Online Appendix
Multinational Expansion in Time and Space

Stefania Garetto — BU, CEPR, and NBER
Lindsay Oldenski — Georgetown University
Natalia Ramondo — BU and NBER

October 4, 2021

A Data Description

Reporting thresholds. The BEA collects firm-level data on the operations of US multinational enterprises (MNEs) in its annual surveys of US direct investment abroad. All US-located firms that have at least one foreign affiliate and that meet a minimum threshold of assets, sales, or net income are required by law to respond to these surveys. These minimum thresholds of assets, sales, or net income required for reporting affiliate sales by destination differ over time. In general, these reporting thresholds increased in recent years, reaching US$60 million (positive or negative) by 2011. Additionally, benchmark survey years (i.e., years in which the survey is more comprehensive), which occur every 5 years, have lower reporting thresholds. Table A.1 shows the reporting thresholds for the years in our sample.

Tax havens. Our sample contains affiliates that do not operate in tax haven countries. Affiliates in tax haven countries are likely to open for different reasons than production purposes, and to be subject to different cost structures than affiliates in non-tax haven countries. We exclude countries defined as tax havens by Gravelle (2015), except for Ireland, Switzerland, Hong Kong, and Singapore, countries that meet some of the criteria for tax haven status but also have a substantial amount of US MNE production. We do not drop the Channel Islands and the Isle of Man because affiliates in those places are combined with affiliates in the United Kingdom. Similarly, affiliates in the Cook Islands and Niue are combined with affiliates in New Zealand. Table A.2 reports the list of countries that we exclude from our sample.

Table A.1: BEA minimum survey exemptions levels.

survey year	Minimum exemption levels (in US$ millions)	survey year	Minimum exemption levels (in US$ millions)
1987-88	10	2000-03	30
1989	**3**	**2004**	**25**
1990 -93	15	2005-07	40
1994	**3**	2008	60
1995-98	20	**2009**	**25**
1999	**7**	2010-11	60

Note: Exemption levels are for majority-owned foreign affiliates. Benchmark survey years are in bold.

Table A.2: Tax haven countries excluded from our sample.

Anguilla	Turks and Caicos	Monaco	Antigua and Barbuda	US Virgin Islands
San Marino	Aruba	Belize	Maldives	Bahamas
Costa Rica	Mauritius	Barbados	Panama	Seychelles
British Virgin Islands	Bermuda	Bahrain	Cayman Islands	Macau
Vanuatu	Dominica	Andorra	Marshall Islands	Grenada
Liberia	Samoa	Montserrat	Cyprus	Nauru
Netherlands Antilles	Gibraltar	Tonga	St. Kitts and Nevis	Malta
St Vincent and Grenadines	St Lucia	Liechtenstein		

Note: From Gravelle (2015).

Industry classification. Each foreign affiliate is assigned an industry classification based on its primary activity according to the BEA International Surveys Industry (ISI) system, which closely follows the 3-digit Standard Industrial Classification (SIC) system. The BEA uses 3-digit SIC-based ISI codes for years prior to 1999. From 1999 onward, they use 4-digit NAICS-based ISI codes. For consistency, we convert the NAICS-based codes to 3-digit SIC-based ISI codes for the relevant years.

Unit of observation. According to the BEA definition, an affiliate is a business enterprise operating in a given host country; it thus can operate several plants in different locations within the host country. The BEA rules permit consolidated reporting for distinct plants located in the same country that operate in the same narrowly defined industry or otherwise are integral parts of the same business operation. We consolidate observations of enterprises belonging to the same parent company and operating in the same country and 3-digit industry. We group these enterprises' activities together and refer to them as a single affiliate.

B Additional Facts and Robustness

Table B.1: Affiliate sales and number of affiliates: horizontal vs export sales. OLS.

Dependent variable	Share of total affiliate sales				Share of affiliates			
	horizontal sales		export sales		horizontal sales		export sales	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
affiliate age	-0.002	-0.012***	-0.005**	0.005***	0.00003	-0.001	0.014***	0.029***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.0006)	(0.003)	(0.002)
country-year fe	yes	yes	yes	yes	yes	yes	yes	yes
industry fe	yes	no	yes	no	yes	no	yes	no
affiliate fe	no	yes	no	yes	no	yes	no	yes
Observations	36,135	36,135	25,958	25,958	38,080	38,080	38,080	38,080
R-squared	0.079	0.013	0.092	0.000	0.042	0.0001	0.081	0.036

Note: Observations at the affiliate-year level, for new majority-owned affiliates that survive for at least ten consecutive years, in manufacturing. In columns (1)-(4), the dependent variable is horizontal (export) sales, as a share of total affiliate's sales, for affiliates with positive horizontal (export) sales; in columns (5)-(8), the dependent variable is the share of affiliates with positive horizontal (export) sales. Standard errors, clustered at the parent level, are in parenthesis. Levels of significance are denoted $^{***}p < 0.01$, $^{**}p < 0.05$, and $^{*}p < 0.1$.

Table B.2: Affiliate sales relative to parent sales. OLS.

(a) Affiliate horizontal sales, as a share of parent sales		(b) Affiliate total sales, as a share of parent sales	
D(age = 2)	-0.0013	D(years to export entry = -5)	-0.0110
	(0.0014)		(0.0073)
D(age = 3)	-0.0007	D(years to export entry = -4)	-0.0201***
	(0.0013)		(0.0064)
D(age = 4)	0.0011	D(years to export entry = -3)	-0.0162**
	(0.0014)		(0.0071)
D(age = 5)	0.0012	D(years to export entry = -2)	-0.0129*
	(0.0011)		(0.0080)
D(age = 6)	0.0012	D(years to export entry = -1)	-0.0150**
	(0.0011)		(0.0067)
D(age = 7)	0.0002	D(years to export entry = 1)	-0.0041
	(0.0009)		(0.0041)
D(age = 8)	0.0002	D(years to export entry = 2)	-0.0049
	(0.0008)		(0.0070)
D(age = 9)	0.0011	D(years to export entry = 3)	0.0054
	(0.0009)		(0.00813)
D(age = 10)	0.0022	D(years to export entry = 4)	0.0010
	(0.0014)		(0.0075)
		D(years to export entry = 5)	0.0019
			(0.0067)
Observations	38,080		38,080
R-squared	0.001		0.002

Note: Observations at the affiliate-year level, for new majority-owned affiliates that survive for at least ten consecutive years, in manufacturing. In panel (a), the dependent variable is the value of affiliate horizontal sales relative to the domestic sales of the US parent, for new affiliates. D(age = a) is a dummy variable that equals 1 if the affiliate's age = a. In panel (b), the dependent variable is affiliate total sales relative to the domestic sales of the US parent. D(years to export entry = t) is a dummy variable that equals 1 for affiliates that start exporting during our sample period in year t relative to when they begin exporting. Controls for t$\geq$6 and t$\leq$-6 are included but not reported here. Country-year and affiliate fixed effects included. Standard errors, clustered at the parent level, are in parentheses. Levels of significance are denoted $^{***}p < 0.01$, $^{**}p < 0.05$, and $^{*}p < 0.1$.

Table B.3: Horizontal affiliate sales, relative to US parent sales, robustness. OLS.

Dep var:	Affiliate horizontal sales relative to US parent sales					
	First affiliate	Subsequent affiliate	GVC affiliate	Non-GVC affiliate	Greenfield affiliate	M&A affiliate
	(1)	(2)	(3)	(4)	(5)	(6)
D(age=2)	-0.0052	-0.0005	-0.0022	-0.0006		
	(0.0037)	(0.0009)	(0.0016)	(0.0020)		
D(age=3)	-0.0037	-0.0008	-0.0011	-0.004	-0.0177	0.0019
	(0.0036)	(0.001)	(0.0013)	(0.0043)	(0.0216)	(0.0051)
D(age=4)	-0.0014	0.0009	0.0011	-0.0043	-0.0076	0.0003
	(0.0037)	(0.0007)	(0.0012)	(0.0046)	(0.0096)	(0.0041)
D(age=5)	-0.0008	0.0009*	0.0004	0.0037	-0.0065	0.0017
	(0.0026)	(0.0005)	(0.0012)	(0.0034)	(0.0074)	(0.0034)
D(age=6)	0.0003	0.0002	0.0015	-0.0036	-0.0072	0.002
	(0.003)	(0.0004)	(0.0014)	(0.0018)	(0.0075)	(0.0026)
D(age=7)	-0.0025	0.0003	0.0003	-0.0034	-0.0069	0.0025
	(0.0024)	(0.0004)	(0.001)	(0.0014)	(0.0074)	(0.0024)
D(age=8)	-0.0022	0.0002	0.0006	-0.0047	-0.0054	0.0026
	(0.0024)	(0.0004)	(0.0009)	(0.0025)	(0.0065)	(0.0022)
D(age=9)	-0.0012	0.0012*	0.0013	-0.0042	-0.0008	0.0036*
	(0.0019)	(0.0007)	(0.001)	(0.0019)	(0.0022)	(0.0021)
D(age=10)	0.002	0.0011	0.0012	0.0056	0.0002	0.0029
	(0.003)	(0.0008)	(0.001)	(0.0083)	(0.0015)	(0.0018)
Observations	17,360	20,720	27,760	10,320	2,214	3,564
R^2	0.0034	0.0013	0.0022	0.0015	0.0116	0.0075

