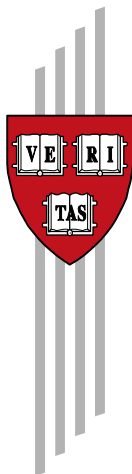


# **Migrant Inventors and the Technological Advantage of Nations**

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Table 1: Summary Statistics

Variable	N	Mean	sd	Min	Max
<i>Panel A - Take-off sample (<math>RTA_{c,p,t_0} = 0</math>)</i>					
Take-off technology (patent applications)	105,304	0.022	0.15	0.0	1.0
Immigrant inventors (weighted)	105,304	24.245	135.54	0.0	8,863.0
Emigrant inventors (weighted)	105,304	79.775	411.80	0.0	7,624.0
Total FDI (billion USD, weighted)	105,304	32.504	216.92	0.0	9,966.9
Total trade (billion USD, weighted)	105,304	106.827	258.35	0.0	4,835.1
Total immigrants lagged IV (thous.,weighted)	105,304	69.439	328.88	0.0	8,701.1
Total emigrants lagged IV (thous.,weighted)	105,304	141.678	486.31	0.0	8,753.7
Immigrant inv. push-pull IV (weighted)	105,304	17.727	91.16	0.0	6,871.3
Emigrant inv. push-pull IV (weighted)	105,304	55.170	214.60	0.0	4,387.0
<i>Panel B - Growth sample (<math>patents_{c,p,t_0} &gt; 0</math>)</i>					
CAGR technology (patent applications)	18,386	0.007	0.08	-0.3	0.8
Baseline patent apps	18,386	16.447	119.13	1.0	9,730.0
Immigrant inventors (weighted)	18,386	709.735	2,116.58	0.0	26,642.0
Emigrant inventors (weighted)	18,386	610.600	1,138.10	0.0	8,229.0
Total FDI (billion USD, weighted)	18,386	836.282	1,567.10	0.0	14,487.1
Total trade (billion USD, weighted)	18,386	1,109.598	1,379.50	0.0	12,273.9
Total immigrants lagged IV (thous.,weighted)	18,386	499.439	903.89	0.0	8,708.0
Total emigrants lagged IV (thous.,weighted)	18,386	448.861	705.99	0.0	8,699.5
Immigrant inv. push-pull IV (weighted)	18,386	468.506	1,150.29	0.0	12,917.9
Emigrant inv. push-pull IV (weighted)	18,386	402.796	674.82	0.0	4,975.3

This table presents the sample summary statistics for the variables used in the paper. The upper panel presents the sample used in the estimations of technology take-offs, where we limit the sample to those country-technology observations that have no patents granted in the beginning of the 1990-2000 and 2000-2010 periods). The lower panel presents results used in the estimations of patent growth regressions, where we limit our observations to those country-technology pairs with number of patents above zero at the beginning of the 1990-2000 and 2000-2010 periods.



Table 2: Migrant inventors and patent applications take-offs and growth

Panel A - Dependent variable: Patent applications take-off (binary)																			
OLS					2SLS (IV1)					2SLS (IV2)									
	est1	est2	est3	est4	est5	est6	est7	est8	est9		est1	est2	est3	est4	est5	est6	est7	est8	est9
Immigrant inventors	0.0050 (0.001)***	0.0017 (0.001)***	0.0050 (0.001)***	0.0111 (0.004)***	0.0059 (0.003)**	0.0135 (0.005)**	0.0098 (0.002)***	0.0098 (0.002)***	0.0111 (0.003)***		0.0045 (0.001)***	0.0042 (0.001)***	0.0034 (0.001)***	0.0243 (0.010)**	0.0250 (0.016)	0.0092 (0.010)	-0.0203 (0.048)	-0.0070 (0.054)	
Emigrant inventors																			
Total FDI	-0.0001 (0.000)	-0.0001 (0.000)	-0.0001 (0.000)	-0.0003 (0.000)**	-0.0002 (0.000)*	-0.0002 (0.000)	-0.0002 (0.000)***	-0.0002 (0.000)***	-0.0002 (0.000)		0.0042 (0.001)***	0.0003 (0.000)	0.0016 (0.001)	-0.0039 (0.003)	-0.0081 (0.008)	0.0000 (0.000)	0.0006 (0.001)	0.0253 (0.029)	0.0241 (0.034)
Total Trade	0.0002 (0.000)	0.0003 (0.000)**	0.0002 (0.000)	-0.0003 (0.000)	-0.0002 (0.000)	-0.0001 (0.000)	-0.0002 (0.000)*	-0.0002 (0.000)**	-0.0002 (0.000)		0.0027 (0.002)	0.0021 (0.001)	0.0016 (0.001)	-0.0016 (0.001)	-0.0082 (0.014)	-0.0086 (0.008)	0.0109 (0.018)	-0.0082 (0.014)	-0.0053 (0.032)
N	105304	105304	105304	105304	105304	105304	105304	105304	105304		-0.0178 (0.002)***	-0.0176 (0.002)***	-0.0178 (0.002)***	-0.0186 (0.002)***	-0.0173 (0.002)***	-0.0178 (0.002)***	-0.0169 (0.002)***	-0.0173 (0.002)***	-0.0171 (0.002)***
r2	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09		-0.1423 (0.039)***	-0.1436 (0.039)***	-0.1424 (0.039)***	-0.1351 (0.041)***	-0.1419 (0.040)***	-0.1390 (0.038)***	-0.1513 (0.042)***	-0.1419 (0.039)***	-0.1446 (0.047)***
KP F Stat				60.59	37.42	40.91	754.69	99.14	26.79		-0.0015 (0.004)	-0.0013 (0.004)	-0.0014 (0.004)	-0.0016 (0.004)	-0.0005 (0.004)	-0.0008 (0.003)	-0.0014 (0.004)	-0.0005 (0.004)	-0.0005 (0.004)
Panel B - Dependent variable: Patent applications growth (CAGR)										2SLS (IV2)									
OLS					2SLS (IV1)					2SLS (IV2)									
Immigrant inventors	0.0045 (0.001)***	0.0042 (0.001)***	0.0034 (0.001)***	0.0243 (0.010)**	0.0250 (0.016)	0.0092 (0.010)	-0.0203 (0.048)	-0.0070 (0.054)											
Emigrant inventors																			
Total FDI	0.0003 (0.000)	0.0003 (0.000)	0.0003 (0.000)	0.0002 (0.000)	0.0000 (0.000)	0.0000 (0.000)	0.0006 (0.001)	0.0253 (0.029)	0.0241 (0.034)		0.0027 (0.002)	0.0021 (0.001)	0.0016 (0.001)	-0.0016 (0.001)	-0.0082 (0.014)	-0.0086 (0.008)	0.0109 (0.018)	-0.0082 (0.014)	-0.0053 (0.032)
Total Trade	0.0027 (0.002)	0.0021 (0.001)	0.0016 (0.001)	-0.0039 (0.003)	-0.0081 (0.008)	-0.0086 (0.008)	0.0109 (0.018)	-0.0082 (0.014)	-0.0053 (0.032)		-0.0178 (0.002)***	-0.0176 (0.002)***	-0.0178 (0.002)***	-0.0186 (0.002)***	-0.0173 (0.002)***	-0.0178 (0.002)***	-0.0169 (0.002)***	-0.0173 (0.002)***	-0.0171 (0.002)***
Baseline patent apps, log	-0.1423 (0.039)***	-0.1436 (0.039)***	-0.1424 (0.039)***	-0.1351 (0.041)***	-0.1419 (0.040)***	-0.1390 (0.038)***	-0.1513 (0.042)***	-0.1419 (0.039)***	-0.1446 (0.047)***		-0.0015 (0.004)	-0.0013 (0.004)	-0.0014 (0.004)	-0.0016 (0.004)	-0.0005 (0.004)	-0.0008 (0.003)	-0.0014 (0.004)	-0.0005 (0.004)	-0.0005 (0.004)
Previous Exports Growth																			
Zero Exports in t-1																			
N	18349	18349	18349	18349	18349	18349	18349	18349	18349		18349	18349	18349	18349	18349	18349	18349	18349	18349
r2	0.55	0.55	0.55	0.53	0.53	0.53	0.52	0.53	0.53		0.55	0.55	0.55	0.53	0.53	0.53	0.52	0.53	0.53
KP F Stat				8.53	5.83	7.59	0.40	2.50	0.25		18349	18349	18349	18349	18349	18349	18349	18349	18349

