Aid and Aids - PEPFAR, Globalization, and the spread of Infectious Disease *

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Abstract

COVID-19 and the subsequent pandemic years have emphasized a fundamental tension inherent in an increasingly interconnected world: the rapid circulation of people, goods, and ideas across borders and between countries facilitate the spread of novel disease yet also provide the tools necessary to contain these pathogens. In this paper we investigate the tension between globalization and global health by examining the interconnections between HIV, international trade, and global investments in public health made through a major HIV relief initiative (PEPFAR). We begin by laying out the plausible pathways linking forms of international investment and trade to the transmission and diffusion of HIV across borders and beyond through trade networks. We then consider the domestic political economy of public health to identify policies that states may take which exacerbate or limit their exposure to these trade-disease forces such as by making domestic investments in public health. Finally, we examine how external shocks through global public health investments alter this process and change the spread of disease locally and beyond through trade- and distance-based diffusion pathways. To achieve this we employ novel dynamic multiple-W spatiotemporal models on a cross-national country panel over the period 2000-2018. Using this modeling approach we demonstrate both that HIV rates within PEPFAR receiving countries decrease in response to PEPFAR investments and that these investments diffuse through trade networks leading to additional downstream HIV rate reductions in trade partners to PEPFAR recipients. By estimating models with multiple-W connectivity matrices, we are able to identify these trade-based transmission pathways while simultaneously controlling for geographic distance and net migration networks among recipient countries. Our analysis and results therefore deviate from past work arguing that greater global interconnectedness will increase public health vulnerability to future disease or pandemic. Rather, our findings suggest that the complex relationship between global trade and international public health may contribute to unanticipated downstream positive health externalities.

Keywords: trade, disease, aid, dynamics, spatiotemporal models

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1 Introduction

Rapid and widespread improvements in standards of living, reduction of inequality, and the embrace of democratic institutions have all been tied to globalization. The movement of people and products introduces idea, habits, behaviors, and practices to new societies and markets. Yet this same mobility also brings risks; inflows of foreign currency often result in appreciation of the domestic currency, imports of foreign goods may push domestic producers out of business, and immigration of foreigners may generate nativist resentments. The COVID-19 pandemic made abundantly clear that the movement of people also exposes native populations to disease. The rapid closing of borders and breaking of supply chains have made some question the value of globalization.

Responses to the COVID-19 pandemic, however, also shine a light on the benefits of globalization: knowledge sharing and collaboration across borders was vital for the discovery of a vaccine **?**DruedahlMissenPrice-2021). The resurrection of global supply chains was essential for the mass production and delivery of vaccines. And international collaboration within the COVAX facility was essential to ensure that vaccines were available even if countries were unable to afford them.

We examine the consequences of global economic integration for the spread of infectious disease. We argue that foreign health aid has positive spillovers to adjacent countries and that cross-border trade is the conduit for these spillovers.

We use exogenous changes in foreign health aid to identify health spillovers to recipient countries' non-donor trade partners.

Our empirical setting is the U.S. President's Emergency Plan for AIDS Relief (PEPFAR). Since its 2003 inception, PEPFAR has spent over $100 billion to prevent and treat HIV/AIDS in poor countries worldwide.[1]

[1] https://www.state.gov/pepfar/

1.0.1 Contributions

Our findings contribute to research on economic integration and disease by demonstrating that trade flows are a conduit for infectious disease independent of migration, distance, and other close correlates of trade.

We also contribute to scholarship on foreign aid effectiveness by documenting a novel positive externality: lower disease incidence in recipients' trade partners. Prior work on focuses on spillovers within the recipient country including negative spillovers for other health outcomes (Lee and Izama, 2015)

2 Literature Review

Global economic integration has far-reaching consequences for health. Integration influences income levels, inequality, and volatility, with numerous implications for disease susceptibility and treatment. Income gains from trade correspond to improvements in numerous health outcomes, especially for women and children **?**Dollar2001; PritchettSummers1996). Other contributions note the somewhat surprising channel that, conditional on the type of commodity, increased trade can be health enhancing when it decreases environmental deterioration **?**BombardiniLu2020).

