International Institute of Social Studies
Erasmus

Working Paper
No. 651

The Border Walls of (De)Globalization

Vetonatus K. Kamwela and Peter A.G. van Bergeijk

January 2020

ISSN 0921-0210

The International Institute of Social Studies is Europe's longest-established centre of higher education and research in development studies. On 1 July 2009, it became a University Institute of the Erasmus University Rotterdam (EUR). Post-graduate teaching programmes range from six-week diploma courses to the PhD programme. Research at ISS is fundamental in the sense of laying a scientific basis for the formulation of appropriate development policies. The academic work of ISS is disseminated in the form of books, journal articles, teaching texts, monographs and working papers. The Working Paper series provides a forum for work in progress which seeks to elicit comments and generate discussion. The series includes academic research by staff, PhD participants and visiting fellows, and award-winning research papers by graduate students.

Working Papers are available in electronic format at www.iss.nl/en/library

Please address comments and/or queries for information to:

Institute of Social Studies
P.O. Box 29776
2502 LT The Hague
The Netherlands

or

E-mail: wpapers@iss.nl

Table of Contents

Abstract

Border walls have recently proliferated and become a global phenomenon with about a third of the countries having at least one wall or fence along its borders. This trend contrasts the idea of the global village and fits into a trend towards deglobalization. So far little attention has been given to their unintended effect. This article fills this gap by developing a gravity model for the years 1990-2014 regarding 118 countries, 44 (37%) of which had a wall during the research period. The impact of border structures on cross-border trade is economically and statistically significant. Countries separated by a wall trade on average 46 to 73 percent less than would ceteris paribus be the case if the border wall did not exist.

Keywords

Border wall; border fence; trade; gravity

Acknowledgements

This working paper is based on Kamwela's MA thesis *The Impact of Border Walls on International Trade Flows*. We would like to thank Howard Nicholas for useful comments.

The Border Walls of (De)Globalization

1 Introduction

Border walls and fortification date back to Ancient and Medieval times and were for example used by the Roman and Chinese empires (Vernon and Zimmermann 2019, Zenderowski and Jankowski 2018), but the consensus for decades has been that border barriers would be something of the past. New technologies of transport and warfare obsoleted physical structures that were once used to protect the integrity of borders.[1] In 1940 the major defence works of France (the Maginot Line) and the Netherlands (the Dutch Water Line) were designed for the 'previous' war and somewhat later in the Second World War the Atlantic Wall did not protect Nazi Germany either. In 1989 the physical remnants of the Cold War, the Iron Curtain and the Berlin Wall were demolished. The 1990s were an epoch of optimism. The end of the superpower conflict, adherence to the principles of the Washington Consensus and new digital communication led to the idea of the "global village" in which information, people and capital would flow freely (van Bergeijk 1994; Simmons and Kenwick 2019). The creation of European Market, agreement on the North America Free Trade Area and African regional integration appeared to confirm the trend that national borders were becoming increasingly irrelevant. Globalization speeded up as never before. Border walls seemed to be redundant if not irrelevant in this new world.

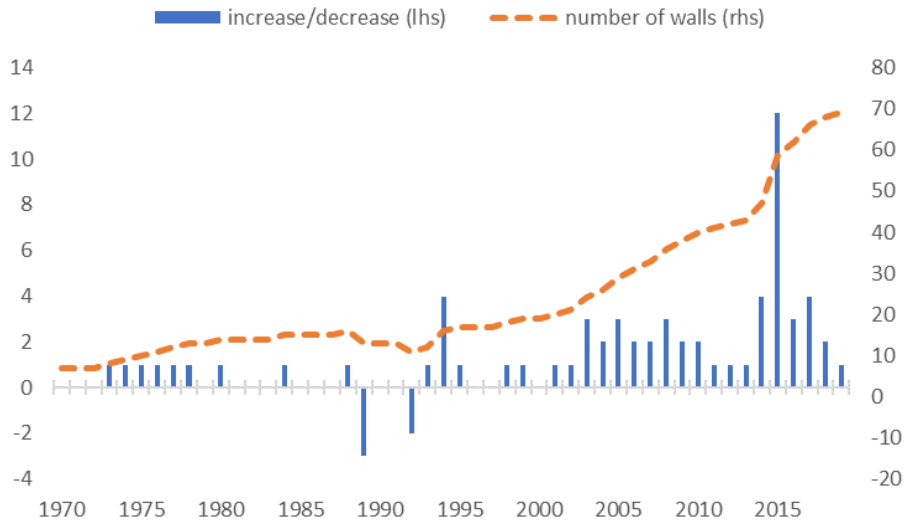
This, however, changed radically around the turn of the Millennium, as illustrated in Figure 1. Three decades after the fall of the Iron Curtain and the Berlin Wall, nearly one third of the countries have erected some type of walls or fences on their borders or as parts of their borders (Szabó 2018:87).[2] Estimates shows that since 1990's countries which are members of the European Union and Schengen area have built almost 1000 km of walls into their borders to combat migration. Countries erected walls include Hungary, Spain, Greece, Latvia, Bulgaria, Slovenia, the United Kingdom, Austria, Norway, Estonia, Lithuania, Ukraine and Macedonia (Benedicto and Brunet 2018:6). In the Middle East, Saudi Arabia constructed 885 km security wall with Iraq and fences with the United Arab Emirates, Oman, Qatar, Jordan and Yemen. Israel erected walls and fences which separate it from the West Bank and Egypt. United Arab Emirates built walls on its borders with Oman and Saudi Arabia. Jordan constructed walls with Iraq and Syria. Iran built a wall separating it from Iraq, Pakistan and Afghanistan. Kuwait built a wall with Iraq. In Asia security walls were built, these include India – Bangladesh,

[1] As is usual in this literature our concept of walls also includes other forms of physical border barriers such as (electrified) fences.