Note: Observations at the affiliate-year level, for new majority-owned affiliates that survive for at least ten consecutive years, in manufacturing. Dependent variable is the ratio of horizontal sales, relative to US parent sales. First affiliate refers to the first foreign affiliate opened by the parent, while subsequent affiliate refers to second or higher. GVC affiliate refers to affiliates with positive intra-firm trade, while non-GVC affiliate refers to affiliates with zero intra-firm trade. M&A affiliate refers to affiliates created through a merger or acquisition of an existing firm, while greenfield affiliate refers to a new firm. All specifications include affiliate and country-year fixed effects. Standard errors, clustered at the parent level, are in parenthesis. Levels of significance are denoted $^{***}p < 0.01$, $^{**}p < 0.05$, and $^{*}p < 0.1$.

Table B.4: Unconditional and conditional probability of affiliate entry.

	Unconditional	Continent	Border	Language	Income	All
Canada	0.021	***0.021***	–	0.023	***0.021***	–
		(0.525)	–	(0.000)	(0.553)	–
United Kingdom	0.025	0.027	***0.030***	***0.026***	0.026	***0.030***
		(0.000)	(0.143)	(0.292)	(0.008)	(0.143)
Germany	0.023	0.026	0.029	0.028	0.024	0.028
		(0.000)	(0.000)	(0.010)	(0.000)	(0.010)
Ireland	0.010	0.010	0.011	0.010	0.010	0.011
		(0.001)	(0.010)	(0.000)	(0.005)	(0.011)
China	0.027	0.037	0.050	0.048	0.051	0.057
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
France	0.021	0.024	0.028	***0.023***	0.022	0.029
		(0.000)	(0.000)	(0.018)	(0.000)	(0.000)
Brazil	0.016	0.022	0.027	***0.025***	0.023	***0.019***
		(0.000)	(0.000)	(0.063)	(0.000)	(0.614)
Singapore	0.016	0.023	0.044	0.017	***0.016***	0.045
		(0.000)	(0.000)	(0.000)	(0.300)	(0.000)
Mexico	0.024	0.029	***0.028***	0.034	0.031	***0.024***
		(0.000)	(0.620)	(0.000)	(0.000)	(0.961)
Japan	0.016	0.021	–	–	***0.016***	–
		(0.000)	(0.000)	(0.000)	(0.224)	(0.000)

Note: Probabilities of affiliate entry into the top-ten most popular destinations of US MNEs. Conditional probabilities refer to the probability of observing an MNE opening an affiliate in a country given that the parent already has an affiliate in a "similar" country. Column 6 refers to similarity in all the dimensions listed in columns 2-5. The sample is restricted to parents with at least two affiliates worldwide. P-values from tests of equality of the conditional and unconditional probabilities are in parentheses. Conditional probabilities in ***bold*** are not significantly different from the relevant unconditional probability.

Table B.5: Unconditional and conditional probability of affiliate entry, GVC vs non-GVC affiliates.

	Unconditional	Continent	Border	Language	Income	All
			GVC Affiliates			
Canada	0.021	***0.022***	-	0.024	***0.021***	-
		(0.733)		(0.000)	(0.360)	
United Kingdom	0.026	0.028	***0.030***	***0.027***	0.027	***0.030***
		(0.001)	(0.204)	(0.426)	(0.008)	(0.204)
Germany	0.024	0.026	0.030	***0.028***	0.025	***0.028***
		(0.000)	(0.000)	(0.024)	(0.000)	(0.024)
Ireland	0.010	0.011	***0.012***	0.011	***0.010***	***0.012***
		(0.003)	(0.012)	(0.001)	(0.005)	(0.012)
China	0.028	0.038	0.051	0.049	0.052	0.057
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
France	0.022	0.025	0.029	***0.024***	0.023	0.029
		(0.000)	(0.000)	(0.059)	(0.000)	(0.000)
Brazil	0.017	0.022	0.027	***0.025***	0.024	***0.019***
		(0.000)	(0.000)	(0.070)	(0.000)	(0.713)
Singapore	0.017	0.024	0.045	0.018	***0.017***	0.046
		(0.000)	(0.000)	(0.000)	(0.292)	(0.000)
Mexico	0.025	0.030	***0.028***	0.034	0.031	***0.024***
		(0.000)	(0.699)	(0.000)	(0.000)	(0.936)
Japan	0.016	0.022	-	-	***0.017***	-
		(0.000)			(0.092)	
			Non-GVC Affiliates			
Canada	0.009	***0.014***	-	0.012	***0.0073***	-
		(0.483)		(0.002)	(0.233)	
United Kingdom	0.009	***0.011***	-	***0.008***	***0.0091***	-
		(0.516)		(0.668)	(0.830)	
Germany	0.010	***0.011***	***0.014***	***0.017***	***0.0096***	***0.0165***
		(0.687)	(0.308)	(0.552)	(0.552)	(0.552)
Ireland	-	-	-	-	-	-
China	0.006	***0.007***	***0.007***	***0.010***	***0.0217***	-
		(0.656)	(0.795)	(0.444)	(0.249)	
France	0.006	***0.007***	***0.014***	***0.009***	***0.006***	***0.0238***
		(0.015)	(0.014)	(0.248)	(0.023)	(0.069)
Brazil	0.005	***0.007***	***0.033***	-	***0.007***	-
		(0.521)	(0.192)		(0.547)	
Singapore	-	-	-	-	-	-
Mexico	0.006	***0.010***	-	***0.024***	***0.0210***	-
		(0.176)		(0.131)	(0.143)	
Japan	0.005	-	-	-	***0.0038***	-
					(0.386)	

Note: Probabilities of affiliates entry. Conditional probabilities refer to the probability of observing an MNE opening an affiliate in a country given that the parent already has an affiliate in a "similar" country. Column 6 refers to similarity in all the dimensions listed in columns 2-5. Sample is restricted to parents with at least two affiliates worldwide. "GVC affiliates" are affiliates with positive intra-firm trade flows, while "non-GVC affiliates" are affiliates with zero intra-firm trade flows. Results for non-GVC affiliates in Ireland and Singapore are not shown for confidentiality reasons. Conditional probabilities in ***bold*** are not significantly different from the relevant unconditional probability.

Table B.6: Gravity in affiliate opening. OLS.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
log(GDP)	0.0322***						0.0271***	0.0143***
	(0.0035)						(0.0035)	(0.0035)
log(distance)		-0.0593***					-0.0476 ***	-.0450***
		(0.0044)					(0.0072)	(0.0071)
log(horizontal sales)			0.0332***					0.0276***
			(0.0022)					(0.0022)
common continent				0.1018***			-0.0083	-0.0103
				(0.0119)			(0.0193)	(0.0192)
common language					0.0706***		0.0520***	0.0418***
					(0.007)		(0.0072)	(0.0072)
common income group						0.0830***	0.0336***	0.0299***
						(0.0083)	(0.0087)	(0.0086)
Observations	132,493	132,493	132,493	132,493	132,493	132,493	132,493	132,493
R-squared	0.0964	0.1022	0.0895	0.0975	0.0961	0.0932	0.1112	0.1135

Note: Dependent variable = 1 for the first affiliate of an MNE, and 0 for subsequent affiliates. *common income group* = 1 if the affiliate's host country is in the same World Bank income group as the US. All specifications include parent and year fixed effects. Standard errors in parentheses. Levels of significance are denoted $^{***}p < 0.01$, $^{**}p < 0.05$, and $^{*}p < 0.1$.

Table B.7: Evidence on Hysteresis.