This table presents results of the estimation of Specification (1). Columns 1-3 show OLS estimations, while columns 4-9 show results for 2SLS regressions. Columns 4-6 use as instrument the 30-year lagged stock of migrants; and columns 7-9 use as instrument the predicted stock of migrant inventors based on push and pull factors. Panel A presents results for take-offs in patenting applications (limiting the sample to cases where the initial patent applications for that country-technology pair was zero), while Panel B estimates future CAGR in patent applications for country-technology pairs that already had some patenting recorded in the baseline year. All specifications include country-year and technology-year fixed effects. SEs clustered at the country level are presented in parenthesis.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 3: Migrant inventors and patent applications, falsification test 1

	Panel A - Dependent variable: Patent applications take-off (binary)								
	OLS			2SLS (IV1)			2SLS (IV2)		
	est1	est2	est3	est4	est5	est6	est7	est8	est9
Immigrant inventors	-0.0054 (0.002)**	-0.0048 (0.002)**	-0.0048 (0.002)**	-0.0057 (0.009)	-0.0050 (0.007)	-0.0018 (0.013)	-0.0112 (0.006)*	-0.0018 (0.004)	-0.0117 (0.007)*
Emigrant inventors		-0.0028 (0.001)**	-0.0022 (0.001)		-0.0022 (0.007)	-0.0040 (0.010)		-0.0018 (0.004)	0.0011 (0.004)
Total FDI	0.0003 (0.000)**	0.0004 (0.000)**	0.0004 (0.000)**	0.0003 (0.000)**	0.0004 (0.000)**	0.0004 (0.000)**	0.0003 (0.000)**	0.0004 (0.000)**	0.0003 (0.000)**
Total Trade	-0.0007 (0.003)	-0.0008 (0.004)	0.0016 (0.003)	-0.0005 (0.007)	0.0018 (0.009)	0.0017 (0.009)	0.0030 (0.004)	-0.0020 (0.005)	0.0021 (0.005)
N	105304	105304	105304	105304	105304	105304	105304	105304	105304
r2	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
KP F Stat				6.56	5.52	5.59	110.58	66.37	101.29