Our theoretical framework focuses on the cross-border movement of people and goods as a transmission mechanism for infectious disease. Historical examples of this mechanism abound. The Black Death/Black Plague originated in Central or East Asia and spread to Europe via merchant ships traveling along the Silk Road **?**Wagner2014, Benedictow2004). US troops spread the Spanish Flu while traveling from Fort Riley, Kansas to Europe during World War I **?**Mankel2007). Long-haul truckers–moving cargo across African countries–have been associated with the spread of HIV-AIDS **?**Oster2012, LinSim2015). Growth in trade following China's accession to the World Trade Organization fueled the spread of severe acute respiratory syndrome (SARS) **?**LinWangZhou2021).

Trade in goods requires people to move across borders

- respiratory vs sexually transmitted diseases

- speed with which effects appear: effects on infectious diseases should be faster than for other health outcomes associated with higher income.

3 The Argument

3.1 Empirical Context: PEPFAR

We test our hypotheses in the context of the President's Emergency Plan for AIDS Relief (PEPFAR). Established in 2003 by US President G.W. Bush, PEPFAR distributes bilateral aid for the prevention and treatment of HIV/AIDS. The program concentrates funding in select countries with high disease rates and emphasizes expanded access to antiretroviral medications. With an annual budget of $2-7 billion, it is the largest single disease foreign health aid program in history (annual report to Congress).

(Bendavid, 2016).

Bendavid and Bhattacharya (2009) estimate that by 2007, HIV-related deaths in PEPFAR focus countries declined by 10.5 percent, approximately 1.2 million fewer deaths.

Lee and Izama (2015) argue that PEPFAR diminished recipient countries' health system capacity, evidenced by slowing improvements in neonatal mortality.

Evidence of broader health consequences are mixed.

Reduced

Our focus: PEPFAR Background Not random in that it was rolled out in highest effected countries But quantity of interest is on countries connected to PEPFAR recipient countries. Note: existing literature does speak to effectiveness of PEPFAR: (a) it is effective in hitting targeted diseases; (b) some studies argue that there is a decrease in aid to other non-PEPFAR diseases; but (c) lots of evidence of a spillover to other diseases (women's health, child mortality, and female empowerment).

> **H1** Trade with PEPFAR recipients provides a substitution effect for PEPFAR aid. As the proportion of a country's trade with PEPFAR recipient countries increase, the marginal effect of PEPFAR aid diminishest.

> **H2** The global trade network serves as a diffusion pathway for infectious disease.

4 Data and Methods

4.1 Data

$$\text{PEPFAR Trade}_{Country\ i} = \sum_{i=1}^{n} \frac{trade_{country\ i \neq j | PEPFAR_j > 0}}{trade_{country\ i}} \tag{1}$$

4.2 Methods

$$\begin{aligned} \text{HIV} \sim\ & \beta_1 \text{Pepfar Aid} + \beta_2 \text{Trade}_{Pfar} + \beta_3 \text{Trade}^2_{Pfar} + \\ & \beta_4 \text{Pepfar Aid} * \text{Trade}_{Pfar} + \beta_5 \text{Pepfar Aid} * \text{Trade}^2_{Pfar} + \\ & \beta_6 \text{Pepfar Aid} * \text{Trade}_{Pfar} * \text{Trade}^2_{Pfar} + \\ & \phi \text{HIV}_{t-1} + \sum_{i=1}^{w} \rho W * \text{HIV} + \delta + \epsilon \end{aligned} \tag{2}$$

where δ represents a vector of control variables and their coefficients as well as country and year fixed effects.

The long run steady state marginal effect of PEPFAR Aid on HIV incidence is therefore:

$$\frac{\partial \text{HIV}}{\partial \text{Pepfar Aid}} = \frac{\beta_1 + \beta_4 \text{Trade}_{Pfar} + \beta_5 \text{Trade}^2_{Pfar} + \beta_6 \text{Trade}_{Pfar} * \text{Trade}^2_{Pfar}}{(1 - \phi - \rho)} \tag{3}$$

A GENERIC FORM OF ABOVE:

$$y = \sum_{i=1}^{p} \rho_i W_i y + \phi y_{t-1} + (\beta \text{Pepfar}_{USD} * \text{Pepfar}_{trade} * \text{Pepfar}^2_{trade}) + X\beta + \epsilon \tag{4}$$

5 Results

Table 3 presents our primary spatial results including non-spatial and spatial variants of our specification.