[2] The modern border barriers are being described depending on their specific roles and contexts. They are identified as security, military, anti-terror and defensive wall. Some are called fence or barrier. Opponents of these walls use their own description depending on how they regard these walls. Terminology like shame, separation, apartheid and political walls is mainly applied in criticizing these walls (Saddiki 2017:3).

Uzbekistan – Kyrgyzstan, North Korea – South Korea, Turkmenistan – Uzbekistan, Myanmar – Bangladesh, Uzbekistan – Afghanistan, Lithuania – Belarus, Brunei – Malaysia, Kazakhstan – Uzbekistan, Kazakhstan – Kyrgyzstan, Azerbaijan – Armenia. In Africa there are fences between Botswana and Zimbabwe, Tunisia and Libya, Algeria and Morocco and South Africa with Zimbabwe and Mozambique built. In North America the wall between US and Mexico is incomplete and plans exist to extend the fences. Latin America is free from border walls with exception of one built by the US between Guantanamo and Cuba (Vernon and Zimmermann 2019:8-10).

FIGURE 1
Border walls and fences 1970-2019



Sources: Based on Vernon and Zimmermann (2019), pp 24-5 and updated based on https://www.aljazeera.com/news/2018/12/russia-builds-border-fence-crimea-ukraine-proper-181228145700919.html and https://112.international/politics/latvia-builds-93-km-section-of-fence-with-barbed-wire-on-border-with-russia-37721.html (date of access: November 26, 2019)

Initially, modern walls were built as a response to terrorist threats in the wake of the al-Quaeda attacks on the World Trade Center in New York (Avdan 2018:118), but later – and especially after the outbreak of the Great Recession border wall construction also fitted in a more general pattern of deglobalization, populism and related anti-immigration policies (van Bergeijk 2019). Many walls constructed after 1990 have been built on boundaries which have not been disputed. These walls are being described as "Walls of Globalization" (Zenderowski and Jankowski 2018:110, Vallet and David 2012:114) and were erected by both autocracies and democracies and by failing, failed states and healthy states alike. Indeed, Figure 1 illustrates that half of the currently existing walls has been built since 2008, the year of the Great Recession that coincides with the start of the current phase of deglobalization. Some of these walls feature regularly in the eight o'clock news such as those between Israel and the State of Palestine or between the United States and

Mexico. Some are less well known, such as the Melila wall between Spain and Morocco and the electrified fence between Botswana and Zimbabwe. A good ten walls are, moreover, currently in the advanced planning stage. Indeed, the return of the border wall phenomenon is unexpected, both as a real world problem, a policy issue and as a scientific challenge (Vallet and David 2012:113 and Minca and Rijke 2017:2).

Modern border walls have become a topic for research and the literature is expanding fast and while the construction costs of walls have been investigated[3] and the economic impact has been assessed in individual cases (as will become clear in the review of literature in Section 2), empirical evidence on the impact of the wall phenomenon on trade flows is scant. Borders (technically: formal differences between jurisdictions) by themselves already have a strong impact on trade between those jurisdictions, as is recognized especially since the seminal paper by McCallum (1995). It is well-established that border effects are related to trade costs: transport, trade policies, including tariffs, exchange rates and Non Tariff Barriers (NTBs), cultural and institutional differences and political risks. And we know that all these factors reduce cross-border trade significantly. So why would physical border structures need to be studied as a separate topic? Why not treat walls just as any other NTB?

There are three reasons for studying walls on their own merits. The first reason is that commercial and trade policies are driven by trade interests and this creates a causality problem that is absent in the case of physical border constructions that are predominantly driven by concerns related to migration and national security. Second, cultural and institutional differences do not show a lot of variation over time (an example is language, historical relationships, religion) unlike walls and fences that due to the dynamics of the last decades have clear before and after episodes. Third, tariff and non-tariff barriers by necessity are not observed directly; tariff rates can be observed from official documents, but their application (de facto) may be different from the documents (de jure); walls and fences can be observed directly. Together with the increased use of walls these three reasons motivate why we study border walls and fences as a separate topic.

[3] Walls are costly to build, for example the walls constructed by US, Israel and India are the largest and most costly infrastructural projects implemented in each nation in this Millennium. (Allen et al. 2018:7, Jones 2012:3 and Vernon and Zimmermann 2019:8).