	Panel B - Dependent variable: Patent applications growth (CAGR)								
	OLS			2SLS (IV1)			2SLS (IV2)		
	est1	est2	est3	est4	est5	est6	est7	est8	est9
Immigrant inventors	-0.0084 (0.002)**	-0.0065 (0.002)**	-0.0068 (0.002)**	-0.0169 (0.009)*	-0.0027 (0.010)	-0.0272 (0.011)**	-0.1088 (0.024)**	-0.0455 (0.015)**	-0.0537 (0.108)
Emigrant inventors		0.0001 (0.000)	0.0001 (0.000)	0.0001 (0.000)	0.0000 (0.000)	0.0000 (0.000)	0.0007 (0.000)	0.0004 (0.000)	0.0006 (0.000)
Total FDI	0.0001 (0.000)	0.0001 (0.000)	0.0001 (0.000)	0.0001 (0.000)	0.0000 (0.000)	0.0000 (0.000)	0.0000 (0.000)	0.0004 (0.000)	0.0006 (0.000)
Total Trade	-0.0047 (0.005)	-0.0041 (0.005)	-0.0001 (0.005)	0.0013 (0.010)	-0.0079 (0.014)	-0.0080 (0.013)	0.0669 (0.021)**	0.0357 (0.022)	0.0524 (0.030)*
Baseline patent apps, log	-0.0180 (0.002)**	-0.0183 (0.002)**	-0.0184 (0.002)**	-0.0182 (0.002)**	-0.0180 (0.002)**	-0.0172 (0.002)**	-0.0205 (0.002)**	-0.0213 (0.002)**	-0.0210 (0.002)**
Previous Exports Growth	-0.1491 (0.038)**	-0.1464 (0.040)**	-0.1489 (0.038)**	-0.1523 (0.034)**	-0.1461 (0.040)**	-0.1553 (0.033)**	-0.1869 (0.027)**	-0.1485 (0.037)**	-0.1675 (0.056)**
Zero Exports in t-1	-0.0008 (0.004)	-0.0012 (0.004)	-0.0008 (0.004)	-0.0004 (0.004)	-0.0012 (0.004)	-0.0002 (0.004)	0.0046 (0.003)	-0.0003 (0.004)	0.0021 (0.007)
N	18349	18349	18349	18349	18349	18349	18349	18349	18349
r2	0.55	0.55	0.55	0.55	0.55	0.52	0.32	0.48	0.47
KP F Stat				42.33	12.48	7.61	9.98	13.54	0.23

This table presents results of the estimation of Specification (1), with a slight modification. Instead of including in the RHS the number of migrant inventors from and in countries that specialize in each technology in the baseline year, we use the number of migrant inventors from and in countries with zero patent applications in each technology at the beginning of the period. Columns 1-3 show OLS estimations, while columns 4-6 show results for 2SLS regressions. Panel A presents results for take-offs in patenting applications (limiting the sample to cases where the initial patent applications for that country-technology pair were zero), while Panel B estimates future CAGR in patent applications for country-technology pairs that already had some patenting recorded in the baseline year. All specifications include country-year and technology-year fixed effects. SEs clustered at the country level are presented in parenthesis.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 4: Migrant inventors and patent applications, subsample analysis

	OLS		2SLS (IV1)		2SLS (IV2)		
	N	$\beta_{im}$	$\beta_{em}$	$\beta_{im}$	$\beta_{em}$	$\beta_{im}$	$\beta_{em}$
All Observations	105304	0.005***	-0.000	0.013**	-0.004	0.011***	-0.003
Non OECD	76695	0.006***	0.000	0.015**	-0.004	0.021***	-0.001
OECD	28609	0.003	0.000	0.015**	-0.003	0.007**	-0.005
Period 1990-2000	54042	0.000	0.000	0.007	-0.003	0.002*	-0.000
Period 2000-2010	51262	0.007***	-0.000	0.014**	-0.004	0.017***	-0.005
Chemistry; Metallurgy	13564	0.009***	0.001	0.016	-0.005	0.012**	0.001
Electricity	7571	0.005	0.002	0.008	0.000	0.017***	-0.003
Fixed Constructions	4985	-0.000	0.002	0.016	-0.010	0.005	0.003
Human Necessities	13211	0.009***	-0.001	0.012	-0.006	0.031***	-0.024
Mechanical Engineering	15958	0.004	-0.002	0.018	-0.005	0.019**	-0.008
Performing Operations; Transporting	27529	0.001	-0.003	0.011	-0.006	0.007	-0.014
Physics	12788	0.006*	0.001	0.023	-0.005	0.016***	-0.004
Textiles; Paper	6663	0.003*	-0.001	0.010	-0.006	0.012***	-0.006

This table summarizes OLS regressions for different cuts of the sample. The reported beta coefficients are standardized to have zero mean and unit standard deviation, for comparison purposes. The dependent variable in all specifications is technology take-off. Significance levels reported based on SE clustered at the country level

# Online Appendix for

## *Migration inventors and the technological advantage of nations*

Dany Bahar, Prithwiraj Choudhury, and Hillel Rapoport

February 17, 2020

### **A Extended summary statistics**

Table A1 presents summary statistics for each of the 95 countries in the sample. The table presents the average probability of take-off for each country (presented in percentage format) based on observations of country-technology pairs with no patent applications in the baseline year for each period. Similarly, the growth rate (also presented in percentage format) is based on observations of country-technology pairs with more than zero patent applications in the baseline period. The \* symbol next to a country name implies that the country is part of the OECD prior to the first period studied (e.g., it does not count countries as OECD members if they became so during the 1990s or 2000s).

[Table A1 about here.]

