
	Changes in non-tariff barriers based on gravity models					0.00	0.00	-1.35	0.18		0.00	0.00	0.02	0.98	
	Changes in non-tariff barriers based on customs docs.					0.00	0.00	0.96	0.34		0.00	0.00	-0.74	0.46	
	Changes in non-tariff barriers based on price wedges					-0.06	0.05	-1.15	0.25		-0.01	0.04	-0.15	0.88	
	Shocks to technical change or related variables					0.13	0.04	3.14	0.00	***	0.17	0.02	8.31	0.00	***
Category D (database)	Database GTAP-3					-13136.5	19879.6	-0.66	0.51		6661.5	10078.9	0.66	0.51	
	Database GTAP-4					72002.7	29848.4	2.41	0.02	**	33452.1	11730.2	2.85	0.00	***
	Database GTAP-5					-13833.5	21129.8	-0.65	0.51		12520.4	5868.9	2.13	0.03	**
	Database GTAP-6					-44979.1	35554.6	-1.27	0.21		6101.9	12630.5	0.48	0.63	
	Non-GTAP database with bound tariffs					23449.0	18833.9	1.25	0.21		9308.2	11078.3	0.84	0.40	
	Non-GTAP database with applied tariffs					3887.8	23920.7	0.16	0.87		-6117.5	12413.0	-0.49	0.62	
Mean of dependent variable						64118					43778				
Standard deviation of dependent variable						192120					75466				
Standard error of regression						158930					50086				
R² (adjusted R²)						0.370 (0.316)					0.596 (0.560)				
F-statistic (df1,df2)						14.57 (37,430)					17.13 (37,408)				

Source: Own calculations using literature sample

This is perhaps not surprising because many of the covariates outlined above are clearly at best rough approximations and proxies. In particular, many factors could only be included as qualitative variables. As outlined in Hess and von Cramon-Taubadel (2008), most studies do not provide comprehensive information on the exact parameter values used in a model, what modifications were made to the basic model and dataset, and how liberalisation scenarios were implemented. Failing such information, it was for example only possible to classify Armington elasticities into the categories 'low' and 'high'. An attempt to contact authors via an internet survey and request more detailed information on the studies that they had published did not improve the situation notably; in many cases authors were not able, after several years, to exactly reconstruct how a particular simulation had been carried out. These deficiencies are to some extent understandable; many publication outlets for trade policy modelling studies do not provide sufficient space for a complete documentation of all relevant details, and most users of these studies are not interested or sufficiently versed in these details. Furthermore, as models become increasingly refined and databases are updated, it becomes increasingly costly for researchers to keep comprehensive records on old model versions and outdated databases, and it becomes increasingly unlikely that doing so will produce any future benefits.

3.2 Accounting for pre-selection effects

This leads us to explore additional explanatory variables that might capture some of the pre-selection effects discussed in the introduction. Some of these pre-selection effects will lead to measurement error in our explanatory variables. For example, it could be that by 'high' Armington elasticities one author means values that are three times as high as the standard GTAP values, while another author means values that are only twice as high. However, since many authors do not report exactly what they mean by 'high', we are only able to include a simple dichotomous effect in our meta-regression. However, pre-selection might also take place with reference to characteristics of models, databases and liberalisation scenarios that we have completely failed to account for but that influence simulation results in a systematic manner.

To test for the existence of pre-selection effects we consider three further specifications of the base model in equation (1). One of these includes publication fixed effects, one includes fixed effects for the lead author of a study, and one includes fixed effects for the most experienced author who has contributed to a study. In the following we explain these specifications and the results that they generate in greater detail.

<u>Publication fixed effects</u>: We are not able to include fixed effects for all 110 (107 without outliers) studies in our literature sample because some of these studies are characterised by unique combinations of the covariates already included in the estimation of the base model in equation (1). Hence, to avoid perfect collinearity only 86 individual dummy variables for publication fixed effects are retained.