6 Discussion

Discussion section here.

7 Conclusion

Conclusion section here.

References

Bendavid, Eran. 2016. "Past and future performance: PEPFAR in the landscape of foreign aid for health." *Current HIV/AIDS Reports* 13:256–262.

Bendavid, Eran and Jayanta Bhattacharya. 2009. "The President's Emergency Plan for AIDS Relief in Africa: an evaluation of outcomes." *Annals of internal medicine* 150(10):688–695.

Lee, Melissa M and Melina Platas Izama. 2015. "Aid externalities: evidence from PEPFAR in Africa." *World Development* 67:281–294.

Tables

		Trade with PEPFAR Recipeints	
		Low	High
PEPFAR Recipient	No	-0.625 [-0.816, -0.434] Observations: 1971	-2.958 [-4.280, -1.637] Observations: 263
	Yes	-7.260 [-9.336, -5.183] Observations: 189	-26.163 [-29.672, -22.653] Observations: 211

Table 1: Trade with PEPFAR recipients and HIV Incidence

	Mean	SD	Min	Max
HIV incidence rate (per 100k)	-3.380	11.933	-146.7	21.790
PEPFAR Aid	1.093	4.631	0.0	47.429
PEPFAR Trade	0.161	0.194	0.0	0.989

Table 2: Descriptive statistics

	Non-Spatial (controls)	Spatial (W1 - Trade)
PEPFAR Trade - 5%	-0.799^*	-1.143^*
	$[-1.304; -0.331]$	$[-1.951; -0.449]$
PEPFAR Trade - 15%	-0.171	-0.243
	$[-0.547; 0.187]$	$[-0.780; 0.273]$

* Null hypothesis value outside the confidence interval.

Table 5: PEPFAR - LRSS Marginal Effects

Country	HIV Incidence (per 100k)	Trade with PEPFAR recipients (% total trade)
Guinea-Bissau	146.16	2.68
Gabon	190.21	7.98
Equatorial Guinea	456.06	10.20
Djibouti	124.12	11.36

Table 6: Hypothetical - PEPFAR Recipients

	Direct	Indirect
Guinea Bissau	-54.3^*	-2175.3^*
	$[-84.9; -24.9]$	$[-4985.9; -662.9]$
Gabon	-35.7^*	-2140.5^*
	$[-61.9; -9.3]$	$[-5208.6; -413.8]$
Equatorial Guinea	-18.0^*	-1881.6^*
	$[-34.6; -1.3]$	$[-5069.7; -118.5]$
Djibouti	-10.7	-1178.4
	$[-22.4; 0.8]$	$[-3405.8; 83.1]$

* Null hypothesis value outside the confidence interval.

Table 7: Hypothetical - Cumulative HIV Case Reductions

Guinea-Bissau (direct: -54 [-85, -25])	Gabon (direct: -36 [-62, -9])
China: -1718 [-3937, -523]	China: -1511 [-3677, -292]
Pakistan: -228 [-522, -69]	India: -289 [-703, -56]
Portugal: -58 [-133, -18]	France: -107 [-260, -21]
Indonesia: -48 [-109, -14]	United States: -93 [-226, -18]
Senegal: -22 [-50, -7]	Brazil: -19 [-47, -4]
Netherlands: -16 [-37, -5]	Belgium: -16 [-38, -3]
Thailand: -14 [-33, -4]	United Kingdom: -11 [-28, -2]
Turkey: -14 [-32, -4]	Thailand: -10 [-25, -2]
India: -14 [-32, -4]	Italy: -10 [-24, -2]
Morocco: -7 [-16, -2]	Japan: -9 [-21, -2]
Equatorial Guinea (direct: -18 [-35, -1])	**Djibouti (direct: -11 [-22, 1])**
China: -1410 [-3799, -89]	China: -847 [-2448, 60]
United States: -222 [-597, -14]	India: -120 [-346, 8]
India: -90 [-242, -6]	France: -61 [-177, 4]
Spain: -49 [-133, -3]	Pakistan: -29 [-83, 2]
Brazil: -15 [-40, -1]	United States: -27 [-78, 2]
United Kingdom: -13 [-35, -1]	Ethiopia: -19 [-56, 1]
France: -13 [-34, -1]	Egypt: -12 [-34, 1]
Italy: -11 [-31, -1]	Japan: -9 [-27, 1]
Turkey: -11 [-29, -1]	Saudi Arabia: -8 [-22, 1]
Germany: -8 [-23, -1]	United Arab Emirates: -6 [-17, 0]