Table A1: Summary statistics by country

Country	1990-2000		2000-2010		Country	1990-2000		2000-2010	
	Take off	CAGR	Take Off	CAGR		Take off	CAGR	Take Off	CAGR
United Arab Emirates	0.00	-3.99	5.54	-5.88	South Korea	1.39	10.24	5.58	6.77
Argentina	0.32	-3.46	7.03	-3.50	Kuwait	0.00	-6.70	6.45	-3.33
Armenia	0.00	.	2.01	-4.34	Lebanon	0.00	-6.70	1.71	-4.13
Australia *	0.82	1.10	6.92	0.92	Liechtenstein	0.32	-3.72	2.12	-5.34
Austria *	0.51	-0.04	7.90	0.41	Sri Lanka	0.00	-6.09	1.56	-5.86
Belgium *	1.16	0.82	7.84	0.54	Lithuania	0.00	.	2.79	-2.66
Bulgaria	0.00	-6.16	3.13	-2.47	Luxembourg *	0.49	-4.64	5.53	-3.67
Bosnia and Herzegovina	0.00	.	1.08	-6.70	Latvia	0.00	.	2.32	0.84
Belarus	0.15	.	2.02	-2.96	Morocco	0.00	-6.70	1.10	-5.58
Bermuda	0.00	-6.70	0.47	-7.11	Monaco	0.16	-4.69	1.60	-5.78
Brazil	0.84	-1.76	10.36	0.62	Moldova	0.00	-6.70	1.69	-6.70
Canada *	0.55	3.17	10.14	0.94	Mexico	0.85	-3.15	10.17	-2.80
Switzerland *	1.30	0.00	2.16	0.21	Macedonia, FYR	0.00	.	0.00	-6.70
Chile	0.31	-5.68	6.55	-2.70	Malta	0.00	0.00	1.54	-7.93
China	2.16	2.36	15.42	15.21	Mongolia	0.00	-6.70	0.31	.
Colombia	0.00	-3.15	4.91	-3.42	Malaysia	0.47	0.30	9.79	-0.13
Costa Rica	0.00	-7.31	1.40	-4.29	Nigeria	0.00	-6.70	0.15	-2.04
Cuba	0.31	.	0.31	-3.44	Netherlands *	1.29	0.57	8.37	1.08
Cayman Islands	0.00	-6.70	2.32	-5.02	Norway *	1.14	-0.94	7.18	-1.12
Cyprus	0.00	-6.70	3.56	-3.92	New Zealand *	0.52	-1.44	6.02	-1.23
Czech Republic	0.48	-4.77	8.96	-0.94	Pakistan	0.00	-6.70	3.10	-6.70
Germany *	1.02	3.44	1.25	0.40	Panama	0.00	-6.70	0.93	-6.70
Denmark *	1.30	0.06	6.07	-0.59	Peru	0.00	-7.59	2.79	-6.70
Algeria	0.00	-6.70	1.08	-6.70	Philippines	0.79	-5.35	5.56	-4.13
Ecuador	0.00	-6.70	0.62	-6.70	Poland	0.16	-3.75	10.07	-1.36
Egypt	0.00	-6.70	5.38	-4.09	North Korea	0.00	-6.70	0.46	-6.70
Spain *	1.76	-0.21	10.44	1.37	Portugal *	0.47	-4.36	6.48	-1.29
Estonia	0.00	.	5.15	-0.62	Russian Federation	2.39	-2.36	8.11	-1.76
Finland *	1.89	1.24	5.52	-1.37	Saudi Arabia	0.31	-1.99	12.97	3.97
France *	0.00	0.77	5.96	0.81	Singapore	1.91	4.87	7.64	0.15
United Kingdom *	0.00	1.51	3.40	0.63	El Salvador	0.00	.	0.00	-6.70
Georgia	0.00	.	1.54	-6.70	Slovakia	0.77	.	4.18	-4.48
Greece *	0.31	-5.60	6.08	-1.61	Slovenia	0.92	.	3.91	-2.37
Guatemala	0.00	-6.70	0.46	-7.93	Sweden *	1.35	2.73	4.74	-1.63
Hong Kong	1.36	1.60	7.35	-0.95	Seychelles	0.00	-6.70	0.77	.
Croatia	0.61	.	4.11	-3.53	Thailand	0.47	-1.90	6.81	-4.04
Hungary	0.00	-4.43	7.00	-1.97	Trinidad and Tobago	0.00	-6.70	2.48	-7.23
Indonesia	0.00	-4.02	3.50	-3.80	Tunisia	0.00	-6.70	1.55	-2.23
India	1.15	4.39	14.42	5.68	Turkey *	0.00	-5.21	8.32	-1.16
Ireland *	0.35	-0.74	6.69	0.18	Ukraine	0.77	.	5.52	-3.63
Iran	0.00	-6.70	8.83	-4.14	Uruguay	0.00	-6.70	1.39	-6.89
Iceland *	0.77	-4.46	3.06	-3.39	United States *	0.00	3.05	3.03	-0.04
Israel	1.62	3.15	3.10	0.72	Uzbekistan	0.00	.	0.15	-6.70
Italy *	0.79	0.98	7.01	0.21	Venezuela	0.00	-3.86	1.17	-5.12
Jamaica	0.00	-6.70	0.93	-6.70	South Africa	0.00	-3.26	5.27	-3.31
Jordan	0.00	-6.70	2.15	-6.70	Zimbabwe	0.00	.	0.15	-6.70
Japan *	0.00	2.72	4.48	0.37	.	.	.	.	.
Kazakhstan	0.00	.	1.24	-6.70	.	.	.	.	.
Kenya	0.00	-4.46	0.78	-3.26	.	.	.	.	.

The table presents values for the probability of take-off and the growth rate (CAGR), both in percentage terms, averaged across all technology subclasses for each country in each period in our sample. Consistent with our analysis, the table presents the average probability of take-off for each country based on observations of country-technology pairs with no patent applications in the baseline year for each period. Similarly, the growth rate is based on observations of country-technology pairs with more than zero patent applications in the baseline period. The \* symbol indicates whether the country is an OECD member (based on the 1980 cutoff, prior to the first period of analysis in our exercise).

## B Explanatory power of bilateral migration on future bilateral inventor stocks

As noted in the paper, one plausible concern about our identification strategy of instrumenting current stocks of migrant inventors with our instruments is that the first-stage correlation of the 2SLS estimation is artificially driven up by the weighting scheme we use in our baseline specification. However, this is not the case, as we show in the following exercise; we estimate the following specification using data for years 1990 and 2000:

$$inventors_{c,c',t} = \beta_{IV} IV_{c,c',t} + \gamma_c + \gamma_{c'} + \theta_t + \varepsilon_{c,c',t}$$

Where  $c$  and  $c'$  are countries;  $t$  is year;  $inventors_{c,c',t}$  is the stock of migrant inventors from country  $c'$  in country  $c$  at time  $t$ ; and  $IV_{c,c',t}$  is one of the two IVs we used for our identification strategy: the stock of total migrants from country  $c'$  in country  $c$  at time  $t-30$  (that is, for years 1960 and 1970), as well as the predicted stock of inventors using push-pull factors. Both terms in the regression are transformed using the inverse hyperbolic sine and, thus,  $\beta_{IV}$  can be interpreted as an elasticity.  $\gamma_c$  and  $\gamma_{c'}$  are receiving and sending country fixed effects, respectively;  $\theta_t$  represents year fixed effects. The last term represents the error.