Table B.7.1. Persistence in Affiliate Operations

	$N^a_{j,t}/N^a_{j,t-1}$	$N^{\sim a}_{j,t}/N^{\sim a}_{j,t-1}$	$N^h_{j,t}/N^h_{j,t-1}$	$N^e_{j,t}/N^e_{j,t-1}$
Canada	0.9997	1.0116	0.9879	1.0152
UK	1.0114	1.002	1.0471	1.0240
Germany	1.0184	1.0008	1.0892	1.0252
France	1.0236	0.9998	1.0679	1.0319
Japan	1.0385	1.0014	1.0354	1.0692
Mexico	1.0341	0.9967	1.0086	1.0629
Ireland	1.0201	1.0041	1.0912	1.0252
Brazil	1.0267	1.0016	1.0328	1.0424
Singapore	1.0608	0.9996	1.2417	1.0705
China	1.2239	0.984	1.1995	1.2804
Average	1.0457	1.0002	1.0801	1.0647

Table B.7.2. Parent Size at Affiliate Entry and Exit

Transition dummies	Coefficient
Entry	0.0074
	(0.0048)
Exit	-0.0216
	(0.0062)

Notes: Table B.7.1: $N^a_{j,t}$ ($N^{\sim a}_{j,t}$) denotes the number of MNEs that have (do not have) an affiliate in country j in year t. $N^h_{j,t}$ ($N^e_{j,t}$) denotes the number of MNEs that have a horizontal (exporting) affiliate in country j in year t. Averaged over all years. Table B.7.2: OLS coefficients from regressing ln(parent domestic sales) on affiliate entry and exit dummies. Year and affiliate fixed effects included. Robust standard errors. N = 111,802. Coefficients on entry and exit are significantly different from each other at the 0.0005% confidence level.

Table B.8: MNE shock structure. OLS.

Dependent variable	log of horizontal affiliate sales			
Country-industry fixed effect	yes	yes	yes	yes
US GDP	yes	yes	yes	yes
Host country GDP	yes	yes	yes	yes
Parent fixed effect	no	yes	yes	no
Parent sales	no	no	yes	yes
Affiliate fixed effect	no	no	no	yes
Adjusted R-squared	0.24	0.27	0.29	0.79

Notes: Sample of affiliates born during the sample period. Number of observations: 153,773.

C Model Solution

C.1 Dynamic firm problem

The compound option structure of the model implies that it can be solved backwards. We start from the problem of a firm that already has an affiliate in country j and has to decide whether to export to any country $k \neq j$. Once this problem is solved, the value of an affiliate in j is determined. Then we can solve the problem of a firm that has to decide whether to open an affiliate in each country j. For each step of the solution, we follow the method outlined in Dixit and Pindyck (1994).

To solve the affiliate export problem, we start by solving for the value functions $V^o_{jk}(z, X, \mathbf{Q})$ and $V^e_{jk}(z, X, \mathbf{Q})$ in their continuation region. Writing the Bellman equation in (13) in the continuation region, taking the limit as $\Delta t \to 0$, and applying Ito's Lemma, yields the no-arbitrage condition

$$\rho V^o_{jk}(z, Y_k) = \tilde{\mu}_k Y_k V'^o_{jk}(z, Y_k) + \frac{\tilde{\sigma}_k^2}{2} Y_k^2 V''^o_{jk}(z, Y_k), \tag{C.1}$$

where the option value of exporting to k only depends on the realization of the composite shock Y_k. Guessing a solution for the value function and applying the method of undetermined coefficients, the value of the option of exporting to country k for an affiliate in country j has general solution given by

$$V^o_{jk}(z, Y_k) = A^o_{jk}(z) Y_k^{\alpha_k} + B^o_{jk}(z) Y_k^{\beta_k}, \tag{C.2}$$

where $\alpha_k < 0$ and $\beta_k > 1$ are the roots of $\frac{1}{2}\tilde{\sigma}_k^2\xi^2 + \left(\tilde{\mu}_k - \frac{\tilde{\sigma}_k^2}{2}\right)\xi - \rho = 0$. As $Y_k \to 0$, the option of exporting becomes worthless, so it must be that $A_{jk}^o(z) = 0$. Conversely, the option of exporting becomes more attractive as Y_k increases, so it must be that $B_{jk}^o(z) > 0$.

Similarly, writing the Bellman equation in (14) in the continuation region, taking the limit as $\Delta t \to 0$, and applying Ito's Lemma, yields the no-arbitrage condition

$$\rho V_{jk}^e(z, Y_k) = \pi_{jk}(z, Y_k) - f_{jk}^e + \tilde{\mu}_k V'^e_{jk}(z, Y_k) + \frac{\tilde{\sigma}_k^2}{2} Y_k^2 V''^e_{jk}(z, Y_k). \tag{C.3}$$

The value of the option of exporting to country k for an affiliate in country j has general solution given by

$$V_{jk}^e(z, Y_k) = A_{jk}^e(z) Y_k^{\alpha_k} + B_{jk}^e(z) Y_k^{\beta_k} + \frac{\pi_{jk}(z, Y_k)}{\rho - \tilde{\mu}_k} - \frac{f_{jk}^e}{\rho}. \tag{C.4}$$

Notice that, as $Y_k \to 0$, there is value from the possibility of endogenously stopping to export, so it must be that $A_{jk}^e(z) > 0$. Also, as Y_k increases, the value of exports converges to the discounted profit flow (i.e., there is no further expansion option), so it must be that $B_{jk}^e(z) = 0$.

To completely solve the affiliate export problem, we need to solve for the policy functions, which are thresholds for the realizations of the composite shock that induce the affiliate to start and stop exporting. For each country pair (j, k) and for each firm with productivity z, the parameters $B_{jk}^o(z) > 0$, $A_{jk}^e(z) > 0$, and the export entry and exit thresholds, denoted by Y_{jk}^{OE} and Y_{jk}^{EO}, respectively, can be recovered from the following system of value-matching conditions,

$$V_{jk}^o(z, Y_{jk}^{OE}) = V_{jk}^e(z, Y_{jk}^{OE}) - F_{jk}^e \quad \text{and} \quad V_{jk}^o(z, Y_{jk}^{EO}) = V_{jk}^e(z, Y_{jk}^{EO}), \tag{C.5}$$

and smooth-pasting conditions,

$$V'^o_{jk}(z, Y_{jk}^{OE}) = V'^e_{jk}(z, Y_{jk}^{OE}) \quad \text{and} \quad V'^o_{jk}(z, Y_{jk}^{EO}) = V'^e_{jk}(z, Y_{jk}^{EO}), \tag{C.6}$$

where $V'(\cdot)$ denotes the derivative of a value function with respect to the composite shock.

The solution method delivering the value functions related to affiliate exports and corresponding entry and exit thresholds is identical for the value functions and entry and exit thresholds associated with US exports.

To determine the value of an affiliate in j, we still need to solve for the value of horizontal sales. Writing the Bellman equation in (12) in the continuation region, taking the limit as $\Delta t \to 0$, and

applying Ito's Lemma:

$$\rho V_j^h(z, Y_j) = \pi_{jj}(z, Y_j) - f_j^h + \tilde{\mu}_j Y_j V'^h_j(z, Y_j) + \frac{\tilde{\sigma}_k^2}{2} Y_j^2 V''^h_j(z, Y_j). \tag{C.7}$$

The value of horizontal sales for an affiliate in country j has general solution given by

$$V_j^h(z, Y_j) = A_j^h(z) Y_j^{\alpha_j} + B_j^h(z) Y_j^{\beta_j} + \frac{\pi_{jj}(z, Y_j)}{\rho - \tilde{\mu}_j} - \frac{f_j^h}{\rho}. \tag{C.8}$$

Notice that, as $Y_j \to 0$, there is value from the possibility of shutting down the affiliate, so it must be that $A_j^h(z) > 0$. As Y_j increases, the value of horizontal sales converges to the discounted profit flow, so it must be that $B_j^h(z) = 0$.

The value of an affiliate in country j, $V_j^a(z, \mathbf{Y})$ is completely characterized up to the option value parameter $A_j^h(z)$:

$$V_j^a(z, \mathbf{Y}) = A_j^h(z) Y_j^{\alpha_j} + \frac{\pi_{jj}(z, Y_j)}{\rho - \tilde{\mu}_j} - \frac{f_j^h}{\rho} + \sum_{k \in \mathcal{A}_j(z)} \left[\frac{\pi_{jk}(z, Y_k)}{\rho - \tilde{\mu}_k} - \frac{f_{jk}^e}{\rho} + A_{jk}^e(z) Y_k^{\alpha_k} \right] + \sum_{k \notin \mathcal{A}_j(z)} \left[B_{jk}^o(z) Y_k^{\beta_k} \right], \tag{C.9}$$

where $\mathcal{A}_j(z)$ denotes the set of export markets in which an affiliate of a firm with productivity z located in country j exports.