2 Review of literature

The trade impact of border walls and fences predominantly has been analysed with the so-called gravity model of international trade. The gravity models that have been applied to border walls span three decades and the literature covers both the original straight forward macroeconomic formulation (first generation models) developed by Tinbergen (1962) and Linnemann (1966), as well as the second generation models that have a microeconomic foundation and allow for multilateral resistance developed by Bergstrand (1985, 1989) Baier and Bergstrand (2009; 2010) and Anderson and Van Wincoop (2003). While the gravity model has a long tradition of application in international relations and has been used to investigate a great many visible and invisible barriers to trade the topic of border walls was not considered in the 1960s – 1980s.[4] Early gravity studies on the impact of conflict and cooperation on trade used events data that did not code border walls, probably due to both the low frequency and semi-permanent nature of the event of border wall construction as well as the coincidence of walls and obvious military and political skirmishes (see van Bergeijk and Moons, 2019, for a discussion of this literature). It took until the fall of the probably most important modern walls before trade economists started to realize the potential importance of border walls and fences.

First generation models

The first wave of econometric analyses was inspired by the fall of the Berlin Wall and the Iron Curtain that offered a new field of application for gravity modelling (Breuss and Egger 1999). From the start of this literature (van Bergeijk and Oldersma 1990) it has consistently been found that the removal of the physical border barriers of the Cold War yielded an economically and statistically significant increase in both East West and West East trade flows (Table 1 summarizes the key findings of these gravity models). The majority of studies (with exception of Van Bergeijk – Oldersma (1990) did not use a dummy variable in order to directly estimate the direct impact of the border wall and fences of the cold war but derived its impact indirectly by contrasting actual and predicted trade flows. The actual development of East West and West East trade that showed double digit growth rates for a number of years confirms that the predictions by the first generation gravity models were spot on.

The studies of the 1990s with hindsight suffered from a number of methodological weaknesses. For one thing the studies of the 1990s did not include multilateral resistance terms. A replication, however, by van Bergeijk (2015) of the first generation model by Van Bergeijk and Oldersma (1990) used a set of Bergstrand-Baier models that include multilateral resistance and fixed

[4] See for examples Pollins (1989), van Bergeijk (1992).

effects and has found comparable results in terms of the sign and significance of the border wall dummy (the size effect is a bit smaller (see Table 1).[5]

TABLE 1
Table 1 Estimated impact of walls in gravity models

	Countries	Period	Trade reduction
Van Bergeijk and Oldersma (1990)	49	1985	– 47% to –89%
Havrylyshyn and Pritchett (1991)	14	1980-87	– 53% to –69%
Hamilton and Winters (1992)	76	1984-86	–79%
Wang and Winters (1992)	76	1984-86	–77%
Erzan, Holmes and Safadi (1992)	76	1988-90	– 74% to –77%
Nitsch and Wolf (2013)	101*	1995-2004	– 58% to –71%
Van Bergeijk (2015)	48	1988	– 73% to –88%
Carter and Poast (2019)	241	1900-2013	– 11% to –54%
	241	1948-2013	–37%

Note: * intra Germany trade between *Verkehrsbezirke*

For another thing all first generation models used cross section data (this was often a choice by necessity since comparable estimates for GDP were much more difficult to obtain also because official statics in the communist world reported Net Material Product rather than GDP. As pointed out by Egger (2000) cross section analysis in gravity models could lead to unreliable estimates since they do not take into account importer and exporter effects. On the plus side is that the model predictions indicated very significant increases in bilateral trade between East and West which were vindicated by the 'natural experiment' of the break-down of the Berlin Wall and the Iron Curtain. Indeed, both East West and West East trade flows showed double digit real annual growth rates for in the early 1990s.

Second generation models

The second wave in the wall literature emerged almost a quarter of a century later. By and large the approach is again to use a gravity model.[6] Nitsch and Wolf (2013) use gravity a la Anderson and van Wincoop (2003) to investigate if the demolished Berlin Wall and Iron Curtain – although dismantled – still have an impact for the trade between 101 so-called *Verkehrsbezirke* using panel data for the period 1995 to 2004 and find a negative effect of the "border" between the former DDR (East-Germany) and FRG (West-Germany). Their study is not only important because of the empirically established longevity of the border effects (of demolished walls), but also because of the fact that this is an analysis at a lower level of aggregation. Lower levels of aggregation help to

[5] The replication is related to a different year (1985 viz. 1988).
[6] An example is Oberholzer (2015) on the study on impact of the West Bank Wall on the Palestinian labour market, using separate linear regression models as well as a panel for 2000-2012 with the wall as the only trade-related explanatory variable.

avoid causality issues, to control for different transportation modes and product types and help to avoid aggregation bias. In contrast Allen et al. (2018) study the border constructions between the United States and Mexico with a panel gravity model for the years 2006 to 2016 finding no evidence that a border fence impacted flow of trade between United States and Mexico.

An important issue is that border walls and fences are more likely to be constructed between countries that have bad political relations (Carter and Poast 2017). Indeed, a border wall may also be seen as a symbol of insult and provocation to a neighboring country, since decision to build walls are made by one part and this can lead to distraction of significant commercial relationship (Avdan 2018:125). Consequently. Carter and Poast (2019) also include territorial disputes and defense alliances in their gravity panel model for the years 1900 to 2010 in addition to the variables that are commonly used in gravity model analyses. Their sample is comparatively large and includes many small island economies that by definition do not have a border wall and moreover by necessity depend on foreign markets for the larger part of goods.