The estimation for this specification is presented in Table B1. The table reports the estimation of  $\beta_{IV}$  for each instrument using three different estimations that vary with the inclusion of fixed effects, as well as standard errors in parenthesis and t-stats below them for the purpose of this exercise. Columns 1 and 4 include only year fixed effects; Columns 2 and 5 include year fixed effects as well as sending country and receiving country fixed effects; Columns 3 and 6 include sending country and year (combined) fixed effects as well as receiving country-by-year fixed effects. Columns 1 to 3 use our first instrumental variable, the lagged stock of migrants; Columns 4 to 6 use the predicted number of inventor migrants. In all columns, we see that there is a positive elasticity and, perhaps more importantly, a strong explanatory power with t-stats. Thus, we conclude that the success of our first stage is

not driven by mechanics due to the transformation of the variables.

[Table B1 about here.]

Table B1: Explanatory power of lagged migration on inventor migrants

Dependent variable: Stock of Immigrant Inventors						
	est1	est2	est3	est4	est5	est6
Immigrant stock (t-30)	0.0754 (0.016)***	0.0362 (0.007)***	0.0356 (0.007)***			
	4.701	5.168	5.126			
Immigrant inventors (Push-Pull prediction)				0.8446 (0.044)***	0.8363 (0.038)***	0.8374 (0.036)***
				19.024	22.053	23.028
Constant	-0.0704 (0.020)***	0.0254 (0.017)	0.0268 (0.017)	-0.0100 (0.002)***	-0.0088 (0.006)	-0.0089 (0.006)
	-3.451	1.476	1.573	-4.019	-1.498	-1.583
N	42924	42924	42924	42924	42924	42924
Adj. R2	0.16	0.35	0.41	0.72	0.74	0.74
$\theta_t$	Y	Y	-	Y	Y	-
$\gamma_c, \gamma_{c'}$	N	Y	-	N	Y	-
$\gamma_c \times \theta_t, \gamma_{c'} \times \theta_t$	-	-	Y	-	-	Y

This table estimates the elasticity of the stock of migrant inventors to the stock of total migrants 30 years before, using bilateral figures. Both left-hand side and right-hand side variables are transformed using the inverse hyperbolic sine (asinh). Columns 1 and 4 include only year fixed effects; columns 2 and 5 include receiving and sending country fixed effects, as well as year fixed effects; columns 3 and 6 include receiving country and year (combined) as well as sending country and year (combined) fixed effects. The estimation uses years 1990 and 2000 as baseline years. Standard errors are clustered at the receiving country and sending country levels and are presented in parenthesis. t-stats are presented below the standard errors

\* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$



## C Alternative methods for dependent binary variables

As noted, our dependent variable measuring technology take-offs is a binary variable. Hence, our OLS estimation represents a linear probability model (LPM). We believe that given the computational difficulties posed by estimating nonlinear models using high-dimensional fixed effects, LPM is a reasonable choice. However, for robustness purposes, we reestimate our main specification using the complementary log-log estimator. This particular maximum likelihood estimator, used to estimate models where the dependent variable responds to a binary distribution, is a more advisable option than logit or probit if the probability of take-off is small, as in our case (Singer and Willett, 2009). For computational reasons, to limit the number of simultaneous fixed effects, we estimate this c-log-log model for the 2000 to 2010 decade only, focusing only on take-offs, naturally. Table C1 presents the results, which are robust to the ones presented in the main body of the paper.

[Table C1 about here.]

Alternatively, we also consider the approach of Horrace and Oaxaca (2006) for binary data. The approach suggests, after the first estimation of a linear probability model, dropping from the sample the observations for which the predicted value falls out of the unit interval and using this subsample to reestimate the linear probability model. Horrace and Oaxaca (2006) show that this approach may reduce the potential biases of the linear probability models. Table C2 reports the results using this method. In fact, very few observations in our sample have a predicted value outside of the 0 to 1 range (less than half a percent), so the number of observations in this estimation is very close to those in Panel A of Table 2, therefore arriving at almost identical results. This suggests the potential bias from linear probability models is minimal, if anything.

[Table C2 about here.]

Table C1: Migrant inventors and patent applications take-offs, c-log-log estimation

<b>Dependent variable: Patent applications take-off (binary)</b>			
	est1	est2	est3
Take off patent class			
Immigrant inventors	0.0856 (0.036)**		0.1001 (0.037)***
Emigrant inventors		-0.0221 (0.045)	-0.0580 (0.047)
Total FDI	0.0056 (0.010)	0.0067 (0.010)	0.0069 (0.010)
Total Trade	0.0220 (0.023)	0.0461 (0.023)**	0.0342 (0.024)
N	41221	41221	41221
r2_p			

This table presents results of the estimation of Specification (1), focusing on take-offs (a binary dependent variable), using a (maximum likelihood) c-log-log estimator. All specifications include country and technology fixed effects. SEs clustered at the country level are presented in parenthesis.

\* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$

Table C2: Migrant inventors and patent applications take-offs, HO (2006)

<b>Dependent variable: Patent applications take-off (binary)</b>			
	est1	est2	est3
Immigrant inventors	0.0050 (0.001)***		0.0050 (0.001)***
Emigrant inventors		0.0017 (0.001)***	0.0000 (0.001)
Total FDI	-0.0001 (0.000)	-0.0001 (0.000)	-0.0001 (0.000)
Total Trade	0.0002 (0.000)	0.0003 (0.000)**	0.0002 (0.000)
N	104792	104792	104792
r2	0.09	0.09	0.09

This table presents results of the estimation of Specification (1), focusing on take-offs (a binary dependent variable), using the methodology suggested by Horrace and Oaxaca (2016). All specifications include country and technology fixed effects. SEs clustered at the country level are presented in parenthesis.

\* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$

## D Alternative dependent variables

For robustness purposes, we extend our exercise to include alternative take-off and growth measures as our dependent variable.

Table D1 replicates the estimation shown in Panel A of Table 2, this time using a modified version of take-offs that does not rely on RTA thresholds. The measure uses a much simpler way to account for new technology subclasses in a given country-technology pair based on zero or larger than zero patent applications. In this case, the dependent variable is measured as:

$$Y_{c,p,t \rightarrow T} = 1 \text{ if } patents_{c,p,t} = 0 \text{ and } patents_{c,p,T} \geq 1 ,$$

where  $T - t = 10$ .

[Table D1 about here.]

The results in Table D1 are qualitatively consistent with those in Panel A of Table 2, with larger point estimates, as is expected. The 2SLS results using the first set of instruments is much noisier (thus, we are unable to find results that are statistically significant), whereas the estimations using the second set of instrument show results consistent with our main estimation. Note that when using these results (instead of the RTA-based measure as our dependent variable), we are unable to conclude anything about gaining technological advantage in certain technology subclasses due to inventor migrants.

We also replicate our main specification using an alternative measure of growth that includes those observations that start off with zero patents. This measure is the symmetric percentage change and is defined as:

$$Y_{c,p,t \rightarrow T} = \frac{patents_{c,p,T} - patents_{c,p,t}}{0.5 * (patents_{c,p,T} + patents_{c,p,t})} \times \frac{1}{T - t}$$

where  $T - t = 10$ . In a sense, this growth measure allows us to include all observations, as opposed to CAGR, since we can include those country-technology pairs for which  $patents_{c,p,t} = 0$  as their symmetric percentage change (SPC) is defined. This measure also presents a symmetric growth rate so that a change from  $patents_{c,p,t} = x_1$  to  $patents_{c,p,T} = x_2$  represents

the same percentage change (in absolute value) than from  $patents_{c,p,T} = x_2$  to  $patents_{c,p,t} = x_1$ . Table D2 presents the results using all the sample (i.e., including those country-technology pairs that start off with zero patent applications).

[Table D2 about here.]

The OLS results of Table D2 show that when using this alternative dependent variable, we find results consistent with our main estimations: Immigrant inventors explain faster growth rates in patent applications in the same specialized technologies of their origin countries. The 2SLS results are somewhat weaker in terms of statistical significance for the first set of instruments, but not for the second set. However, across the board, the point estimates do hold, particularly for the sample of country-technology pairs that start off with no patent applications whatsoever (i.e., the same sample used in Panel A of Table 2).

Table D1: Migrant inventors and patent applications new technology subclass

Dependent variable: $patents_{c,p,t+10} > 0   patents_{c,p,t} = 0$ (binary)	OLS			2SLS (IV1)			2SLS (IV2)		
	est1	est2	est3	est4	est5	est6	est7	est8	est9
Immigrant inventors	0.0318 (0.004)***		0.0298 (0.004)***	0.0178 (0.011)		0.0160 (0.015)	0.0867 (0.005)***		0.0862 (0.008)***
Emigrant inventors		0.0155 (0.003)***	0.0054 (0.002)***		0.0128 (0.008)	0.0023 (0.010)		0.0975 (0.013)***	0.0010 (0.015)
Total FDI	0.0003 (0.000)	0.0005 (0.000)*	0.0002 (0.000)	0.0006 (0.000)*	0.0006 (0.000)	0.0006 (0.000)	-0.0009 (0.000)***	-0.0026 (0.001)***	-0.0010 (0.000)*
Total Trade	0.0028 (0.001)***	0.0034 (0.001)***	0.0023 (0.001)***	0.0040 (0.001)***	0.0038 (0.001)***	0.0038 (0.001)***	-0.0016 (0.001)**	-0.0073 (0.002)***	-0.0017 (0.001)
N	105304	105304	105304	105304	105304	105304	105304	105304	105304
r <sup>2</sup>	0.26	0.25	0.26	0.26	0.25	0.26	0.24	0.22	0.24
KP F Stat				60.59	37.42	40.91	754.69	99.14	26.79

This table presents results of the estimation of Specification (1). Columns 1-3 show OLS estimations, while columns 4-9 show results for 2SLS regressions. Columns 4-6 use as instrument the 30-year lagged stock of migrants; and columns 7-9 use as instrument the predicted stock of migrant inventors based on push and pull factors. Panel A presents results for take-offs in patenting applications (limiting the sample to cases where the initial patent applications for that country-technology pair were zero), while Panel B estimates future CAGR in patent applications for country-technology pairs that already had some patenting recorded in the baseline year. All specifications include country-year and technology-year fixed effects. SEs clustered at the country level are presented in parenthesis.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table D2: Migrant inventors and patent applications growth (SPC)