Note:

Values reflect predicted HIV case reductions. Prediction 95% credible interval in brackets.

Table 8: Hypothetical - Top 10 beneficiaries

Figures

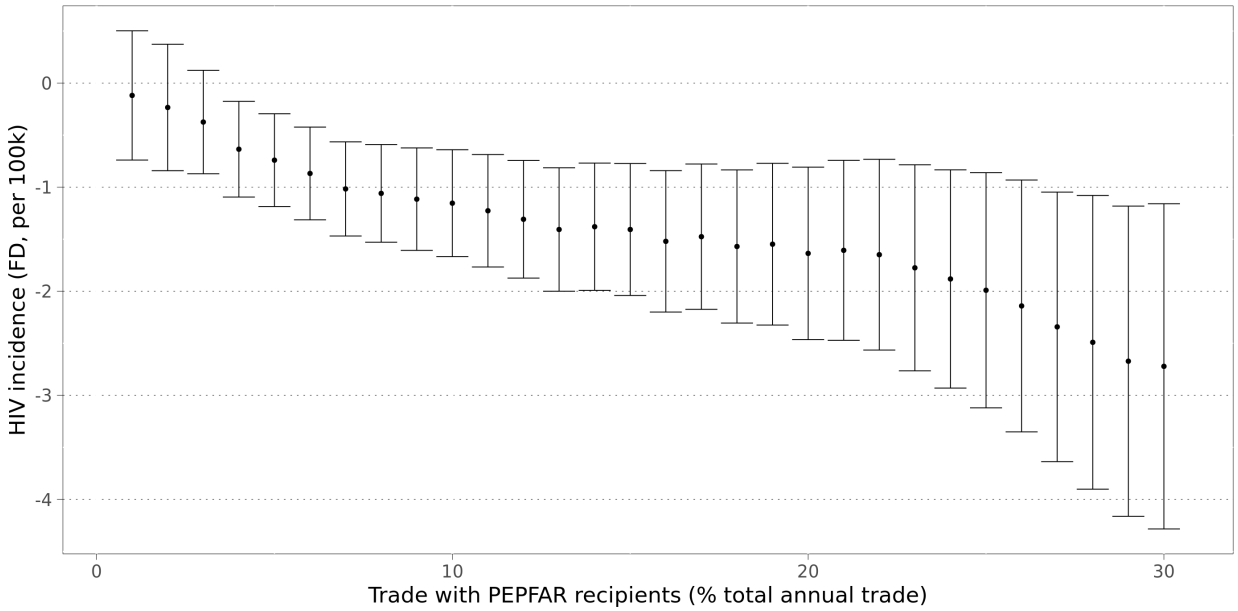

Figure 1: Mean differences in HIV incidence reductions across trade cutoffs