Lead author fixed effects: We assume that the author named first on a publication is the lead author. Overall, 146 authors have contributed to the 110 studies in our literature sample, of which 71 appear as lead authors. After eliminating lead author effects that are perfectly collinear with the covariates that are included in the base model, we are left with 65 dummy variables for the lead authors listed alphabetically in Table 3. We see that individual lead authors have contributed as many as 58 and as few as one of the 468 observations that we extract from the 110 studies in the literature sample.

Table 3: Lead authors in the literature sample

First Author	Obs. in sample	First Author	Obs. in sample	First Author	Obs. in sample	First Author	Obs. in sample
Achterbosch	12	Conforti	11	Gilbert	4	OECD	2
Agbenyegah	6	Daude	1	Glismann	6	Peters	7
Ahmen	2	deCordoba	6	Gurgel	2	Poonyth	3
Anderson	46	Decreux	10	Harrison	8	Rae	4
Annabi	10	Dee	1	Hertel	12	Redmond	8
Antimiani	2	Dessus	1	Hoekman	2	Rege	4
Bchir	7	Diao	6	Hosoe	2	Shakur	2
Beghin	16	Dimaranan	4	Jensen	12	Shantong	4
Beutre	4	Elbehri	13	Jha	4	Sohinger	3
Bouët	5	Fan	2	Kerkelä	1	Terra	3
Bradford	1	Felloni	8	Kowalski	9	Tongzon	1
Britz	3	Flasbarth	6	Laird	4	Tumbarello	2
Brown	20	Fontagné	4	Lejour	4	Wahl	2
Cernat	3	Francois	58	Lips	11	Wang	3
Cheong	2	Frandsen	2	Lodefolk	12	vanMeijl	5
Chiang	4	Fugazza	3	Mai	15	Witzke	2
Chow	2	Ghosh	1	Matthews	6	Yu	3
Cockburn	4	Giblin	7	Nagarajan	3		

Source: Own depiction based on literature sample.

Most experienced author fixed effects: While the lead author is usually the individual who has coordinated or contributed the most to a study, this individual will not necessarily have had the most influence on the actual modelling of the liberalisation scenarios presented in that study. The internet survey that we carried out in an attempt to collect more information on model characteristics, databases etc. revealed that in some cases the lead author was not directly involved in the actual modelling at all. Many applied trade models have evolved over years under the auspices of particular researchers who appear relatively often in our literature sample. Analysis reveals that 23 of the 146 authors who have contributed to the studies in our sample, appear on 77% of these 110 studies and have contributed to 360 of the 468 observations on simulated global welfare gains that we extract from these studies. Most of these 23 authors are both familiar to anyone who has worked in the area of trade policy simulation (e.g. Harrison, Francois, Brown, Hertel) and many have fostered the development of particular modelling platforms or ‘schools’ over the years. Hence, these individuals will be responsible for many of any pre-selection effects in our literature sample.

To capture the influence exercised by these 'most experienced authors' (MEA) we rank all authors by the frequencies with which they appear as lead or co-authors in our literature sample. The MEA for a given study and the observations derived from this study is the author with the highest frequency of appearances. If all the authors who have contributed to a study have the same frequency ranking, this study is coded as having the MEA 'other'. The results of this procedure are summarised in Table 4.

Table 4: Most experienced authors in the literature sample

Most experienced author	Obs. in sample	Most experienced author	Obs. in sample	Most experienced author	Obs. in sample
Achterbosch	9	Diao	6	Mai	15
Anderson	46	Elbehri	3	Other	108
Beghin	16	Francois	58	Wahl	14
Brown	20	Harrison	10	Wang	5
Chiang	4	Hertel	26	Van Tongeren	14
Cockburn	14	Jean	16	Vanzetti	24
Conforti	13	Laird	3	Yu	17
Decreux	10	Lips	13	Zhai	4

Source: Own depiction based on literature sample.