Dependent variable: Patents application growth (SPC), yearly average	OLS			2SLS (IV1)			2SLS (IV2)		
	All	$patents_{c,p,t_0} > 0$	All	All	$patents_{c,p,t_0} > 0$	All	All	$patents_{c,p,t_0} > 0$	All
Immigrant inventors	0.0048 (0.001)***	0.0053 (0.001)***	-0.0005 (0.004)	0.0034 (0.003)	0.0034 (0.003)	0.0144 (0.002)***	0.0155 (0.001)***		
Emigrant inventors	0.0007 (0.000)	0.0009 (0.000)**	0.0038 (0.003)	0.0001 (0.002)	0.0001 (0.002)	0.0003 (0.004)	0.0003 (0.003)		
Total FDI	0.0000 (0.000)	0.0000 (0.000)	0.0000 (0.000)	0.0001 (0.000)	0.0001 (0.000)	-0.0002 (0.000)*	-0.0002 (0.000)*		
Total Trade	0.0006 (0.000)***	0.0004 (0.000)***	0.0007 (0.000)**	0.0007 (0.000)***	0.0007 (0.000)***	-0.0003 (0.000)	-0.0003 (0.000)		
Baseline patent apps, log	0.0066 (0.002)***	0.0000 (.)	0.0073 (0.002)***	0.0000 (.)	0.0000 (.)	0.0052 (0.003)**	0.0000 (.)		
Previous Exports Log-Growth	-0.6119 (0.026)***	0.0000 (.)	-0.6122 (0.026)***	-0.1843 (0.013)***	-0.1843 (0.013)***	-0.6129 (0.027)***	-0.1633 (0.011)***		
Zero Exports in t-1	0.0813 (0.005)***	-0.0360 (0.002)***	0.0805 (0.005)***	0.0000 (.)	0.0000 (.)	0.0840 (0.006)***	0.0000 (.)		
N	123690	105304	123690	105304	105304	123690	105304		
r <sup>2</sup>	0.30	0.27	0.30	0.27	0.27	0.30	0.26		
KP F Stat			44.26	41.07	41.07	20.71	26.81		

This table presents results of the estimation of Specification (1). Columns 1-2 show OLS estimations, while columns 3-6 show results for 2SLS regressions. Columns 3-4 use as instrument the 30-year lagged stock of migrants; and columns 5-6 use as instrument the predicted stock of migrant inventors based on push and pull factors. The table reports estimations for an alternative measure for decade-long growth in patenting applications: the symmetric percentage change. This measure of growth is defined for country-technology pairs that start off with zero patent applications in the baseline year. Columns 1, 3, and 5 use all the sample, while columns 2, 4, and 6 limit the sample to those observations with initial value 0 in their patent applications count, similarly to Panel A of Table 2. All specifications include country-year and technology-year fixed effects. SEs clustered at the country level are presented in parenthesis.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## **E Excluding controls for trade and FDI**

Table E1 presents results of our main specification excluding controls for FDI and trade, as some might regard these as "bad controls" since the presence of migrant inventors could also explain an increased flow in trade and FDI. Our main results are robust to this exercise, and the point estimates remain fairly similar.

[Table E1 about here.]



Table E1: Migrant inventors and patent applications take-offs and growth, excl. controls

	Panel A - Dependent variable: Patent applications take-off (binary)								
	OLS			2SLS (IV1)			2SLS (IV2)		
	est1	est2	est3	est4	est5	est6	est7	est8	est9
Immigrant inventors	0.0049 (0.001)***	0.0049 (0.001)***	0.0049 (0.001)***	0.0089 (0.003)***	0.0130 (0.005)**	0.0086 (0.002)***	0.0130 (0.005)**	0.0086 (0.002)***	0.0110 (0.002)***
Emigrant inventors		0.0019 (0.001)***	-0.0001 (0.001)		0.0051 (0.002)***	-0.0037 (0.003)		0.0063 (0.001)***	-0.0032 (0.003)
N	105304	105304	105304	105304	105304	105304	105304	105304	105304
r <sup>2</sup>	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
KP F Stat				61.15	63.00	39.02	1432.04	504.58	71.31
	Panel B - Dependent variable: Patent applications growth (CAGR)								
	OLS			2SLS (IV1)			2SLS (IV2)		
	est1	est2	est3	est4	est5	est6	est7	est8	est9
Immigrant inventors	0.0059 (0.001)***	0.0056 (0.001)***	0.0038 (0.001)***	0.0208 (0.008)***	0.0055 (0.011)	0.0678 (0.065)	0.0055 (0.011)	0.0678 (0.065)	-0.0615 (0.313)
Emigrant inventors		0.0056 (0.001)***	0.0039 (0.002)**		0.0162 (0.007)**	0.0126 (0.014)		0.0160 (0.008)*	0.0286 (0.063)
Baseline patent apps, log	-0.0179 (0.002)***	-0.0176 (0.002)***	-0.0178 (0.002)***	-0.0185 (0.002)***	-0.0175 (0.002)***	-0.0177 (0.002)***	-0.0202 (0.003)***	-0.0175 (0.002)***	-0.0151 (0.013)
Previous Exports Growth	-0.1424 (0.039)***	-0.1438 (0.039)***	-0.1424 (0.039)***	-0.1354 (0.041)***	-0.1413 (0.040)***	-0.1396 (0.037)***	-0.1133 (0.035)***	-0.1414 (0.039)***	-0.1673 (0.127)
Zero Exports in t-1	-0.0016 (0.004)	-0.0014 (0.004)	-0.0014 (0.004)	-0.0015 (0.004)	-0.0007 (0.004)	-0.0009 (0.004)	-0.0010 (0.004)	-0.0008 (0.004)	-0.0007 (0.004)
N	18349	18349	18349	18349	18349	18349	18349	18349	18349
r <sup>2</sup>	0.55	0.55	0.55	0.54	0.54	0.54	0.37	0.54	0.40
KP F Stat				15.90	16.57	7.35	0.35	12.60	0.03

This table presents results of the estimation of Specification (1), excluding controls for trade and FDI. Columns 1-3 show OLS estimations, while columns 4-9 show results for 2SLS regressions. Columns 4-6 use as instrument the 30-year lagged stock of migrants; and columns 7-9 use as instrument the predicted stock of migrant inventors based on push and pull factors. Panel A presents results for take-offs in patenting applications (limiting the sample to cases where the initial patent applications for that country-technology pair was zero), while Panel B estimates future CAGR in patent applications for country-technology pairs that already had some patenting recorded in the baseline year. All specifications include country-year and technology-year fixed effects. SEs clustered at the country level are presented in parenthesis.  
\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## **F Excluding China from the sample**

Table F1 presents results of our main specification excluding China, as an attempt to rule out a confounding story that attributes our results to intellectual property stealing facilitated by migrant networks. We choose to exclude China because (1) it represents an important share of migrants due to its size and (2) it is known to have weaker intellectual property protection. Our main results are robust to this exercise.

