Global Trade Analysis Project
https://www.gtap.agecon.purdue.edu/

This paper is from the
GTAP Annual Conference on Global Economic Analysis
https://www.gtap.agecon.purdue.edu/events/conferences/default.asp

DRAFT: NOT FOR PUBLICATION

Potential productivity effects of U.S. trade agreements

Marinos E. Tsigas
USITC

30 May 2021

GTAP Conference Paper to be updated by 18 June 2021

Potential productivity effects of U.S. trade agreements

This work analyzes the potential productivity effects of U.S. trade agreements implemented during 1984-2016.

After reviewing the literature of the effects of trade on productivity, we will discuss the mechanisms that may come into play when there are trade policy changes.

In a general view of the potential effects of trade on productivity, trade may result in increased productivity because firms take actions to cope with competition (Aghion et al., 2004).

In Melitz (2003), strong competition and selection caused by trade liberalization result in less productive firms exiting the market and a reallocation of market shares to more productive firms.

This analysis is based on the GTAP (Global Trade Analysis Project) computable general equilibrium model (Hertel, 1997, and Corong et al., 2017) and the GTAP-HET (Akgul et al., 2016) computable general equilibrium model.

Trade agreements directly affect tariffs and nontariff measures (NTMs). We rely on published estimates of the direct effects of U.S. trade agreements on tariffs and NTMs for cross-border trade in goods and services.

The GTAP-HET model introduces the firm heterogeneity theory of Melitz in the GTAP model.

A subset of the producing sectors in GTAP-HET are monopolistically competitive and the model simulates the scale effect (that is the change in output per firm) and the variety effect (that is the change in the number product varieties supplied) of a scenario.

Firm heterogeneity arises from fixed set-up costs that firms incur as they enter a sector to produce, and destination specific fixed trading costs that firms incur when they enter the domestic market or a foreign market to sell their product.

In addition to providing productivity effects, the GTAP-HET model allows for a different specification of NTM changes. To exporting firms, import tariffs are variable trade costs. Most NTMs, however, are fixed trading costs, which are modeled explicitly in GTAP-HET.

Simulations with the GTAP model provide an analysis of U.S. trade agreements which abstracts from Melitz-type productivity effects. The GTAP analysis provides a reference point to which the GTAP-HET analysis will be compared.

The economy-wide impact of U.S. trade agreements is simulated using a data set for the year 2017 from Version 11 of the GTAP database (Aguiar et al., 2020). The dataset has seven aggregate sectors: crops, livestock, and meats; mining and extraction; light manufacturing;

heavy manufacturing; services with significant trade exposure; all other services. The dataset has five aggregate regions: the United States; Canada; Mexico; a region representing all U.S. FTA partners; and a rest of the world.

Light manufacturing and heavy manufacturing are modeled as monopolistically competitive sectors in GTAP-HET. The remaining sectors are modeled as perfectly competitive.

Subsequent versions of this work may be based on less aggregated datasets.

The U.S. International Trade Commission (2016) estimated the tariffs and NTMs for cross-border trade for goods and services that were removed by U.S. trade agreements. The USITC econometric analysis was based on the Baier and Bergstrand (2007) gravity model of trade. The econometric gravity model estimates the symmetric average bilateral effect on barriers to trade between the United States and its FTA partners, by sector. The statistically significant effects are shown in table 1.

Table 1. Estimated effects of U.S. FTAs on the power of tariffs and NTMs

Sector	Percent reduction in the power of tariffs and NTMs for cross-border trade
Crops	6.6
Livestock and meats	6.1
Light manufacturing	4.9
Heavy manufacturing	4.3
Trade exposed services	3.5

In this work we discuss the productivity effects of U.S. trade agreements by simulating the absence of U.S. FTAs in 2017. The shocks that are applied to the power of tariffs and NTMs are shown in table 2.

Table 2. Shocks applied to the power of tariffs and NTMs to simulate the hypothetical absence of U.S FTAs

Sector	Percent increase in the power of tariffs and NTMs for cross-border trade
Crops	7.1
Livestock and meats	6.5
Light manufacturing	5.2
Heavy manufacturing	4.5
Trade exposed services	3.6

We decompose the shocks in table 2 in two components. One component applies to the power of tariffs. The other component applies to the power of NTMs. The two components are shown in table 3.