3.3 Results of specifications that include model pre-selection effects.

We re-estimate the base model in equation (1) augmented by the three different types of pre-selection variable defined above. Fixed effect estimation is used because it is very likely that the pre-selection effects that we hypothesise will be correlated with covariates in the categories M, L and D. A simple multinomial logit estimation of the MEA dummy variables on these covariates (available from the authors on request) confirms this is the case. Table 5 presents information on the goodness of fit for the base model and the augmented base models. Table 5 also presents results for weighted estimations of the base and augmented models in which each observation is divided by the sum of squared residuals over all observations taken from the same study. In this way the regression places greater weight on studies that produce results that have a smaller variance. Detailed tables that present the full results for each of the three augmented models are presented in Appendix Tables A (publication fixed effects), B (lead author fixed effects) and C (MEA fixed effects).

Adding a fixed effect for each individual publication clearly improves the explanatory power of the model. However, this specification is not very informative because it simply confirms that each publication is unique without providing any indication of what might be driving these differences. Adding lead author fixed effects also improves the fit of the base model considerably, albeit somewhat less than the publication fixed effects. However, the structure of the literature sample implies that lead author fixed effects (of which there are 65) are closely related to publication fixed effects (of which there are 86).

The specification with 23 MEA fixed effects is comparatively parsimonious and also improves the fit of the base model considerably. Furthermore, in the weighted estimations this specification performs almost as well or better than the other specifications, increasing the R^2 to 93% in the full sample. Appendix Table C reveals that inclusion of fixed effects generally leads to a larger number of the covariates in the base model being significant; the signs of the coefficients associated with these covariates are for the most part in accordance with expectations based on theory.

Table 5: Goodness of fit measures for models that include model pre-selection effects

Model	Full sample		Outliers removed	
	R^2	Adjusted R^2	R^2	Adjusted R^2
Base model (see Table 2)	0.37	0.32	0.60	0.56
Base model, weighted σ^2	0.84	0.83	0.65	0.62
Base model with publication fixed effects	0.59	0.45	0.77	0.68
Base model with publication fixed effects, weighted σ^2	0.94	0.92	0.70	0.62
Base model with lead author fixed effects	0.54	0.41	0.74	0.67
Base model with lead author fixed effects, weighted σ^2	0.95	0.94	0.71	0.64
Base model with MEA fixed effects	0.49	0.41	0.66	0.61
Base model with MEA fixed effects, weighted σ^2	0.94	0.93	0.74	0.70

Source: Own calculations based on literature sample.

3.4 Nonlinear versions of the base model and MEA fixed effects models

We next consider whether the explanatory power of the meta-regressions presented above could be improved by allowing for possible non-linearity. We re-estimate these regressions using three common transformations of the dependent variable, namely the Box-Cox, the Zellner and the Arcsin transformations (for a discussion see Linton et al 1997). Results are presented in Table 6 for the base model and the base model augmented by MEA fixed effects.

The results indicate that Box-Cox transformations with low λ-values lead to some improvement in the goodness of fit of estimations with the total sample (plus 10-12%). However, no notable improvements in goodness of fit are attained in the sample with outliers removed. This suggests that the strong non-linearity introduced by lower values of λ helps the meta-regression to fit the outlier observations.

4. Conclusion

Estimates of the benefits from global trade liberalization are frequently cited by economists and policy makers. However, estimates generated by trade policy simulation models vary considerably even for apparently similar liberalisation scenarios. We demonstrate that one-third to one-half of the variation in estimates of the benefits of liberalisation under the Doha Development Agenda can be explained using a meta-regression in which model characteristics, the database employed in a model, and information on the nature of the simulated liberalisation scenario are used as covariates. We also demonstrate that adding fixed effects for the 23 most prolific authors in our literature sample improves the fit of these meta-regressions significantly. This is evidence that individual leading authors in the field engage in model pre-selection that incorporates their individual beliefs about how economies function and how this should be modelled into their simulations, and that this model pre-selection systematically influences the estimates of global welfare gains that they report.