To solve the affiliate opening problem, we still need to solve for the option value of opening an affiliate, and for the policy functions. Writing the Bellman equation in (11) in the continuation region, taking the limit for $\Delta t \to 0$, and applying Ito's Lemma:

$$\rho V_j^o(z, Y_j) = \tilde{\mu}_j Y_j V'^o_j(z, Y_j) + \frac{\tilde{\sigma}_j^2}{2} Y_j^2 V''^o_j(z, Y_j). \tag{C.10}$$

Hence the value of the option of opening an affiliate in country j has general solution given by

$$V_j^o(z, Y_j) = A_j^o(z) Y_j^{\alpha_j} + B_j^o(z) Y_j^{\beta_j}. \tag{C.11}$$

As $Y_j \to 0$, the option of opening an affiliate becomes worthless, so it must be that $A_j^o(z) = 0$. Conversely, the option of opening an affiliate becomes more attractive as Y_j increases, so it must be that $B_j^o(z) > 0$.

Let Y_j^{OH} and Y_j^{HO} denote the thresholds for the realization of the composite shock that induce a firm to open or shut down an affiliate in country j, respectively. The value-matching and smooth-pasting conditions that deliver the parameters $A_j^h(z)$, $B_j^o(z)$, and the policy functions Y_j^{OH} and

Y_j^{HO} are:

$$V_j^o(z, Y_j^{OH}) = V_j^a(z, Y_j^{OH}, \mathbf{Y}_{-j}) - F_j^h \quad , \quad V_j^o(z, Y_j^{HO}) = V_j^a(z, Y_j^{HO}, \mathbf{Y}_{-j}), \tag{C.12}$$

$$V'^o_j(z, Y_j^{OH}) = V'^a_j(z, Y_j^{OH}, \mathbf{Y}_{-j}) \quad , \quad V'^o_j(z, Y_j^{HO}, \mathbf{Y}_{-j}) = V'^a_j(z, Y_{-j}^{HO}), \tag{C.13}$$

where , $\mathbf{Y}_{-j}$ denotes the vector of composite shocks in countries other than j.

C.2 Price indexes

As we only consider MNEs from the United States, we compute the price index as an aggregate of the prices associated with transactions of US MNEs and of domestic firms:

$$P_k^{1-\eta} = \lambda_{kkk} P_{kkk}^{1-\eta} + \lambda_{US,kk} P_{US,kk}^{1-\eta} + \sum_{j \neq k} \lambda_{US,jk} P_{US,jk}^{1-\eta}, \tag{C.14}$$

where P_{kkk} denotes the aggregate price of domestic varieties, $P_{US,kk}$ denotes the aggregate price of varieties produced via the horizontal operations of US affiliates in k, and $P_{US,jk}$ denotes the aggregate price of varieties produced either by the US parents or by US affiliates in j and exported to k:

$$P_{kkk}^{1-\eta} = \int_{\Omega_{kkk}} \left(\frac{\eta}{\eta - 1} \frac{w_k}{z} \right)^{1-\eta} dG_k(z), \tag{C.15}$$

$$P_{US,kk}^{1-\eta} = \int_{\Omega_{US,kk}} \left(\frac{\eta}{\eta - 1} \frac{w_k}{zZ} \right)^{1-\eta} dG_{US}(z), \tag{C.16}$$

$$P_{US,jk}^{1-\eta} = \int_{\Omega_{US,jk}} \left(\frac{\eta}{\eta - 1} \frac{\tau_{jk} w_j}{zZ} \right)^{1-\eta} dG_{US}(z) \tag{C.17}$$

and Ω_{kkk}, $\Omega_{US,kk}$, $\Omega_{US,jk}$, denote the corresponding sets of varieties produced. $G_k(z)$ denotes the exogenous distribution of productivity of firms from country k.

The price indexes depend directly on the US productivity shock $Z = e^X$ and indirectly —via the integration sets— on the demand shocks Q_k. Moreover, as shown below, the integration sets themselves depend on the entry and exit thresholds, which in turn depend on the price indexes. To solve the aggregation problem, we appeal to the equivalence result shown in Leahy (1993): when solving the entry and exit problem, each firm takes aggregate prices and the sets of firms operating in each country as given, and does not take into account the effect of its own entry and exit decisions on these variables.

We assume that the mass of firms in each country k, M_k, is constant. The endogenous mass of

affiliates of US firms located in j, $M_{US,j}$, is given by continuing plus new affiliates,

$$M'_{US,j} = M_{US,j} \cdot (1 - G_{US}(z^{HO}_{US,j})) + (M_{US} - M_{US,j}) \cdot (1 - G_{US}(z^{OH}_{US,j})), \quad \text{(C.18)}$$

where $z^{OH}_{US,j}$ ($z^{HO}_{US,j}$) is the productivity threshold that induces a US firm to open (shut down) an affiliate in j. Notice that $z^{OH}_{US,j}(Y_j)$ ($z^{HO}_{US,j}(Y_j)$) is the inverse of the threshold in the realization of the shock $Y^{OH}_j(z)$ ($Y^{HO}_j(z)$), whose existence is guaranteed by the monotonicity property of the thresholds shown in Proposition 1.

Similarly, the mass of affiliates of US firms located in j that export to k is given by continuing plus new exporters to k,

$$M'_{US,jk} = M_{US,jk} \cdot (1 - G_{US}(z^{EO}_{US,jk})) + (M_{US,j} - M_{US,jk}) \cdot (1 - G_{US}(z^{OE}_{US,jk})), \quad \text{(C.19)}$$

where $z^{OE}_{US,jk}$ ($z^{EO}_{US,jk}$) is the productivity threshold that induces an affiliate of a US firm in j to start (stop) exporting to k.

Lastly, the mass of US parents that export to k is given by continuing plus new exporters to k,

$$M'_{US,US,k} = M_{US,US,k} \cdot (1 - G_{US}(z^{EO}_{US,US,k})) + (M_{US} - M_{US,US,k}) \cdot (1 - G_{US}(z^{OE}_{US,US,k})), \quad \text{(C.20)}$$

where $z^{OE}_{US,US,k}$ ($z^{EO}_{US,US,k}$) is the productivity threshold that induces a US parent to start (stop) exporting to k.

C.3 Proofs

In this section, we provide proofs for Propositions 1 and 2. To this end, notice that, when $A^e_j(z) = A^e_{jk}(z) = 0$, the systems of value-matching and smooth pasting conditions (C.5)-(C.6) and (C.12)-(C.13) only identify the entry thresholds Y^{OH}_j, Y^{OE}_{jk} and can be solved in closed form, delivering the expressions in (21) and (22). Additionally, the option value parameters $B^o_j(z)$, $B^o_{jk}(z)$ can be characterized in closed form,

$$B^o_j(z) = \beta_j^{-\beta_j}(\beta_j - 1)^{\beta_j - 1} \cdot \left(\frac{f^h_j + \rho F^h_j}{\rho} - \mathbf{V}^E_j(z, \mathbf{Y}_{-j}) \right)^{1-\beta_j} \cdot \left(\frac{\kappa_{jj}(z)}{\rho - \tilde{\mu}_j} \right)^{\beta_j}, \quad \text{(C.21)}$$

$$B^o_{jk}(z) = \beta_k^{-\beta_k}(\beta_k - 1)^{\beta_k - 1} \cdot \left(\frac{f^e_{jk} + \rho F^e_{jk}}{\rho} \right)^{1-\beta_k} \cdot \left(\frac{\kappa_{jk}(z)}{\rho - \tilde{\mu}_k} \right)^{\beta_k}, \quad \text{(C.22)}$$

where $\kappa_{jk}(z) \equiv H(\tau_{jk} w_j / z)^{1-\eta} P_k^{\eta} \lambda_{jk}$ and $\mathbf{V}_j^E(z, \mathbf{Y}_{-j}) = \sum_{k \in \mathcal{A}_j(z)} \left[\frac{\kappa_{jk}(z) Y_k}{\rho - \tilde{\mu}_k} - \frac{f_{jk}^e}{\rho} \right] + \sum_{k \notin \mathcal{A}_j(z)} \left[B_{jk}^o(z) Y_k^{\beta_k} \right]$.