Relatedly, one particular difficulty with this entire literature has been that authors so far have not sufficiently recognized that border walls and fences always occur on so-called common borders. It is a general finding of the gravity literature that a common border between exporter and importer in general is associated with larger trade. Specifications that do not include a (dummy) variable for common border will not be able to discriminate between the positive impact of the common border in general and the trade reducing impact of border walls. For the studies of the 1990s this was less problematic since border walls were not as endemic as in today's world where the issue occurs for about a third of the countries. In our analysis we will therefore always include a dummy variable that assumes the value 1 if a common border exists (and is zero if not).

3 Method and data

As is customary in the literature, we use a standard gravity model that assumes that trade will be larger if economic masses (proxied by GDP and population of the trading partners) are larger and economic distance is smaller (nearby countries trade ceteris paribus more). We complement this model by including other trade resisting (landlockedness) or trade facilitating (common language, former colonial ties, common borders) factors. This gives us a traditional trade model that does not yet include political factors.

$$\ln E_{ijt} = \alpha + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln POP_{it} + \beta_4 \ln POP_{jt} + \beta_5 \ln Dist_{ij} + \beta_5 Comlang_{ij} + \beta_6 Comborder_{ij} + \beta_7 Evercol_{ij} + \beta_8 Landlocked_{it} + \beta_8 Landlocked_{it} + \varepsilon_{ijt} \quad (1)$$

where
E_{ijt} = exports of country i to country j in year t
GDP_{it}= GDP of country i in year t
GDP_{jt}=GDP of country j in year t
$Dist_{ij}$= distance between capitals of country *i* and *j*
POP_{it} = population of country i in year t
POP_{jt}= population of country j in year t
$Comlang_{ij}$ is 1 if country i and country j speak the same language, 0 if otherwise;
$Comborder_{ij}$ is 1 if country i and country j share the same border, 0 if otherwise;
$Evercol_{ij}$ is 1 if country i and country j have colonial links, 0 if otherwise
$Landlocked_{it}$ is 1 if exporter is landlocked, 0 if otherwise
$Landlocked_{jt}$ = 1 if importer is landlocked, 0 if otherwise
ε_{ijt} = error term.

To this base model we always add $Wall_{it}$ that is a dummy variable with a value of 1 for a border wall or fence, else 0 otherwise, and $Democratic\ dyad_{ijt}$ a dummy that is 1 if both country *i* and country *j* are democratic in year *t*, 0 if otherwise.

We also add in some specifications the dummy variable $Hostility_{ijt}$ that assumes the value 1 if the political interaction between i and j is negative, else zero. In the latter case the research period due to lacking data reduces to 1990 – 2010. So we have:

$$\ln E_{ijt} = \alpha + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln POP_{it} + \beta_4 \ln POP_{jt} + \beta_5 \ln Dist_{ij} + \beta_6 Comlang_{ij} + \beta_7 Comborder_{ij} + \beta_8 Evercol_{ij} + \beta_9 Hostility_{ijt} + \beta_{10} Landlocked_{it} + \beta_{11} Landlocked_{it} + \beta_{12} Wall_{ijt} \ \beta_{13} Democractic\ dyad_{ijt} + \beta_{14} Hostility_{ijt} + \varepsilon_{ijt} \quad (2)$$

Equation (2) is the equation for the panel for the years 1990 – 2014 to be estimated in Section 4.

TABLE 2
Summary of independent variables

Variable	Definition	Expected sign	Source
$Dist_{ij}$	Geographical distance between the exporter and importer	Negative	CEPII, Accessed on 11th June 2019
GDP_{it}	GDP of exporter country in year *t*	Positive	CEPII, Accessed on 11th June 2019
GDP_{jt}	GDP of importer country in year *t*	Positive	CEPII, Accessed on 11th June 2019
Pop_{it}	Population of exporter country in year *t*	Positive	CEPII, Accessed on 11th June 2019
Pop_{jt}	Population of importer country in year *t*	Positive	CEPII, Accessed on 11th June 2019
Wall	Dummy variable to describe whether the trading partners are separated by border wall	Negative	Vernon and Zimmermann 2019, Carter and Poast 2017 and Zenderowski and Jankowski 2018
Comlang	Dummy variable to describe if trading partners share the same language.	Positive	CEPII, Accessed on 11th June 2019
Comborder	Dummy variable to depict if the trading countries share the same border	Positive	CEPII, Accessed on 11th June 2019
Evercolo	Dummy variable for a (former colonial relationship)	Positive	CEPII, Accessed on 11th June 2019
Hostility	Dummy variable if two countries are in political hostility (dispute)	Negative	Correlates of War project, accessed on 3rd October 2019
Democratic dyad	Dummy variable if the two countries are both democratic	Positive	Centre for Systemic Peace, accessed on 22nd October 2019