Table 6: Goodness of fit of nonlinear versions of the base and MEA fixed effects models

Transformation of the dependent variable	λ	Base model				Base model with MEA fixed effects			
		Total sample		Outliers removed		Total sample		Outliers removed	
		R^2	Adj. R^2	R^2	Adj. R^2	R^2	Adj. R^2	R^2	Adj. R^2
No transformation	-	0.37	0.32	0.60	0.56	0.49	0.41	0.66	0.61
BoxCox	0.2	0.46	0.42	0.44	0.39	0.56	0.50	0.51	0.43
BoxCox	0.25	0.49	0.44	0.48	0.43	0.59	0.53	0.55	0.49
BoxCox	0.3	0.50	0.45	0.51	0.47	0.60	0.55	0.59	0.52
BoxCox	0.35	0.50	0.46	0.53	0.49	0.61	0.55	0.61	0.55
BoxCox	0.4	0.50	0.46	0.55	0.51	0.61	0.56	0.62	0.57
BoxCox	0.5	0.49	0.45	0.57	0.53	0.61	0.55	0.64	0.59
BoxCox	0.9	0.40	0.35	0.60	0.56	0.52	0.44	0.66	0.61
BoxCox	0.95	0.38	0.33	0.60	0.56	0.50	0.43	0.66	0.61
Zellner	0.35	0.37	0.32	0.60	0.56	0.49	0.41	0.66	0.61
Zellner	0.5	0.37	0.32	0.60	0.56	0.49	0.41	0.66	0.61
Zellner	0.9	0.37	0.32	0.60	0.56	0.49	0.41	0.66	0.61
Arcsin	0.35	0.37	0.31	0.61	0.57	0.49	0.41	0.67	0.62
Arcsin	0.5	0.37	0.31	0.61	0.57	0.49	0.41	0.67	0.62
Arcsin	0.9	0.37	0.31	0.61	0.57	0.49	0.41	0.67	0.62

Source: Own calculations based on literature sample.

Given the model specifications and data commonly used in our representative literature sample, a safe estimate of the gains that could be expected from global elimination of tariffs and export subsidies would fall between 100 and 230 billion 2001 U.S. dollars. The breadth of this range may appear disappointing at first glance. In view of the complexity of the world economy, the limited precision of the data that are available, the complications introduced by the aggregation of products and countries, and the incomplete nature of economic theory, it would perhaps be unreasonable to expect more precision.

Much more research is needed to develop stronger consensus on appropriate trade policy simulation models. In the meantime, improving standards of documentation and transparency is of paramount importance in the modelling field. The scientific community needs to establish a peer review system that is capable of ensuring the scientific quality of trade policy simulations when they are being used to support political decision making, rather than years later. Furthermore, given the variance in simulation results documented above, policymakers and economists should refrain from treating these results as facts.

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Appendix Table A: Base model with publication fixed effects