Equations (C.21) and (C.22) show that the option value of opening an affiliate (exporting from an affiliate) is decreasing in both the fixed and sunk costs of affiliate opening (exporting). In addition, the option value of opening an affiliate is increasing in the value of the potential export network of the affiliate, highlighting the effects of the compound option mechanism. Finally, both the option values of opening and exporting from an affiliate are increasing in firm productivity z.

Proof of Proposition 1. Affiliate's variable profits and the value of an affiliate's export network are increasing in firm productivity,

$$\frac{\partial \kappa_{jk}(z)}{\partial z} > 0, \tag{C.23}$$

$$\frac{\partial \mathbf{V}_j^E(z, \mathbf{Y}_{-j})}{\partial z} > 0. \tag{C.24}$$

Given (C.23) and (C.24), the proof for the affiliate export entry threshold is immediate from taking the derivative of (22),

$$\frac{\partial Y_{jk}^{OE}(z)}{\partial z} = \underbrace{\left(\frac{\beta_k}{\beta_k - 1} \right) \cdot \left(\frac{f_{jk}^e + \rho F_{jk}^e}{\rho} \right) \cdot (\rho - \tilde{\mu}_k)}_{\geq 0} \cdot \underbrace{\left(\frac{1}{-\kappa_{jk}(z)^2} \right)}_{<0} \cdot \underbrace{\frac{\partial \kappa_{jk}(z)}{\partial z}}_{>0} \leq 0.$$

We compute the derivative in the scenario in which $(f_j^h + \rho F_j^h)/\rho - \mathbf{V}_j^E(z, \mathbf{Y}_{-j}) > 0$, so that $Y_j^{OH}(z) > 0$ and the entry problem is well-defined. Taking the derivative of (21) yields

$$\frac{\partial Y_j^{OH}(z)}{\partial z} = \underbrace{\left(\frac{\beta_j}{\beta_j - 1} \right)}_{>0} \cdot \left\{ \underbrace{\frac{-\partial \mathbf{V}_j^E(z, \mathbf{Y}_{-j})}{\partial z} \cdot \frac{\rho - \tilde{\mu}_j}{\kappa_{jj}(z)}}_{<0} + \underbrace{\left(\frac{f_j^h + \rho F_j^h}{\rho} - \mathbf{V}_j^E(z, \mathbf{Y}_{-j}) \right)}_{\geq 0} \cdot \underbrace{\left(\frac{\rho - \tilde{\mu}_j}{-\kappa_{jj}(z)^2} \right) \cdot \frac{\partial \kappa_{jj}(z)}{\partial z}}_{<0} \right\} \leq 0.$$

Corollary 1. *More productive firms enter more export markets.*

Proof. $\frac{\partial [prob\{y \geq Y_j^{OH}(z)\}, \forall j]}{\partial z} = \frac{\partial [prob\{y \geq Y_j^{OH}(z)\}, \forall j]}{\partial Y_j^{OH}(z)} \cdot \frac{\partial Y_j^{OH}(z)}{\partial z}$ where the first term is negative and Proposition 1 implies that the second term is weakly negative, so $\frac{\partial [prob\{y \geq Y_j^{OH}(z)\}, \forall j]}{\partial z} \geq 0$.

Corollary 2. *The mass of firms having affiliates in n host markets is decreasing in n.*

Proof. Without loss of generality, let us assume that all firms only sell in the US and are considering

whether and where to open affiliates ($t = 1$). Let us order the productivity thresholds needed to open an affiliate in a market in ascending order, and let $\bar{Z}_n^{OH}$ ($\bar{Z}_{n-1}^{OH}$) denote the maximum among the first n ($n-1$) productivity thresholds, so that $\bar{Z}_n^{OH} \geq \bar{Z}_{n-1}^{OH}$. Let M_j denote the mass of firms that at $t = 1$ open affiliates in country j: $M_j = \int_{Z_j^{OH}}^{\infty} dG(z)$, so $\frac{\partial M_j}{\partial Z_j^{OH}} \leq 0$. Let $\bar{M}_n$ ($\bar{M}_{n-1}$) denote the mass of firms that at $t = 1$ open affiliates in the n ($n-1$) countries with the lowest productivity thresholds. Then $\bar{Z}_n^{OH} \geq \bar{Z}_{n-1}^{OH}$ and $\frac{\partial M_j}{\partial Z_j^{OH}} \leq 0$ implies that $\bar{M}_n \leq \bar{M}_{n-1}, \forall n$.

Proof of Proposition 2. Affiliate's variable profits are increasing in the taste shifter,

$$\frac{\partial \kappa_{jj}(z)}{\partial \lambda_j} \quad > \quad 0. \tag{C.25}$$

We compute the derivative in the scenario in which $(f_j^h + \rho F_j^h)/\rho - \mathbf{V}_j^E(z, \mathbf{Y}_{-j}) > 0$, so that $Y_j^{OH}(z) > 0$ and the entry problem is well-defined. Given (C.25), the proof is immediate from the taking derivative of (21),

$$\frac{\partial Y_j^{OH}(z)}{\partial \lambda_j} = \underbrace{\frac{\beta_j}{\beta_j - 1} \cdot \left(\frac{f_j^h + \rho F_j^h}{\rho} - \mathbf{V}_j^E(z, \mathbf{Y}_{-j}) \right)}_{\geq 0} \cdot \underbrace{\left(\frac{\rho - \tilde{\mu}_j}{-\kappa_{jj}(z)^2} \right)}_{<0} \cdot \underbrace{\frac{\partial \kappa_{jj}(z)}{\partial \lambda_j}}_{>0} \leq 0.$$

Additionally, taking the derivative with respect to F_j^h in (21) yields

$$\frac{\partial Y_j^{OH}(z)}{\partial F_j^h} = \frac{\beta_j}{\beta_j - 1} \cdot \left(\frac{\rho - \tilde{\mu}_j}{\kappa_{jj}(z)} \right) > 0.$$

D Calibration: Additional Results

Table D.1: Calibrated parameters: shock processes and wages.

	$\tilde{\mu}_j$	$\tilde{\sigma}_j$	γ_j	$Q_j(0)$	w_j
Brazil	0.051	0.130	0.032	0.096	0.711
Canada	0.030	0.136	0.661	0.073	0.831
China	0.064	0.122	0.035	1.162	0.307
France	0.025	0.127	0.370	0.125	0.981
United Kingdom	0.025	0.136	0.314	0.128	0.930
Germany	0.026	0.128	0.648	0.222	0.825
Ireland	0.048	0.144	0.560	0.003	1.188
Japan	0.027	0.133	0.383	0.354	0.719
Mexico	0.036	0.127	0.083	0.078	0.699
Singapore	0.080	0.137	0.213	0.003	0.950
United States	0.028	0.116	1.000	1.000	1.000

Note: $\tilde{\mu}_j$ and $\tilde{\sigma}_j$ denote to the drift and standard deviation of the composite shock Y_j. γ_j is the correlation between the US aggregate productivity shock and country j's aggregate demand shock. $Q_j(0)$ denotes the initial value of the demand shock process in country j. w_j is country j's wage relative to the US.

Table D.3: Calibrated parameters: bilateral iceberg trade costs.

	BRA	CAN	CHN	FRA	GBR	GER	IRL	JPN	MEX	SGP	USA
BRA	1.000	2.577	1.008	2.470	3.465	2.418	2.359	2.548	1.823	2.682	5.245
CAN	1.676	1.000	1.000	1.828	2.517	1.780	1.684	1.820	1.220	2.203	3.216
CHN	8.411	10.120	1.000	8.123	12.131	7.737	7.776	6.686	7.146	6.489	16.611
FRA	2.346	1.835	1.000	1.000	1.459	1.178	1.357	1.598	2.176	2.717	3.656
GBR	2.569	1.620	1.008	1.244	1.000	1.328	1.286	1.374	2.357	2.975	3.348
GER	2.788	2.166	1.070	1.429	1.550	1.000	1.665	1.787	2.568	3.156	3.982
IRL	3.406	2.009	1.346	2.061	1.737	2.085	1.000	1.745	3.089	3.988	3.932
JPN	2.239	2.640	1.000	2.230	3.072	2.131	2.123	1.000	1.827	1.783	5.105
MEX	2.487	3.270	1.169	3.125	3.773	3.038	2.920	2.838	1.000	3.448	5.666
SGP	1.937	2.255	1.000	2.064	2.176	1.978	1.995	1.605	1.826	1.000	4.152
USA	1.273	1.000	1.710	1.000	1.000	1.000	1.062	1.144	1.188	1.245	1.000

Note: Each entry τ_{jk} is the iceberg trade costs from country j (rows) to destination k (columns). $\tau_{US,k}$ denotes the iceberg costs of direct exports from the US parents. $\tau_{j,US}$ denotes the iceberg costs associated with exports from an affiliate located in j back to the home country (the US).