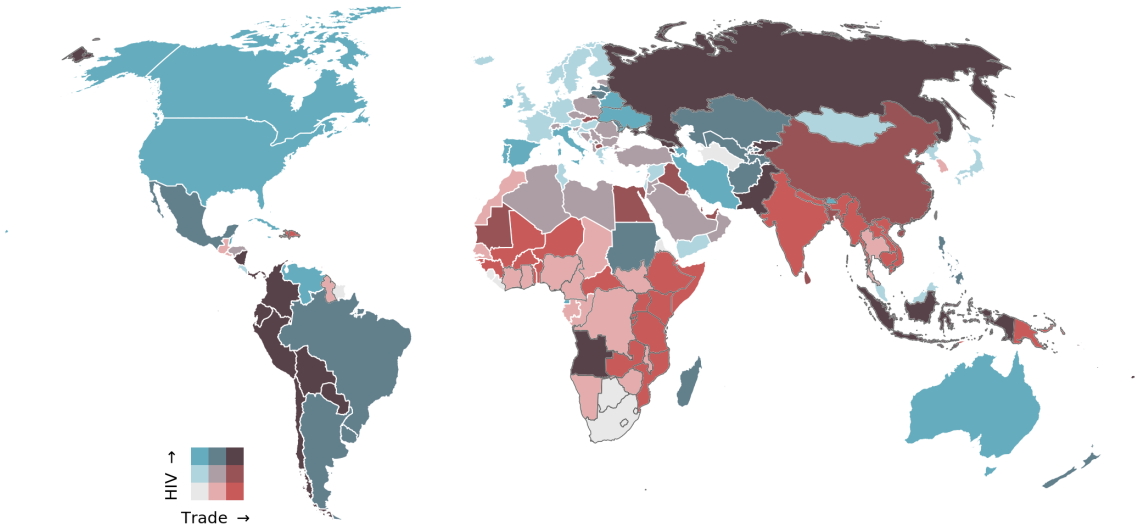

Figure 2: Bivariate Map - HIV Incidence and General Trade Growth

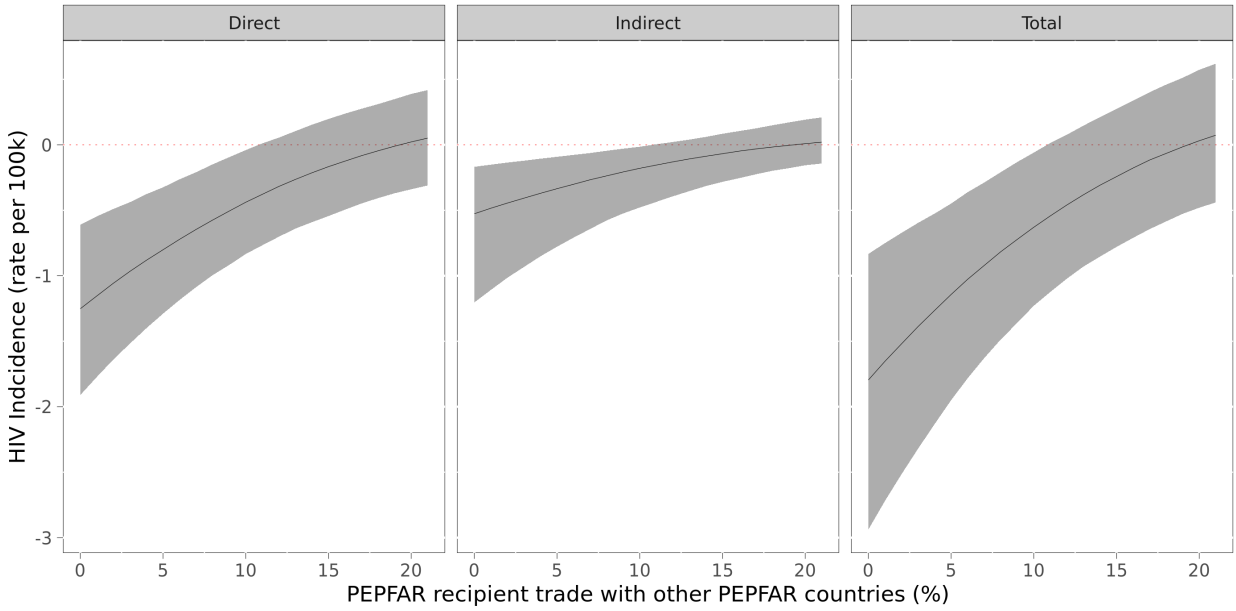

Figure 3: Conditional LRSS Effects - PEPFAR Aid, PEPFAR Trade, and Trade Diffusion

Appendix A

Appendix discussion here.