Variable						Base model (110 studies)					Outliers removed (107 studies)				
						Coefficient	Standard error	t-value	p-value		Coefficient	Standard error	t-value	p-value	
Dependent. variable is absolute change in GDP (2001US$)						1024520.00	509739.00	2.01	0.05	**	229730.00	105023.00	2.19	0.03	**
Dependent variable is % of baseline EV						981408.00	589241.00	1.67	0.10	*	179267.00	114159.00	1.57	0.12	
Dependent variable is sum of PE surplus and government revenue						1440920.00	874572.00	1.65	0.10		240813.00	170535.00	1.41	0.16	
Category M (model characteristics)	Multi-country GE	Comp. static	CRTS	Capital accum.	Armingtons high 3	190716.00	426916.00	0.45	0.66		27109.90	195910.00	0.14	0.89	
			CRTS		Armingtons low	6044.99	5097.63	1.19	0.24		6926.70	4984.49	1.39	0.17	
			CRTS		Armingtons high	124886.00	121195.00	1.03	0.30		16117.90	51158.70	0.32	0.75	
			IRTS	Fixed	Armingtons low	508319.00	292139.00	1.74	0.08	*	7168.43	50538.90	0.14	0.89	
			IRTS	Capital accum.	Armingtons low	561374.00	325566.00	1.72	0.09	*	63886.00	55850.90	1.14	0.25	
			IRTS		Armingtons high	241210.00	82246.90	2.93	0.00	***	138665.00	61562.10	2.25	0.02	**
		Dynamic	CRTS	Capital fixed	Armingtons high	726862.00	358347.00	2.03	0.04	**	195846.00	85216.70	2.30	0.02	**
			CRTS		Armingtons low	58950.50	119755.00	0.49	0.62		-151337.00	27081.40	-5.59	0.00	***
			CRTS	Accum.	Armingtons high	644007.00	354961.00	1.81	0.07	*	110945.00	72652.20	1.53	0.13	
	Single-country GE	Capital fixed			Armingtons low	-1235190.00	671589.00	-1.84	0.07	*	-365976.00	142421.00	-2.57	0.01	**
		Capital accumulation			Armingtons low	-1211880.00	671589.00	-1.80	0.07	*	-342663.00	142421.00	-2.41	0.02	**
	PE	Some primary factors modelled		Short run	No Armington	-1342920.00	736092.00	-1.82	0.07	*	-402225.00	162234.00	-2.48	0.01	**
					With Armington	-1688660.00	952458.00	-1.77	0.08	*	-427869.00	200869.00	-2.13	0.03	**
				Long run	With Armington	-1410460.00	855737.00	-1.65	0.10		-231958.00	166964.00	-1.39	0.17	
		...none modelled			No Armington	31328.00	17041.10	1.84	0.07	*	14075.50	1883.21	7.47	0.00	***
	One or more countries' trade balance fixed					-1258930.00	1106320.00	-1.14	0.26		50745.90	219968.00	0.23	0.82	
	Length of dynamic simulation run					-165033.00	107975.00	-1.53	0.13		-6876.23	20151.10	-0.34	0.73	
	[Length of dynamic simulation run]²					6856.99	4609.23	1.49	0.14		158.57	894.64	0.18	0.86	
	Length of pre-simulation projection of database					-26945.40	16694.60	-1.61	0.11		-2288.82	2705.57	-0.85	0.40	
	Number of regions * number of sectors					1100.56	884.53	1.24	0.21		-54.23	167.48	-0.32	0.75	
	Ad hoc modifications to elasticities					185818.00	193706.00	0.96	0.34		-78745.00	50317.70	-1.57	0.12	
	Own econometric estimates of elasticities					89805.10	57556.80	1.56	0.12		5169.73	10613.40	0.49	0.63	
Category L (liberalisation scenario)	Changes in tariff protection					-0.31	0.14	-2.30	0.02	**	-0.08	0.02	-4.76	0.00	***
	Changes in export subsidies					-0.55	0.58	-0.95	0.34		-0.21	0.13	-1.59	0.11	
	Changes in blue and green box policies					0.07	0.07	0.97	0.33		0.03	0.02	1.37	0.17	
	Changes in non-tariff barriers based on gravity models					0.00	0.00	-1.79	0.07	*	0.00	0.00	0.06	0.95	
	Changes in non-tariff barriers based on customs docs.					0.00	0.00	1.43	0.15		0.00	0.00	-1.06	0.29	
	Changes in non-tariff barriers based on price wedges					0.00	0.04	0.06	0.95		-0.02	0.04	-0.58	0.56	
	Shocks to technical change or related variables					0.12	0.04	3.11	0.00	***	0.13	0.02	5.64	0.00	***
Category D (database)	Database GTAP-3					30174.10	6191.73	4.87	0.00	***	38257.60	1172.35	32.63	0.00	***
	Database GTAP-4					340105.00	276548.00	1.23	0.22		101102.00	87110.60	1.16	0.25	
	Database GTAP-5					-610084.00	413852.00	-1.47	0.14		43078.00	73991.40	0.58	0.56	
	Database GTAP-6					-405993.00	298357.00	-1.36	0.17		-2213.58	53204.90	-0.04	0.97	
	Non-GTAP database with bound tariffs					885914.00	491050.00	1.80	0.07	*	218227.00	107195.00	2.04	0.04	**
	Non-GTAP database with applied tariffs					242477.00	91465.70	2.65	0.01	***	187173.00	32563.40	5.75	0.00	***
Mean of dependent variable						64118					43778				
Standard deviation of dependent variable						192120					75466				
Standard error of regression						142509					42511				
R² (adjusted R²)						0.595 (0.450)					0.768 (0.683)				