Table D.2: Calibrated parameters: affiliate fixed and sunk costs, and taste shifters.

	f_j^h	F_j^h	$f_{j,US}^e$	$F_{j,US}^e$	f_{jk}^e	F_{jk}^e	λ_j
Brazil	0.0103	0.0010	0.0032	0.0000	0.0022	0.0006	0.051
Canada	0.0113	0.0003	0.0040	0.0008	0.0024	0.0000	0.161
China	0.0017	0.0000	0.0013	0.0000	0.0007	0.0000	0.013
France	0.0158	0.0005	0.0024	0.0000	0.0045	0.0022	0.097
United Kingdom	0.0128	0.0003	0.0024	0.0003	0.0045	0.0004	0.104
Germany	0.0161	0.0005	0.0028	0.0001	0.0063	0.0027	0.088
Ireland	0.0025	0.0001	0.0018	0.0000	0.0016	0.0003	0.010
Japan	0.0295	0.0005	0.0046	0.0000	0.0048	0.0001	0.097
Mexico	0.0045	0.0004	0.0015	0.0001	0.0008	0.0000	0.020
Singapore	0.0023	0.0000	0.0033	0.0002	0.0024	0.0009	0.013
United States	–	–	–	–	0.0052	0.0002	1.000
Average	0.0107	0.0004	0.0027	0.0001	0.0032	0.0007	0.1505

Note: f_j^h (F_j^h) is the fixed (sunk) cost of opening an affiliate in country j. $f_{j,US}^e$ ($F_{j,US}^e$) is the fixed (sunk) cost of exporting from j to the United States. f_{jk}^e (F_{jk}^e) is the fixed (sunk) cost of exporting from j to a destination k other than the United States. λ_j is the taste shifter associated with goods produced by US MNEs in country j.

Table D.4: Targeted static moments: affiliate sales, by destination. Model vs data.

Share of:	Affiliate sales to host market		Affiliate sales to the US		Affiliate sales to third countries	
	data	model	data	model	data	model
Brazil	0.018	0.018	0.072	0.081	0.142	0.145
Canada	0.048	0.048	0.261	0.266	0.113	0.111
China	0.003	0.003	0.099	0.088	0.219	0.156
France	0.038	0.038	0.075	0.073	0.364	0.316
United Kingdom	0.052	0.052	0.111	0.114	0.371	0.363
Germany	0.047	0.047	0.092	0.102	0.413	0.437
Ireland	0.002	0.002	0.242	0.291	0.515	0.587
Japan	0.034	0.034	0.047	0.052	0.130	0.120
Mexico	0.011	0.011	0.173	0.176	0.128	0.119
Singapore	0.003	0.003	0.222	0.218	0.488	0.413
United States					0.150	0.110
Average	0.026	0.026	0.139	0.146	0.288	0.277

Note: Affiliate sales to the host market are expressed as a share of the parent's US sales. Affiliate sales to the US and to third countries are expressed as a share of affiliate sales in the host market. Calculations are conditional on affiliate entry, but unconditional on affiliate exports. Averages across years.

Table D.5: Targeted static moments: affiliate export sales, by destination (benchmark survey years). Model vs data.

Share of:	Affiliate sales to Canada		Affiliate sales to the United Kingdom		Affiliate sales to Japan	
	data	model	data	model	data	model
Brazil	0.008	0.018	0.008	0.005	0.004	0.005
Canada			0.006	0.005	0.003	0.005
China	0.008	0.004	0.002	0.002	0.037	0.033
France	0.010	0.005	0.091	0.107	0.006	0.004
United Kingdom	0.012	0.010			0.009	0.010
Germany	0.009	0.003	0.079	0.145	0.010	0.004
Ireland	0.053	0.036	0.386	0.411	0.082	0.031
Japan	0.006	0.005	0.001	0.004		
Mexico	0.007	0.013	0.001	0.012	0.002	0.012
Singapore	0.024	0.021	0.047	0.089	0.147	0.099
Average	0.015	0.013	0.069	0.087	0.033	0.023

Note: Affiliate sales to destination j are expressed as a share of affiliate sales in the host market. Calculations are conditional on affiliate entry, but unconditional on affiliate exports. Averages across (benchmark) years.

Table D.6: Targeted static moments: number of affiliates. Model vs data.

Share of:	MNEs with affiliates in j		Affiliates in j exporting to the US		Affiliates in j exporting to third countries	
	data	model	data	model	data	model
Brazil	0.198	0.199	0.515	0.515	0.674	0.674
Canada	0.544	0.533	0.725	0.722	0.478	0.478
China	0.184	0.180	0.382	0.379	0.548	0.551
France	0.312	0.316	0.539	0.547	0.747	0.745
United Kingdom	0.554	0.558	0.605	0.608	0.739	0.731
Germany	0.367	0.367	0.608	0.608	0.760	0.758
Ireland	0.122	0.120	0.575	0.577	0.760	0.759
Japan	0.155	0.153	0.468	0.468	0.578	0.578
Mexico	0.302	0.294	0.647	0.647	0.494	0.494
Singapore	0.129	0.129	0.597	0.596	0.724	0.724
United States					0.880	0.904
Average	0.287	0.285	0.566	0.567	0.650	0.649

Note: MNEs with affiliates in j are expressed as shares of the total number of US MNEs. Exporting affiliates are expressed as shares of the total number of affiliates in j. Calculations are conditional on affiliate entry. Averages across years.

Table D.7: Targeted dynamic moments: entry. Model vs data.

Share of:	MNEs opening affiliates in j		Affiliates in j that start exporting to:			
			the United States		third countries	
	data	model	data	model	data	model
Brazil	0.021	0.016	0.032	0.023	0.037	0.028
Canada	0.060	0.027	0.024	0.019	0.036	0.028
China	0.029	0.013	0.027	0.024	0.040	0.038
France	0.038	0.020	0.033	0.024	0.025	0.020
United Kingdom	0.069	0.026	0.029	0.023	0.027	0.026
Germany	0.046	0.019	0.030	0.022	0.025	0.019
Ireland	0.015	0.011	0.037	0.031	0.030	0.023
Japan	0.020	0.009	0.032	0.023	0.030	0.021
Mexico	0.036	0.020	0.029	0.021	0.033	0.029
Singapore	0.019	0.014	0.026	0.018	0.028	0.021
United States					0.018	0.013
Average	0.035	0.018	0.030	0.023	0.031	0.025

Note: MNEs opening affiliates in j are expressed as shares of the total number of US MNEs in the period before entry. Affiliates that start exporting are expressed as shares of the total number of affiliates in j in the period before export entry. Calculations are conditional on affiliate entry. Averages across years.

Table D.8: Untargeted dynamic moments: exit. Model vs data.

Share of:	MNEs shutting down affiliates in j		Affiliates in j that stop exporting to the United States		third countries	
	data	model	data	model	data	model
Brazil	0.102	0.073	0.027	0.043	0.032	0.032
Canada	0.125	0.063	0.021	0.022	0.028	0.056
China	0.082	0.066	0.020	0.069	0.031	0.059
France	0.117	0.057	0.029	0.039	0.021	0.017
United Kingdom	0.128	0.049	0.026	0.039	0.023	0.033
Germany	0.122	0.048	0.029	0.031	0.024	0.017
Ireland	0.119	0.090	0.030	0.056	0.030	0.024
Japan	0.111	0.040	0.029	0.048	0.029	0.03
Mexico	0.114	0.056	0.021	0.027	0.026	0.044
Singapore	0.115	0.125	0.023	0.028	0.026	0.012
United States					0.021	0.019
Average	0.113	0.067	0.025	0.040	0.027	0.032

Note: MNEs shutting down affiliates in j are expressed as shares of the total number of affiliates in j in the period before exit. Affiliates that stop exporting are expressed as shares of the total number of affiliates in j that export in the period before export exit. Calculations are conditional on affiliate exit. Averages across years.

Table D.9: Exporter and early-exporter size advantage (untargeted). Model vs data.