Table 2 summaries the variables and their a priori expected signs. Data for exports, GDP, population, distance, colonial ties, common language and contingency was obtained from CEPII database on Trading history by Fouquin and Hugot (2016). The data were accessed on 11th June 2019.[7] The data for the walls was extracted from Vernon and Zimmermann (2019), Carter and Poast (2017) and Zenderowski and Jankowski (2018). Data on Millitarized Interstate Disputes (political hostility) were obtained from the Correlates of War project

[7] CEPII extracted data for exports, GDP and population from the Direction of Trade Statistics of International Monetary Fund (IMF) and World Bank development indicators. Distance is measured as the crow flies between the two main cities in each pair of trading countries.

updated by Palmer et al. (2019) which covers the period 1816 to 2010. The data was accessed on 3rd October 2019. Militarized Interstate Disputes records information on conflicts in which a country threatens, displays or uses force against another country. (Davis and Meunier 2011; Morrow et al. (1998). Data on democratic dyad were extracted from Polity IV project dataset version p4v2018 for country reports issued by Centre for Systemic Peace developed by Marshall et al. (2017). These data were accessed on 22nd October 2019. The data are collected for a period from 1990 to 2014. This is the period after the fall of Berlin wall. The panel dataset covers 118 Countries for the period 1990 to 2010. Among these countries 40 are separated by a border wall or fence.

Our dataset is an unbalanced panel with 280,845 observations. Zero trade flows in the dataset occur in 59,483 cases which is almost 21% of the dataset. We deal with the zero flow issue by means of a linear transformation that increases all export flows by 0.05. Table 3 provides the summary statistics for the dependent and explanatory variables.

TABLE 3
Summary statistics

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
Exports	305,221	$3.13e^{+08}$	$3.26e^{+09}$	0	$2.84e^{+11}$
GDP_origin	323,460	$2.12e^{+11}$	$8.05e^{+11}$	$8.54e^{+07}$	$1.07e^{+13}$
GDP_destination	323,632	$2.12e^{+11}$	$8.05e^{+11}$	$8.54e^{+07}$	$1.07e^{+13}$
POP_origin	335,239	50239	157566	257	1364270
POP_destination	335,395	50535	157880	70	1364270
Distance	335,584	6558	3.895	8	19812
Comlang	335,584	0.125	0.331	0	1
Com_border	335,584	0.029	0.167	0	1
Evercol	335,584	0.016	0.127	0	1
Land_lock_origin	335,586	0.206	0.405	0	1
Land_lock_destination	335,586	0.203	0.402	0	1
Wall	335,586	0.003	0.054	0	1
Hostility*	280,845	0.005	0.071	0	1
Democratic Dyad	335,586	0.048	0.214	0	1

Note * data for hostility are only available for 1990-2010

4 Empirical findings

The correlation matrix does not indicate problems related to multicollinearity and the Hausmann test yields a χ^2 of 2744 rejecting the null hypothesis that random effects is more efficient than fixed effects estimation. Still we also present random effects estimates as a robustness check in Table 4 that shows the results of our gravity model.

Columns (1) and (2) of Table 4 relate to the shorter period 1990-2010 since we want to include *Hostility* for which we do not have data for 2011-2014. It appears that *Hostility* is not significant at all and therefore we are confident about our estimates for the full period that do not include *Hostility*.

TABLE 4
Impact of border walls in gravity model (panel 1990-2014)

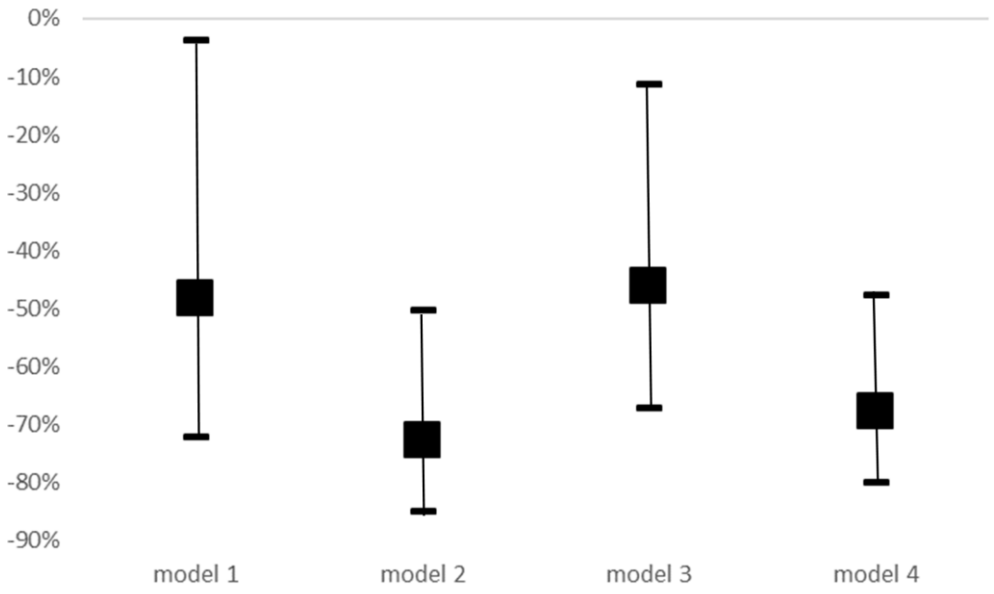
	(1)	(2)	(3)	(4)
	1990 - 2010		1990-2014	
	(Fixed Effects)	(Random Effects)	(Fixed Effects)	(Random Effects)
lnGDP_o	0.75***	1.38***	0.69***	1.14***
	(0.03)	(0.02)	(0.02)	(0.02)
lnGDP_d	1.10***	1.22***	1.04***	1.04***
	(0.03)	(0.02)	(0.02)	(0.02)
lnPOP_o	1.67***	0.56***	1.07***	0.63***
	(0.09)	(0.03)	(0.07)	(0.03)
lnPOP_d	2.14***	0.45***	1.71***	0.56***
	(0.09)	(0.03)	(0.07)	(0.03)
lnDistance		-2.44***		-2.43***
		(0.06)		(0.06)
Comlang		1.04***		0.93***
		(0.12)		(0.12)
Com_border		0.72***		0.67***
		(0.26)		(0.25)
Evercol		1.88***		2.27***
		(0.31)		(0.31)
Land_lock_0		-1.39***		-1.88***
		(0.10)		(0.10)
Land_lock_d		-1.09***		-1.34***
		(0.10)		(0.102)
Wall	-0.66**	-1.30***	-0.62**	-1.13***
	(0.31)	(0.30)	(0.25)	(0.24)
Hostility	0.15	-0.03		
	(0.14)	(0.14)		
Democratic_dyad	0.95***	0.90***	0.93***	1.15***
	(0.15)	(0.11)	(0.12)	(0.10)
Constant	-69.40***	-39.5***	-56.7***	-31.5***
	(0.71)	(0.60)	(0.56)	(0.56)
Observations	237,146	237,146	285,039	285,039
No. of country pairs	12,948	12,948	12,995	12,995
R^2	0.10		0.11	