Source: Own calculations using literature sample

Appendix Table B: Base model with lead author fixed effects

Variable						Base model (110 studies)					Outliers removed (107 studies)				
						Coefficient	Standard error	t-value	p-value		Coefficient	Standard error	t-value	p-value	
Dependent. variable is absolute change in GDP (2001US$)						205440.00	118097.00	1.74	0.08	*	17447.40	31477.90	0.55	0.58	
Dependent variable is % of baseline EV						1174400.00	759659.00	1.55	0.12		-84107.00	220486.00	-0.38	0.70	
Dependent variable is sum of PE surplus and government revenue						1298530.00	832372.00	1.56	0.12		-7695.28	251958.00	-0.03	0.98	
Category M (model characteristics)	Multi-country GE	Comp. static	CRTS	Capital accum.	Armingtons high 3	489750.00	324133.00	1.51	0.13		292044.00	104024.00	2.81	0.01	***
			CRTS		Armingtons low	39203.70	71940.40	0.54	0.59		26759.50	19424.50	1.38	0.17	
			CRTS		Armingtons high	-109914.00	104331.00	-1.05	0.29		45045.20	26233.10	1.72	0.09	*
			IRTS	Fixed	Armingtons low	178482.00	195793.00	0.91	0.36		35104.80	42326.80	0.83	0.41	
			IRTS	Capital accum.	Armingtons low	154153.00	176198.00	0.87	0.38		35274.80	42037.80	0.84	0.40	
			IRTS		Armingtons high	271092.00	99774.00	2.72	0.01	***	139131.00	60156.50	2.31	0.02	**
		Dynamic	CRTS	Capital fixed	Armingtons high	-17130.20	147126.00	-0.12	0.91		120093.00	53256.20	2.26	0.02	**
			CRTS		Armingtons low	-167212.00	125343.00	-1.33	0.18		-44376.20	37126.80	-1.20	0.23	
			CRTS	Accum.	Armingtons high	-50075.40	127420.00	-0.39	0.69		55054.70	27454.90	2.01	0.05	**
	Single-country GE	Capital fixed			Armingtons low	1280640.00	810020.00	1.58	0.11		-26145.00	239843.00	-0.11	0.91	
		Capital accumulation			Armingtons low	1303950.00	810020.00	1.61	0.11		-2832.11	239843.00	-0.01	0.99	
	PE	Some primary factors modelled		Short run	No Armington	6784.38	6468.46	1.05	0.29		1657.88	1381.41	1.20	0.23	
					With Armington	-564245.00	241689.00	-2.33	0.02	**	-261442.00	87430.20	-2.99	0.00	***
				Long run	With Armington	-7508.50	36069.20	-0.21	0.84		-9431.49	9441.54	-1.00	0.32	
		...none modelled			No Armington	25385.10	15346.70	1.65	0.10	*	11800.10	2045.68	5.77	0.00	***