	Exporter size advantage		Early exporter size advantage	
	data	model	data	model
Brazil	6.31	7.69	3.49	5.67
Canada	3.39	6.99	2.52	5.61
China	7.84	7.77	3.08	5.76
France	4.46	7.26	1.95	5.86
United Kingdom	1.93	7.20	1.52	5.65
Germany	5.47	7.18	4.24	5.63
Ireland	8.02	6.31	8.57	5.24
Japan	12.49	7.25	2.31	5.48
Mexico	4.21	7.27	2.08	5.71
Singapore	8.59	6.98	7.04	5.44
Average	6.27	7.19	3.68	5.61

Note: Observations at the affiliate-year level, for new majority-owned affiliates that survive for at least ten consecutive years, in manufacturing. Exporter size advantage refers to the average size of exporting MNE affiliates relative to the average size of non-exporting MNE affiliates, an average across countries and years. Early-exporter size advantage refers to the average size of exporting MNE affiliates that start exports in their first year of life relative to the average size of exporting MNE affiliates that start exports after their first year of life. Size refers to horizontal affiliate sales; early versus late exporters refers to affiliates that are born with exports versus the ones that start exporting later.

Table D.10: Calibrated MNE costs, as share of sales, by country.

	Sunk costs F_j^h (% of US parent sales)			Fixed costs f_j^h (% of horizontal sales)		
Sales percentiles	5th	50th	95th	5th	50th	95th
Brazil	0.1894	0.0682	0.0074	16.25	9.96	1.53
Canada	0.0232	0.0141	0.0021	22.73	14.36	2.40
China	0.0002	0.0001	0.0000	11.82	7.01	2.78
France	0.0748	0.0351	0.0052	22.47	15.81	2.55
United Kingdom	0.0002	0.0001	0.0000	23.93	14.90	2.39
Germany	0.0372	0.0209	0.0031	22.60	15.52	2.48
Ireland	0.0087	0.0056	0.0007	18.92	10.85	1.82
Japan	0.1631	0.0663	0.0089	22.63	16.30	2.39
Mexico	0.0096	0.0031	0.0004	17.86	12.68	2.27
Singapore	0.0010	0.0003	0.0000	7.73	4.43	2.85
Average	0.0507	0.0214	0.0028	18.69	12.18	2.35

Note: US parent sales in the year of affiliate entry. Horizontal sales are averages across years.

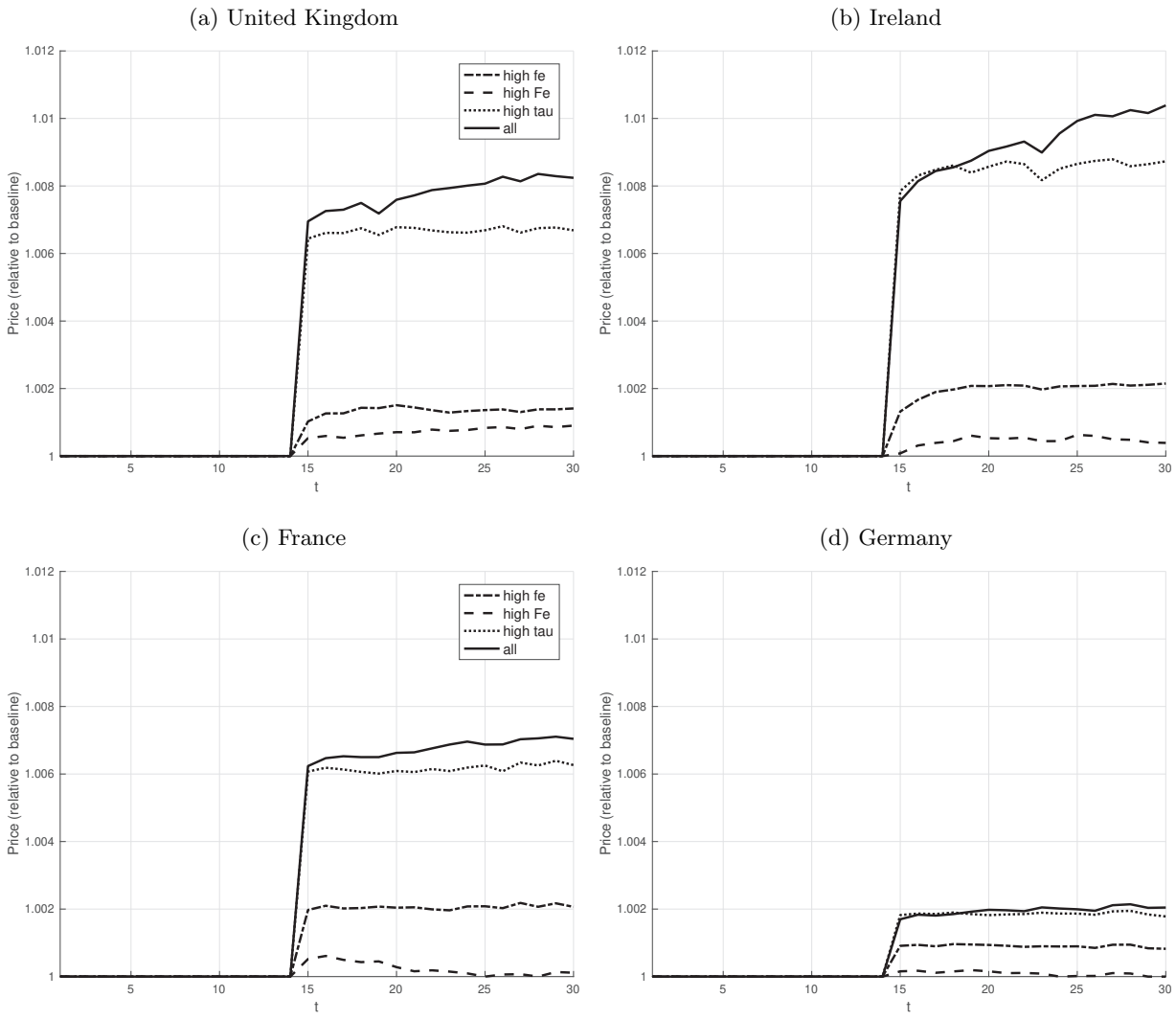
Table D.11: Calibrated MNE export costs, as share of sales, by country.

	Sunk export costs F^e_{jk} (% of horizontal affiliate sales)						Fixed export costs f^e_{jk} (% of average affiliate exports)					
	to United States			to other countries			to United States			to other countries		
Sales percentiles	5th	50th	95th	5th	50th	95th	5th	50th	95th	5th	50th	95th
Brazil	0.009	0.003	0.001	1.601	0.599	0.091	11.89	9.57	1.69	15.30	11.76	3.58
Canada	1.499	0.765	0.121	0.000	0.000	0.000	11.85	9.82	1.60	14.46	12.52	3.66
China	0.026	0.013	0.002	0.020	0.008	0.001	12.96	9.51	1.75	12.67	11.39	3.37
France	0.008	0.003	0.000	4.767	1.667	0.206	12.13	9.90	1.47	12.17	11.69	3.02
United Kingdom	0.423	0.203	0.030	0.660	0.245	0.036	12.06	10.12	1.61	12.74	10.32	3.71
Germany	0.139	0.046	0.006	6.587	1.781	0.252	12.88	10.09	1.43	12.35	11.75	2.21
Ireland	0.000	0.000	0.000	11.285	3.706	0.634	13.92	10.88	1.89	11.68	10.01	3.53
Japan	0.001	0.000	0.000	0.101	0.020	0.003	13.71	11.10	2.00	13.74	13.14	4.12
Mexico	0.596	0.222	0.029	0.031	0.011	0.001	12.95	10.60	1.49	14.03	11.35	2.89
Singapore	0.580	0.328	0.086	6.059	2.404	0.705	12.16	9.65	1.71	12.39	12.02	3.21
United States	–	–	–	0.182	0.102	0.014	–	–	–	13.21	8.66	2.07
Average	0.328	0.158	0.027	2.845	0.958	0.177	12.65	10.12	1.67	13.16	11.33	3.22

Note: Horizontal sales in the year the affiliate first exports to the destination. Export sales to a destination are averages across years.