(Standard errors in parentheses)
*** p<0.01, ** p<0.05, * p<0.1

All coefficients confirm to *a priori* expectations and are highly significant at $p<0.05$ and better. Column (3) reports our preferred equation with Fixed Effects, but since this means that we cannot test for time invariant explanatory variables we also report in column (4) the Random Effects estimates.

For the variable of interest (*Wall*) the difference between the two estimation methods is statistically and economically significant. In the Fixed Effect estimation the wall reduces exports by 51%; for the Random Effects model this is 73%. (Figure 2). and these findings are well in line with the literature (compare Table 1).

Figure 2
Impact of border walls and 95% confidence interval



5 Discussion and conclusions

The recent increase in the interest in the use and impact of border walls may as much have been stimulated by the 30th anniversary of the fall of the Berlin Wall, as by the construction of the wall along the southern border of the United States that has drawn a lot of attention internationally. The revival of the use of border walls has been associated with a general tendency to less openness and a phase of deglobalization (Myambo and Frassinelli, 2019). Rather than the "Walls of Globalization" (Zenderowski and Jankowski 2018:110, Vallet and David 2012:114) the wave of walls in the 2010s seems to be a physical symptom of world-wide deglobalization.

Our analysis that deals with the first 15 years of the Millennium uncovers significant reduction in bilateral trade due to border walls and fences. This finding in itself should not come as a surprise because walls and border fences are physical distortions of trade flows. Our finding thus fits into the international trade literature on barriers to trade as well as in the international relations literature that deal with these specific constructions. The trade costs of border walls and fences – that come in addition to the costs of construction and maintenance of these physical barriers – are thus significant, but often ignored in analyses on the costs of border walls.

We have not considered other welfare costs of walls, such as travelling costs, distortion of factor and product markets or environmental costs. Still our finding of a fifty percent reduction of bilateral trade between the two sides of the border provides a ball park number that can be applied in cost benefit analyses of considered border walls and fences in order to arrive at more relevant cost estimates.

Issues for further research include use of alternative econometric methods that could yield better estimates of the welfare loss due to walls. We also plan to further extend our analysis increasing the research period so as to include more recent walls, both because this increases the number of walls and because this will possibly allow for a test on differences in impact between the pre-2010 and post 2010 walls.

References

Allen, T., C. de Castro Dobbin and M. Morten (2018) 'Border Walls', *NBER Working Paper No. 25267*. National Bureau of Economic Research: Massachusetts.

Anderson, J.E. and E. Van Wincoop (2003) 'Gravity with Gravitas: A Solution to the Border Puzzle', *American Economic Review* 93 (1): 170-192.

Avdan, N. (2018) *Visas and Walls: Border Security in the Age of Terrorism*. University of Pennsylvania Press: Philadelphia.

Baier, S.L. and Bergstrand, J.H. (2009): Bonus vetus OLS: A Simple Method for Approximating International Trade-Cost Effects Using the Gravity Equation. *Journal of International Economics*, 77 (1): 77–85.

Baier, S.L. and Bergstrand, J.H. (2010): Approximating General Equilibrium Impacts of Trade Liberalizations Using the Gravity Equation: Applications to NAFTA and the European Economic Area. In: van Bergeijk, P.A.G. and S. Brakman, (eds): *The Gravity Equation in International Trade*. Cambridge, MA: Cambridge University Press, pp. 88–134.