	One or more countries' trade balance fixed					-250991.00	257943.00	-0.97	0.33		-33254.50	52755.20	-0.63	0.53	
	Length of dynamic simulation run					33631.60	19028.50	1.77	0.08	*	2538.12	3709.55	0.68	0.49	
	[Length of dynamic simulation run]²					-3104.01	1577.37	-1.97	0.05	**	-355.96	384.34	-0.93	0.36	
	Length of pre-simulation projection of database					-1971.81	10068.80	-0.20	0.84		-2853.44	2761.61	-1.03	0.30	
	Number of regions * number of sectors					87.48	147.97	0.59	0.55		-8.62	31.59	-0.27	0.79	
	Ad hoc modifications to elasticities					-146158.00	105069.00	-1.39	0.17		-23919.20	23920.40	-1.00	0.32	
	Own econometric estimates of elasticities					439.71	1145.54	0.38	0.70		600.78	326.84	1.84	0.07	*
Category L (liberalisation scenario)	Changes in tariff protection					-0.25	0.12	-2.11	0.04	**	-0.07	0.01	-4.68	0.00	***
	Changes in export subsidies					-0.42	0.59	-0.72	0.47		-0.31	0.11	-2.69	0.01	***
	Changes in blue and green box policies					0.13	0.08	1.66	0.10	*	0.03	0.02	1.57	0.12	
	Changes in non-tariff barriers based on gravity models					0.00	0.00	-1.77	0.08	*	0.00	0.00	0.13	0.89	
	Changes in non-tariff barriers based on customs docs.					0.00	0.00	1.03	0.30		0.00	0.00	-1.24	0.21	
	Changes in non-tariff barriers based on price wedges					-0.01	0.04	-0.14	0.89		-0.02	0.04	-0.59	0.56	
	Shocks to technical change or related variables					0.12	0.03	4.02	0.00	***	0.13	0.02	6.04	0.00	***
Category D (database)	Database GTAP-3					-166158.00	122866.00	-1.35	0.18		-93874.30	50872.80	-1.85	0.07	*
	Database GTAP-4					-138294.00	102067.00	-1.35	0.18		-68957.60	38521.70	-1.79	0.07	*
	Database GTAP-5					-212046.00	151302.00	-1.40	0.16		-104445.00	51560.70	-2.03	0.04	**
	Database GTAP-6					-236348.00	142137.00	-1.66	0.10	*	-61276.00	37514.10	-1.63	0.10	
	Non-GTAP database with bound tariffs					-1301790.00	816016.00	-1.60	0.11		21472.30	240553.00	0.09	0.93	
	Non-GTAP database with applied tariffs					32195.10	69185.40	0.47	0.64		87044.10	30044.60	2.90	0.00	***
Mean of dependent variable						64118					43778				
Standard deviation of dependent variable						192120					75466				
Standard error of regression						142509					43658				
R^2 (adjusted R^2)						0.540 (0.411)					0.741 (0.665)				