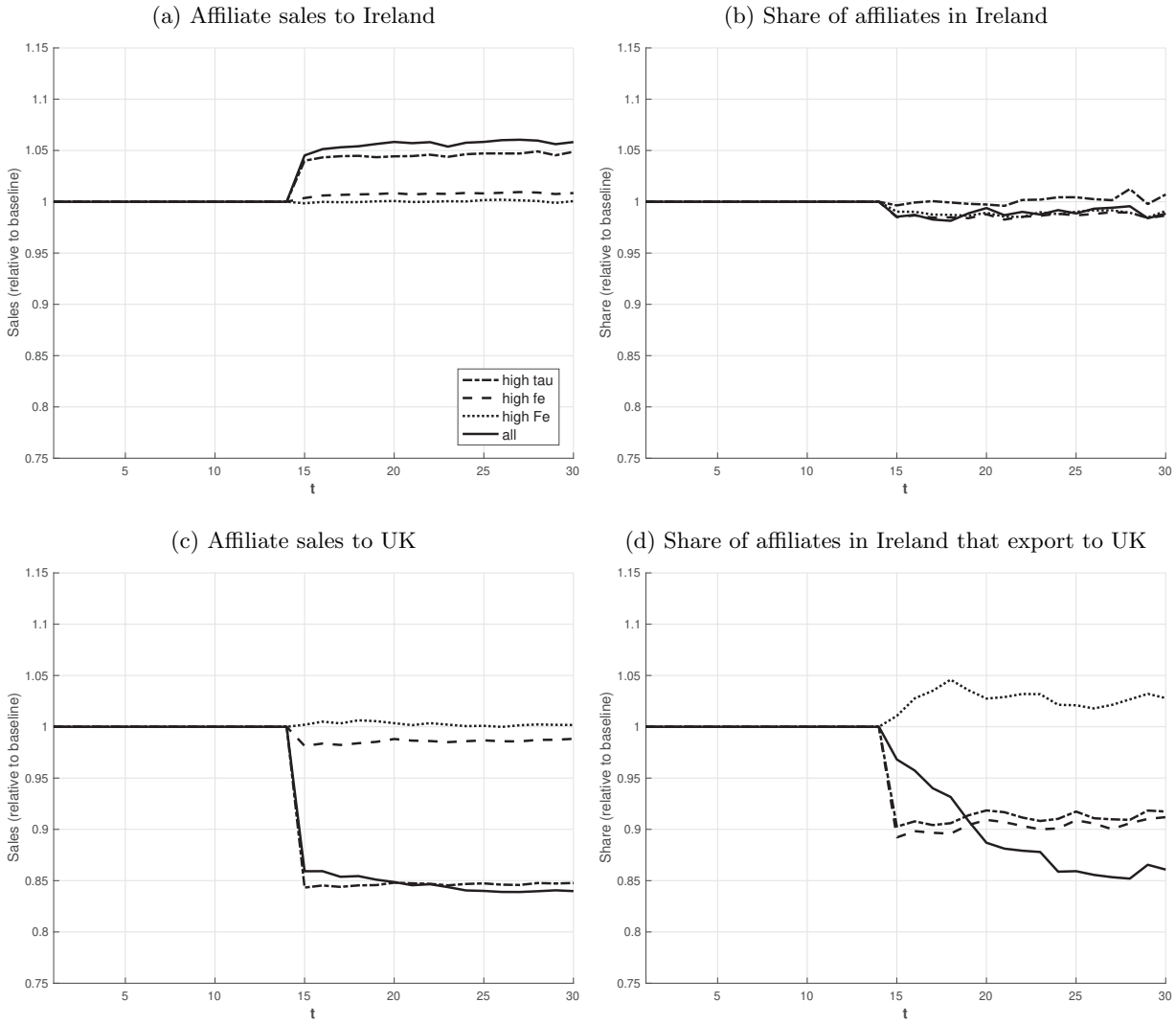
E Quantitative Analysis: Additional Results

Figure E.1: Brexit: changes in price indexes.



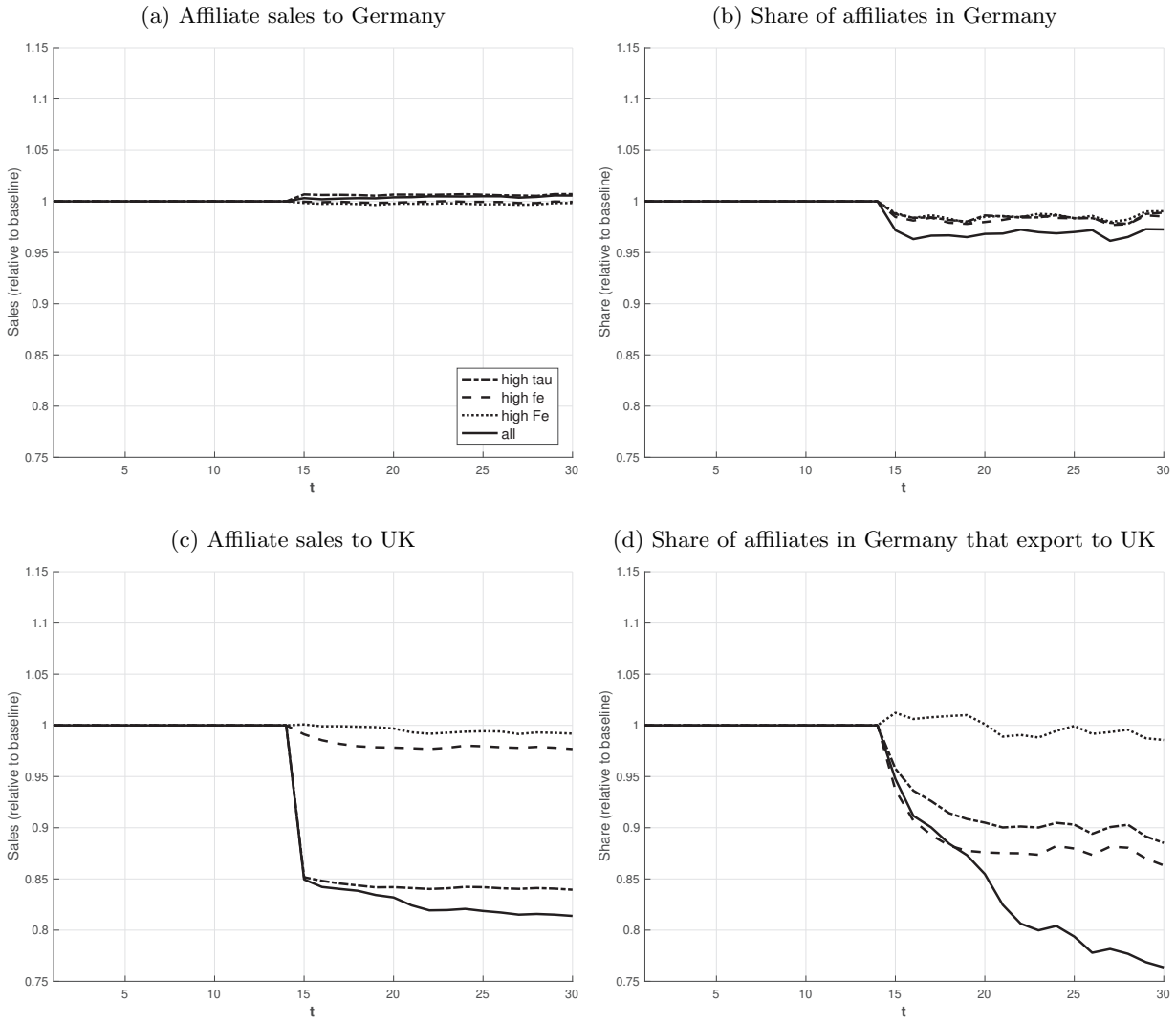
Note: "high X" refers to an increase in the barrier X from/to United Kingdom to/from country j. "All" refers to increasing all three export barriers from/to the United Kingdom to/from j at once. Country j refers to Ireland, Germany, and France.

Figure E.2: Brexit: US affiliates in Ireland.



Note: "high X" refers to an increase in the barrier X from/to United Kingdom to/from country j. "All" refers to increasing all three export barriers from/to the United Kingdom to/from j at once. Country j refers to Ireland, Germany, and France.

Figure E.3: Brexit: US affiliates in Germany.



Note: "high X" refers to an increase in the barrier X from/to United Kingdom to/from country j. "All" refers to increasing all three export barriers from/to the United Kingdom to/from j at once. Country j refers to Ireland, Germany, and France.

References

Dixit, A. K. and R. S. Pindyck (1994). *Investment under Uncertainty*. Princeton, NJ: Princeton University Press.

Gravelle, J. (2015). Tax havens: International tax avoidance and evasion. *Congressional Research Service 7*(5700), 1–55.

Leahy, J. V. (1993). Investment in competitive equilibrium: the optimality of myopic behavior. *Quarterly Journal of Economics 108*(4), 1105–1133.