Benedicto, A.R., and P. Brunet. (2018) "Building walls Fear and securitization in the European Union." Barcelona: Centre Delàs d'Estudis d'Estudis per la Pau, available at https://www.tni.org/en/publication/building-walls and accessed December 18, 2019

Bergstrand, J.H. 1985, 'The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical Evidence', Review of Economics and Statistics, 67 (1), pp. 474–81.

Bergstrand, J.H., 1989, 'The Generalized Gravity Equation, Monopolistic Competition, and the Factor-proportions Theory in International Trade', Review of Economics and Statistics, 71, pp. 143–52.

Breuss, F. and P. Egger (1999) 'How Reliable are Estimations of East-West Trade Potentials Based on Cross-Section Gravity Analyses?', *Empirica* 26 (2): 81-94.

Carter, D.B. and P. Poast (2017) 'Why do States Build Walls? Political Economy, Security, and Border Stability', *Journal of Conflict Resolution* 61 (2): 239-270.

Carter, D.B. and P. Poast (2019) 'Barriers to Trade: How Border Walls Affect Trade Relations.' *International Organization*. DOI: https://doi.org/10.1017/S0020818319000353

Davis, C.L. and S. Meunier (2011) 'Business as Usual? Economic Responses to Political Tensions', *American Journal of Political Science* 55 (3): 628-646.

Erzan, R., C. Holmes and R. Safadi (1992) How Changes in the Former CMEA Area may Affect International Trade in Manufactures. *World Bank PRIT Working Papers Series, WPS 973*, World Bank: Washington, D.C.

Fouquin, M. and J. Hugot (2016) 'Two centuries of bilateral trade and gravity data: 1827-2014' . *CEPII Working paper No 2016-14*. Paris: Centre d'Etudes Prospectives et d'Informations Internationales

Hamilton, C.B. and L.A. Winters (1992) 'Opening Up International Trade with Eastern Europe', *Economic Policy* 7 (14): 77-116.

Havrylyshyn, O., and L. Pritchett (1991) European Trade Patterns After the Transition. Country Economics Department WPS 748, World Bank, available at http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/1991/08/01/000009265_3961001212040/Rendered/PDF/multi0page.pdf and accessed December 18, 2019

Jones, R. (2012) *Border Walls : Security and the War on Terror in the United States, India, and Israel*. London: Zed Books

Linnemann, H., (1966), *An Econometric Study of International Trade Flows*, Amsterdam: North Holland.

Marshall, M.G., K. Jaggers and T. Gurr (2017) 'Political Regime Characteristics and Transitions, 1800-2016, Polity IV Project', Center for Systemic Peace. Available at http://www.systemicpeace.org/polity/polity4.htm and accessed October 23, 2019.

McCallum, J. (1995) 'National Borders Matter: Canada-US Regional Trade Patterns', The *American Economic Review* 85 (3): 615-623.

Minca, C. and A. Rijke (2017) 'Walls! Walls! Walls', available at https://societyandspace.org/2017/04/18/walls-walls-walls/ and accessed December 18, 2019.

Morrow, J.D., R.M. Siverson and T.E. Tabares (1998) 'The Political Determinants of International Trade: The Major Powers, 1907–1990', *American Political Science Review* 92 (3): 649-661.

Myambo, M.T., and P.P. Frassinelli (2019). "Introduction: Thirty Years of Borders Since Berlin." *New Global Studies* 13 (3): 277-300.

Nitsch, V. and N. Wolf (2013) 'Tear Down this Wall: On the Persistence of Borders in Trade', *Canadian Journal of Economics/Revue Canadienne d'Économique* 46 (1): 154-179.

Oberholzer, F. (2015) 'The Impact of the West Bank Wall on the Palestinian Labour Market', *International Development Policy/ Revue Internationale de Politique de Développement* 6 (6.2).

Palmer, G., V. D'Orazio, M.R. Kenwick and R.W. McManus (2019) 'Updating the Militarized Interstate Dispute Data: A Response to Gibler, Miller, and Little', *International Studies Quarterly* available at https://doi.org/10.1093/isq/sqz045 and accessed December 19, 2019.

Pollins, B M. (1989). "Conflict, Cooperation and Commerce," *American Journal of Political Science* 33: 737–61.

Saddiki, S. (2017) *World of Walls: The Structure, Roles and Effectiveness of Separation Barriers*. Open Book Publishers: Cambridge, UK.

Simmons, B.A. and M. Kenwick (2019) 'Border Orientation in a Globalizing World: Concept and Measurement', Available at https://ssrn.com/abstract=3326773 and accessed December 18,2019.

Szabó, É. (2018). Fence Walls: From the Iron Curtain to the US and Hungarian Border Barriers and the Emergence of Global Walls. *Review of International American Studies*, 11 (1), pp. 83-111.

Tinbergen, J.J. (1962) 'Shaping the World Economy; Suggestions for an International Economic Policy'. Twentieth Century Fund: New York.