	Mean	SD	Min	Max
OECD STI aid	0.093	3.408	-85.738	116.076
OECD General health aid	0.066	3.684	-65.145	82.286
OECD Reproductive health aid	0.018	0.614	-6.932	7.764
OECD Infectious disease aid	0.029	1.155	-23.615	23.615
Public/Private health spending ratio	0.046	0.266	-1.898	3.405
Pop. density$^{\circ}$	0.015	0.016	-0.069	0.194
GDP PC$^{\circ}$	0.023	0.050	-0.650	0.676
Export/Import ratio	-0.011	0.121	-1.120	0.948
Internet access	2.722	3.034	-8.742	24.881
Life expecectancy	0.337	0.327	-1.459	2.256
Infant mortality$^{\circ}$	-0.033	0.034	-0.577	0.536

Note:

$\circ$ denotes logged variable.

Table 9: Descriptive statistics

	Non-spatial		Spatial		
	[1]	[2]	[3]	[4]	[5]
PEPFAR Aid	−0.468*	−0.489*	−0.486*	−0.488*	−0.490*
	[−0.724; −0.219]	[−0.737; −0.246]	[−0.740; −0.239]	[−0.728; −0.247]	[−0.744; −0.239]
PEPFAR Trade	0.316	−0.181	0.308	0.361	0.410
	[−3.510; 4.159]	[−3.888; 3.522]	[−3.379; 3.921]	[−3.333; 4.006]	[−3.317; 4.086]
PEPFAR Trade^2	−0.944	−0.169	−1.084	−1.090	−1.161
	[−5.715; 3.765]	[−4.641; 4.293]	[−5.614; 3.370]	[−5.617; 3.469]	[−5.700; 3.366]
PEPFAR Aid × PEPFAR Trade	3.962*	3.936*	3.961*	4.110*	4.115*
	[2.034; 5.842]	[2.028; 5.894]	[1.972; 5.962]	[2.086; 6.059]	[2.018; 6.138]
PEPFAR Aid × PEPFAR Trade^2	−8.524*	−8.342*	−8.572*	−8.931*	−8.930*
	[−12.647; −4.412]	[−12.428; −4.309]	[−12.873; −4.361]	[−13.232; −4.594]	[−13.222; −4.464]
PEPFAR Aid × PEPFAR Trade × PEPFAR Trade^2	5.559*	5.498*	5.722*	5.948*	5.945*
	[3.011; 8.118]	[2.932; 8.072]	[3.132; 8.337]	[3.222; 8.637]	[3.210; 8.656]
OECD STI aid		−0.119*	−0.116*	−0.115*	−0.116*
		[−0.155; −0.083]	[−0.152; −0.081]	[−0.151; −0.079]	[−0.153; −0.080]
OECD General health aid		−0.005	−0.006	−0.006	−0.006
		[−0.040; 0.028]	[−0.039; 0.026]	[−0.039; 0.028]	[−0.039; 0.025]
OECD Reproductive health aid		0.032	0.035	0.040	0.038
		[−0.171; 0.239]	[−0.172; 0.237]	[−0.157; 0.238]	[−0.173; 0.242]
OECD Infectious disease aid		−0.047	−0.054	−0.056	−0.055
		[−0.151; 0.056]	[−0.158; 0.049]	[−0.165; 0.054]	[−0.162; 0.054]
Public/Private health spending ratio		0.964*	0.953*	0.943*	0.945*
		[0.408; 1.523]	[0.382; 1.490]	[0.379; 1.509]	[0.385; 1.515]
Pop. density°		−5.222	−5.269	−5.293	−5.223
		[−19.190; 9.300]	[−19.611; 8.494]	[−19.391; 8.517]	[−19.360; 8.562]
GDP PC°		0.168	0.157	0.174	0.154
		[−2.816; 3.021]	[−2.637; 2.967]	[−2.763; 3.085]	[−2.640; 2.971]
Export/Import ratio		0.241	0.196	0.207	0.198
		[−0.834; 1.359]	[−0.896; 1.254]	[−0.870; 1.278]	[−0.866; 1.260]
Internet access		0.020	0.019	0.020	0.020
		[−0.025; 0.064]	[−0.027; 0.066]	[−0.025; 0.066]	[−0.024; 0.065]
Life expecectancy		−1.550*	−1.660*	−1.647*	−1.643*
		[−2.165; −0.939]	[−2.323; −0.984]	[−2.275; −1.026]	[−2.270; −1.028]
Infant mortality°		3.440	3.311	3.299	3.292
		[−1.233; 8.165]	[−1.437; 7.849]	[−1.650; 8.118]	[−1.329; 7.996]
HIV 100k (lag)	0.622*	0.613*	0.612*	0.614*	0.614*
	[0.591; 0.653]	[0.581; 0.645]	[0.581; 0.644]	[0.582; 0.646]	[0.582; 0.645]
Rho - Trade			0.117*	0.123*	0.123*
			[0.055; 0.176]	[0.064; 0.182]	[0.053; 0.189]
Rho - Distance				−0.108	−0.106
				[−0.279; 0.133]	[−0.277; 0.139]
Rho - Migration					0.001
					[−0.074; 0.071]
FE - Country	Yes	Yes	Yes	Yes	Yes
FE - Year	Yes	Yes	Yes	Yes	Yes
Log lik.	−6847.650	−6807.840	−6809.419	−6806.033	−6813.627
WAIC	14051.815	13986.454	13992.430	14007.591	14209.719
N	2634	2634	2634	2634	2634