Source: Own calculations using literature sample

Appendix Table C: Base model with most experienced author fixed effects

Variable						Base model (110 studies)					Outliers removed (107 studies)				
						Coefficient	Standard error	t-value	p-value		Coefficient	Standard error	t-value	p-value	
Dependent. variable is absolute change in GDP (2001US$)						67540.90	24430.40	2.76	0.01	***	64587.90	21872.10	2.95	0.00	***
Dependent variable is % of baseline EV						39551.30	26283.40	1.50	0.13		21039.60	16271.00	1.29	0.20	
Dependent variable is sum of PE surplus and government revenue						61020.20	33397.80	1.83	0.07	*	55476.00	19691.90	2.82	0.01	***
Category M (model characteristics)	Multi-country GE	Comp. static	CRTS	Capital accum.	Armingtons high 3	346129.00	256819.00	1.35	0.18		118879.00	64294.30	1.85	0.07	*
			CRTS		Armingtons low	5266.36	21587.80	0.24	0.81		440.13	8929.23	0.05	0.96	
			CRTS		Armingtons high	-59295.60	55098.10	-1.08	0.28		32870.80	19292.70	1.70	0.09	*
			IRTS	Fixed	Armingtons low	58907.10	47446.00	1.24	0.22		70064.90	33018.70	2.12	0.03	**
			IRTS	Capital accum.	Armingtons low	30970.10	44058.30	0.70	0.48		82565.50	29780.20	2.77	0.01	***
			IRTS		Armingtons high	143073.00	71559.50	2.00	0.05	**	73397.90	43425.80	1.69	0.09	*
		Dynamic	CRTS	Capital fixed	Armingtons high	48495.40	68527.50	0.71	0.48		80791.10	50309.50	1.61	0.11	
			CRTS		Armingtons low	-39521.10	32597.30	-1.21	0.23		-31050.90	18028.10	-1.72	0.09	*
			CRTS	Accum.	Armingtons high	160.73	39308.90	0.00	1.00		51829.60	19228.50	2.70	0.01	***
	Single-country GE	Capital fixed			Armingtons low	-40064.60	24499.80	-1.64	0.10		-35305.50	13583.60	-2.60	0.01	***
		Capital accumulation			Armingtons low	-18080.50	28599.40	-0.63	0.53		-46068.00	23890.60	-1.93	0.05	*
	PE	Some primary factors modelled		Short run	No Armington	-68134.30	43012.00	-1.58	0.11		-57154.40	30702.70	-1.86	0.06	*
					With Armington	-90872.00	47217.60	-1.92	0.05	*	-88244.80	29300.20	-3.01	0.00	***
				Long run	With Armington	-40539.10	26858.80	-1.51	0.13		-43469.20	15248.70	-2.85	0.00	***
		...none modelled			No Armington	-25031.40	40172.00	-0.62	0.53		-13849.50	22730.40	-0.61	0.54	
	One or more countries' trade balance fixed					-176178.00	224884.00	-0.78	0.43		-5552.75	21651.90	-0.26	0.80	
	Length of dynamic simulation run					5212.43	3761.04	1.39	0.17		3195.30	2116.16	1.51	0.13	
	[Length of dynamic simulation run]²					-451.47	186.47	-2.42	0.02	**	-315.10	132.07	-2.39	0.02	**
	Length of pre-simulation projection of database					-4403.60	2355.57	-1.87	0.06	*	-3797.99	1204.61	-3.15	0.00	***
	Number of regions * number of sectors					-3.91	75.87	-0.05	0.96		2.92	16.21	0.18	0.86	
	Ad hoc modifications to elasticities					17082.00	67918.90	0.25	0.80		-18571.00	14660.10	-1.27	0.21	
	Own econometric estimates of elasticities					32522.40	52536.60	0.62	0.54		-3203.52	13062.90	-0.25	0.81	
Category L (liberalisation scenario)	Changes in tariff protection					-0.18	0.08	-2.19	0.03	**	-0.06	0.01	-5.61	0.00	***
	Changes in export subsidies					-0.53	0.44	-1.21	0.23		-0.26	0.11	-2.35	0.02	**
	Changes in blue and green box policies					0.13	0.06	1.96	0.05	*	0.02	0.02	1.27	0.21	
	Changes in non-tariff barriers based on gravity models					0.00	0.00	-1.23	0.22		0.00	0.00	0.27	0.79	
	Changes in non-tariff barriers based on customs docs.					0.00	0.00	0.87	0.38		0.00	0.00	-1.01	0.31	
	Changes in non-tariff barriers based on price wedges					-0.02	0.04	-0.52	0.61		-0.01	0.04	-0.40	0.69	
	Shocks to technical change or related variables					0.12	0.03	3.72	0.00	***	0.14	0.02	8.64	0.00	***
Category D (database)	Database GTAP-3					-2529.71	50470.80	-0.05	0.96		44979.00	28868.70	1.56	0.12	
	Database GTAP-4					5736.02	57008.60	0.10	0.92		33084.60	27067.10	1.22	0.22	
	Database GTAP-5					-6523.74	45658.60	-0.14	0.89		32219.00	25944.10	1.24	0.22	
	Database GTAP-6					-67325.30	55328.20	-1.22	0.22		5359.43	28666.60	0.19	0.85	
	Non-GTAP database with bound tariffs					30771.80	34881.10	0.88	0.38		30385.60	22619.10	1.34	0.18	
	Non-GTAP database with applied tariffs					12233.60	30761.40	0.40	0.69		11550.30	21821.50	0.53	0.60	
Mean of dependent variable						64118					43778				
Standard deviation of dependent variable						192120					75466				
Standard error of regression						147507					47306				
R² (adjusted R²)						0.486 (0.411)					0.659 (0.607)				

Source: Own calculations using literature sample

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