Vallet, É and C. David (2012) 'Introduction: The (Re) Building of the Wall in International Relations', *Journal of Borderlands Studies* 27 (2): 111-119.

van Bergeijk, P.A.G. (1992) "Diplomatic barriers to trade." *De Economist* 140 (1): 45-64.

van Bergeijk, P.A.G. (1994), *Economic Diplomacy, Trade and Commercial Policy: Positive and negative sanctions in a new world order* Edward Elgar: Cheltenham.

van Bergeijk, P. A.G, and Selwyn J.V Moons. "Introduction to the Research Handbook on Economic Diplomacy." In: P.A.G. van Bergeijk and .J.V. Moons *Research Handbook on Economic* Diplomacy: Bilateral relations in a context of geopolitical change. Edward Elgar Publishing, 2018: 1-29.

van Bergeijk, P.A.G. (2015) 'Visible and Invisible Walls: World Trade Patterns and the End of the Cold War', *Acta Oeconomica* 65 (2): 231-247.

van Bergeijk, P.A.G and H. Oldersma (1990) 'Détente, Market-Oriented Reform and German Unification: Potential Consequences for the World Trade System', *Kyklos* 43 (4): 599-609.

Vernon, V. and K.F. Zimmermann (2019), Walls and Fences: A Journey Through History and Economics. *GLO Discussion Paper No. 330*. Global Labor Organization. Essen available at http://hdl.handle.net/10419/193640 and accessed December 18, 2019.

Wang, Z.K. and L.A. Winters (1992) 'The Trading Potential of Eastern Europe', *Journal of Economic Integration* 7 (2): 113-136.

Zenderowski, R. and B. Jankowski (2018) 'The Walls in the Global Village', *Pogranicze. Polish Borderlands Studies* 6 (2): 103-115

Appendices

Appendix 1: List of countries contained in the sample

Afghanistan
Albania
Algeria
Angola
Armenia
Azerbaijan
Bangladesh
Belarus
Belgium
Benin
Bhutan
Bosnia
Botswana
Brazil
Brunei
Bulgaria
Burundi
Cambodia
Canada
Central African Republic
Chad
China
Colombia
Congo Republic
Cote d'Ivoire
Croatia
Cuba
Cyprus
Democratic Republic of Congo
Denmark
Djibouti
Dominican Republic
Egypt
Ecuador
Eritria
Estonia
Ethiopia
Finland
France
Gambia
Georgia
Germany
Ghana
Greece
Guinea
Guinea Bissau
Guyana
Hungary
India
Indonesia
Iran
Iraq
Israel
Japan
Jordan
Kazakhstan
Kenya
Kuwait
Kyrgyzstan
Latvia
Lebanon
Liberia
Libya
Lithuania
Macedonia
Malaysia
Mali
Mexico
Morocco
Myanmar
Nepal
Nicaragua
Niger
Nigeria
North Korea
Oman
Pakistan
Papua New Guinea
Peru
Philippines
Poland
Portugal
Qatar
Russia
Rwanda
Saudi Arabia
Senegal
Sierra Leone
Singapore
Slovakia
Slovenia
Somalia
South Africa
South Korea
Spain
Sri lanka
Sudan
Suriname
Switzerland
Syria
Taiwan
Tajikistan
Tanzania
Thailand
Togo
Turkey
Turkmenistan
Uganda
Ukraine
United Arb Emirates
United Kingdom
United States
Uzbekistan
Venezuela
Vietnam
Yemen
Zambia
Zimbabwe

Appendix 1: Walls included in the dataset for analysis

1.	Cuba	US (Guantanamo)	1961
2.	Israel	Syria	1973
3.	Israel	Lebanon	1976
4.	North Korea	South Korea	1977
5.	Thailand	Malaysia	1978
6.	South Africa	Zimbabwe	1984
7.	India	Pakistan	1988
8.	Thailand	Cambodia	1987
9.	Israel	Jordan	1981
10.	United States	Mexico	1993
11.	India	Bangladesh	1994
12.	Kuwait	Iraq	1994
13.	Uzbekistan	Afghanistan	1994
14.	Spain	Morocco-Ceuta	1995
15.	Spain	Morocco-Melilla	1998
16.	Uzbekistan	Kyrgyzstan	1999
17.	Turkmenistan	Uzbekistan	2001
18.	Botswana	Zimbabwe	2003
19.	Iran	Afghanistan	2003
20.	Saudi Arabia	Yemen	2003
21.	India	Myanmar	2004
22.	Lithuania	Belarus	2004
23.	Brunei	Malaysia	2005
24.	Arab Emirates	Oman	2005
25.	Arab Emirates	Saudi Arabia	2005
26.	Kazakhstan	Uzbekistan	2006
27.	Saudi Arabia	Iraq	2006
28.	China	North Korea	2006
29.	Iran	Iraq	2007
30.	Iran	Pakistan	2007
31.	Jordan	Iraq	2008
32.	Jordan	Syria	2008
33.	Russia	Georgia	2008
34.	Myanmar	Bangladesh	2009
35.	Saudi Arabia	Qatar	2009
36.	Saudi Arabia	Oman	2009
37.	Israel	Egypt	2010
38.	Kazakhstan	Kyrgyzstan	2010

Source: Authors description based on Vernon and Zimmermann 2019:24-25, Carter and Poast 2017:249-250 and Zenderowski and Jankowski 2018:107