* Null hypothesis value outside the confidence interval. ◦ denotes logged variable.

Table 3: Main Results

	Non-spatial		Spatial		
	[1]	[2]	[3]	[4]	[5]
PEPFAR Aid	-0.468^* $[-0.724; -0.219]$	-0.489^* $[-0.737; -0.246]$	-0.486^* $[-0.740; -0.239]$	-0.488^* $[-0.728; -0.247]$	-0.490^* $[-0.744; -0.239]$
PEPFAR Aid × PEPFAR Trade	3.962^* $[2.034; 5.842]$	3.936^* $[2.028; 5.894]$	3.961^* $[1.972; 5.962]$	4.110^* $[2.086; 6.059]$	4.115^* $[2.018; 6.138]$
PEPFAR Aid × PEPFAR Trade^2	-8.524^* $[-12.647; -4.412]$	-8.342^* $[-12.428; -4.309]$	-8.572^* $[-12.873; -4.361]$	-8.931^* $[-13.232; -4.594]$	-8.930^* $[-13.222; -4.464]$
PEPFAR Aid × PEPFAR Trade × PEPFAR Trade^2	5.559^* $[3.011; 8.118]$	5.498^* $[2.932; 8.072]$	5.722^* $[3.132; 8.337]$	5.948^* $[3.222; 8.637]$	5.945^* $[3.210; 8.656]$
Spatial Lags					
Rho - Trade			0.117^* $[0.055; 0.176]$	0.123^* $[0.064; 0.182]$	0.123^* $[0.053; 0.189]$
Rho - Distance				-0.108 $[-0.279; 0.133]$	-0.106 $[-0.277; 0.139]$
Rho - Migration					0.001 $[-0.074; 0.071]$
Temporal Lag					
HIV incidence rate (per 100k, lag)	0.622^* $[0.591; 0.653]$	0.613^* $[0.581; 0.645]$	0.612^* $[0.581; 0.644]$	0.614^* $[0.582; 0.646]$	0.614^* $[0.582; 0.645]$
Controls	No	Yes	Yes	Yes	Yes
FE - Country	Yes	Yes	Yes	Yes	Yes
FE - Year	Yes	Yes	Yes	Yes	Yes
Log lik.	-6847.650	-6807.840	-6809.419	-6806.033	-6813.627
WAIC	14051.815	13986.454	13992.430	14007.591	14209.719
N	2634	2634	2634	2634	2634

* Null hypothesis value outside the confidence interval.