Table 3. Shocks applied to the power of tariffs and to the power of NTMs to simulate the hypothetical absence of U.S FTAs

Sector	Percent increase in the power of tariffs	Percent increase in the power of NTMs
Crops	3.55	3.55
Livestock and meats	3.25	3.25
Light manufacturing	2.60	2.60
Heavy manufacturing	2.25	2.25
Trade exposed services	1.80	1.80

Table 4 summarizes the welfare effects of the simulations of the hypothetical absence of the U.S. FTAs with the GTAP and the GTAP-HET models. The GTAP simulation computes a welfare loss of $24,157 million or about 0.14 percent of GDP. The GTAP-Het simulation computes a welfare loss of $8,214 million or about 0.05 percent of GDP.

Table 4. Simulated real income (welfare) effects of the absence of U.S. FTAs, million dollars

Welfare components	GTAP model	GTAP-HET model, σ_{LM}=4.8, σ_{HM}=5.5	
		γ_{LM}=3.9, γ_{HM}=5.6	γ_{LM}=4.1, γ_{HM}=5.8
Allocative efficiency	-2,149	-2,313	-1,190
Terms of trade	-5,434	-5,974	-5,587
Technical change (ams)	-16,574	-1,783	-1,789
Technical change (avafs)		-8,655	-5,120
Love of variety		15,247	12,486
Scale		-20,769	-18,384
Fixed costs		16,033	14,823
TOTAL	-24,157	-8,214	-4,760

Technical change, or productivity, effects in the GTAP simulation are driven by increases in NTMs for all five sectors (see table 3). The welfare component of technical change is a loss of $16,574 million.

Technical change, or productivity, effects are also present in the GTAP-HET simulation. Increases in NTMs for the three perfectly competitive sectors (that is crops; livestock and meats; and trade exposed services) drive the ams component of technical change. Increases in

NTMs for the two monopolistically competitive sectors (that is light and heavy manufacturing) drive the avafs component of technical change. The sum of the two effects is a loss of $10,438 million.

The next version of this paper will analyze the difference between the GTAP and GTAP-HET technical change, or productivity, welfare components.

References

Aghion, Philippe, Richard Blundell, Rachel Griffith, Peter Howitt, and Susanne Prantl. "Entry and Productivity Growth: Evidence from Microlevel Panel Data." *Journal of the European Economic Association* 2, no. 2/3 (2004): 265-76. http://www.jstor.org/stable/40004902.

Aguiar, Angel, Chepeliev, Maksym, Corong, Erwin, McDougall, Robert, and van der Mensbrugghe, Dominique. *GTAP 11 Pre-release 1.* Center for Global Trade Analysis. Purdue University, West Lafayette, Indiana: Global Trade Analysis Project, 2020.

Aguiar, Angel, Chepeliev, Maksym, Corong, Erwin, McDougall, Robert, and van der Mensbrugghe, Dominique: "The GTAP Data Base: Version 10." *Journal of Global Economic Analysis, 4(1)*, (2019):1-27. https://www.gtap.agecon.purdue.edu/resources/jgea/ojs/index.php/jgea/article/view/77.

Akgul, Zeynep, Nelson B. Villoria and Thomas W. Hertel. "GTAP-HET: Introducing Firm Heterogeneity into the GTAP Model", *Journal of Global Economic Analysis*, 1(1), 2016: 111-180. https://www.jgea.org/ojs/index.php/jgea/article/viewFile/18/8.

Baier, Scott L., and Jeffrey H. Bergstrand. "Do Free Trade Agreements Actually Increase Members' International Trade?" *Journal of International Economics* 71(8), (2007): 72–95. https://doi.org/10.1016/j.jinteco.2006.02.005

Corong, E.L., T.W. Hertel, R. McDougall, M.E. Tsigas, and D. van der Mensbrugghe. "The Standard GTAP Model, Version 7." *Journal of Global Economic Analysis* 2(1), (2017): 1–119. https://jgea.org/resources/jgea/ojs/index.php/jgea/article/view/47.

Hertel, Thomas W., ed. *Global Trade Analysis: Modeling and Applications*. Cambridge: Cambridge University Press, 1997.

Melitz, Marc J. "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity." *Econometrica* 71(6), (2003): 1695-725. http://www.jstor.org/stable/1555536.

United States International Trade Commission. *Economic Impact of Trade Agreements Implemented Under Trade Authorities Procedures*, June, 2016. https://www.usitc.gov/publications/332/pub4614.pdf.