Table 4: Statistical models

	W1 - Distance	W1 - Migration	W2 - Distance + Migration	W2 - Trade + Migration
ihme_hiv100kFdLag	0.613*	0.612*	0.613*	0.612*
	[0.581; 0.646]	[0.581; 0.644]	[0.580; 0.645]	[0.580; 0.643]
pepfarPc	−0.489*	−0.489*	−0.491*	−0.485*
	[−0.732; −0.249]	[−0.735; −0.244]	[−0.732; −0.245]	[−0.735; −0.230]
analysis_tradePepfarPercent	−0.148	−0.206	−0.190	0.345
	[−3.667; 3.491]	[−3.750; 3.364]	[−3.845; 3.450]	[−3.213; 4.020]
analysis_tradePepfarPercent2	−0.195	−0.335	−0.314	−1.116
	[−4.695; 4.208]	[−4.843; 3.996]	[−4.879; 4.154]	[−5.482; 3.300]
oecd_disStdhivAid2020usdPc	−0.120*	−0.122*	−0.122*	−0.116*
	[−0.156; −0.085]	[−0.159; −0.085]	[−0.157; −0.087]	[−0.153; −0.079]
oecd_basicAid2020usdPc	−0.005	−0.005	−0.006	−0.006
	[−0.039; 0.028]	[−0.037; 0.028]	[−0.039; 0.027]	[−0.040; 0.026]
oecd_reproductiveAid2020usdPc	0.033	0.030	0.033	0.037
	[−0.175; 0.244]	[−0.172; 0.241]	[−0.172; 0.238]	[−0.165; 0.232]
oecd_disInfectiousAid2020usdPc	−0.046	−0.049	−0.049	−0.054
	[−0.159; 0.066]	[−0.156; 0.062]	[−0.154; 0.057]	[−0.163; 0.054]
ihme_gov2oop	0.960*	0.967*	0.967*	0.950*
	[0.395; 1.541]	[0.391; 1.511]	[0.415; 1.529]	[0.375; 1.536]
un_popDensSqkm	−5.029	−5.206	−5.017	−5.412
	[−18.890; 8.588]	[−19.542; 8.687]	[−19.068; 9.231]	[−19.286; 8.423]
un_gdpUSDPc	0.163	0.173	0.168	0.170
	[−2.765; 3.087]	[−2.579; 2.946]	[−2.772; 2.989]	[−2.650; 2.928]
un_e2i	0.242	0.245	0.259	0.192
	[−0.847; 1.317]	[−0.853; 1.328]	[−0.821; 1.337]	[−0.855; 1.256]
wb_internetPercent	0.020	0.019	0.019	0.020
	[−0.025; 0.065]	[−0.026; 0.064]	[−0.027; 0.065]	[−0.025; 0.065]
wb_lifeExpecYrs	−1.552*	−1.600*	−1.579*	−1.659*
	[−2.167; −0.938]	[−2.258; −0.979]	[−2.202; −0.947]	[−2.269; −1.031]
wb_mortalityInfant100k	3.392	3.419	3.422	3.281
	[−1.300; 8.102]	[−1.315; 8.129]	[−1.359; 8.247]	[−1.412; 8.034]
pepfarPc:analysis_tradePepfarPercent	3.922*	3.852*	3.939*	3.972*
	[1.935; 5.953]	[1.839; 5.861]	[1.941; 5.907]	[1.913; 5.977]
pepfarPc:analysis_tradePepfarPercent2	−8.305*	−8.075*	−8.276*	−8.617*
	[−12.601; −4.052]	[−12.418; −3.753]	[−12.467; −4.059]	[−12.861; −4.239]
pepfarPc:analysis_tradePepfarPercent:analysis_tradePepfarPercent2	5.476*	5.325*	5.445*	5.759*
	[2.888; 8.095]	[2.636; 7.979]	[2.838; 8.078]	[3.042; 8.361]
rho1	0.007	0.043	−0.037	0.118*
	[−0.213; 0.236]	[−0.023; 0.106]	[−0.251; 0.205]	[0.049; 0.184]
rho2			0.044	−0.006
			[−0.021; 0.108]	[−0.081; 0.065]
FE - Country	Yes	Yes	Yes	Yes
FE - Year	Yes	Yes	Yes	Yes
Log lik.	−6808.971	−6810.602	−6809.803	−6810.313
WAIC	13991.064	14003.231	13997.913	14006.016
N	2634	2634	2634	2634

* Null hypothesis value outside the confidence interval. ∘ denotes logged variable.

Table 10: Supplemental Results