[Table F1 about here.]

Table F1: Migrant inventors and patent applications take-offs and growth, excl. China

Panel A - Dependent variable: Patent applications take-off (binary)									
OLS					2SLS				
	est1	est2	est3	est4	est5	est6	est7	est8	est9
Immigrant inventors	0.0048 (0.001)***		0.0048 (0.001)***	0.0106 (0.004)**		0.0126 (0.005)**	0.0097 (0.002)***		0.0116 (0.003)***
Emigrant inventors		0.0016 (0.001)**	-0.0001 (0.001)		0.0058 (0.003)**	-0.0025 (0.004)		0.0094 (0.002)***	-0.0038 (0.004)
Total FDI	-0.0001 (0.000)	-0.0001 (0.000)	-0.0001 (0.000)	-0.0003 (0.000)**	-0.0002 (0.000)*	-0.0002 (0.000)	-0.0002 (0.000)***	-0.0004 (0.000)***	-0.0001 (0.000)
Total Trade	0.0001 (0.000)	0.0003 (0.000)**	0.0002 (0.000)	-0.0003 (0.000)	-0.0002 (0.000)	-0.0002 (0.000)	-0.0003 (0.000)*	-0.0007 (0.000)**	0.0001 (0.000)
N	104274	104274	104274	104274	104274	104274	104274	104274	104274
r <sup>2</sup>	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
KP F Stat				60.09	37.10	40.12	732.02	95.33	24.65
Panel B - Dependent variable: Patent applications growth (CAGR)									
OLS					2SLS				
	est1	est2	est3	est4	est5	est6	est7	est8	est9
Immigrant inventors	0.0048 (0.001)***		0.0039 (0.001)***	0.0210 (0.009)**		0.0084 (0.010)	-0.0140 (0.038)		-0.0019 (0.046)
Emigrant inventors		0.0040 (0.001)***	0.0026 (0.001)**		0.0214 (0.016)	0.0166 (0.021)		0.0189 (0.024)	0.0184 (0.032)
Total FDI	0.0003 (0.000)	0.0003 (0.000)	0.0003 (0.000)	0.0002 (0.000)	0.0000 (0.000)	0.0000 (0.000)	0.0005 (0.001)	0.0001 (0.001)	0.0001 (0.001)
Total Trade	0.0021 (0.001)	0.0017 (0.001)	0.0011 (0.001)	-0.0033 (0.003)	-0.0067 (0.008)	-0.0072 (0.008)	0.0083 (0.014)	-0.0055 (0.011)	-0.0046 (0.029)
Baseline patent apps, log	-0.0170 (0.002)***	-0.0167 (0.002)***	-0.0169 (0.002)***	-0.0175 (0.002)***	-0.0165 (0.002)***	-0.0169 (0.002)***	-0.0163 (0.002)***	-0.0165 (0.002)***	-0.0165 (0.002)***
Previous Exports Growth	-0.1472 (0.040)***	-0.1485 (0.040)***	-0.1473 (0.040)***	-0.1417 (0.042)***	-0.1473 (0.040)***	-0.1448 (0.038)***	-0.1535 (0.042)***	-0.1475 (0.040)***	-0.1482 (0.046)***
Zero Exports in t-1	-0.0014 (0.004)	-0.0012 (0.004)	-0.0013 (0.004)	-0.0014 (0.004)	-0.0005 (0.004)	-0.0007 (0.004)	-0.0014 (0.004)	-0.0006 (0.004)	-0.0007 (0.004)
N	18077	18077	18077	18077	18077	18077	18077	18077	18077
r <sup>2</sup>	0.53	0.53	0.53	0.52	0.52	0.52	0.52	0.52	0.52
KP F Stat				8.22	5.74	7.34	0.46	2.41	0.20

This table presents results of the estimation of Specification (1), excluding China from our sample. Columns 1-3 show OLS estimations, while columns 4-9 show results for 2SLS regressions. Columns 4-6 use as instrument the 30-year lagged stock of migrants; and columns 7-9 use as instrument the predicted stock of migrant inventors based on push and pull factors. Panel A presents results for take-offs in patenting applications (limiting the sample to cases where the initial patent applications for that country-technology pair was zero), while Panel B estimates future CAGR in patent applications for country-technology pairs that already had some patenting recorded in the baseline year. All specifications include country-year and technology-year fixed effects. SEs clustered at the country level are presented in parenthesis.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## G Using alternative patents data

Table G1 replicates the results of Tables 2, but using EPO patent applications as the main source of data, following the description in Section 2.3 (as opposed to USPTO patent applications, used in our main results). Our main results hold with these data.

[Table G1 about here.]

Along the same lines, Table G2 replicates the results using patent applications based on PCT records as the main source of data, following the description in Section 2.3. Our main results hold with these data.

[Table G2 about here.]

In addition, Table G3 replicates our main results using granted patents—as opposed to patent applications—to construct our dependent variables, as well as those control variables that are based on patents data. In the table, we document that our main results are robust to using granted patents as opposed to patent applications.

We consider these results of high relevance as, even when there could be a significant time gap between the time of patent application and the moment it is granted, the take-offs and accelerations we document in innovation are also present when focusing on patents that have gone through the process imposed by patent agencies that certify the innovation.

[Table G3 about here.]

Table G1: Migrant inventors and patent applications take-offs and growth (EPO)

	2SLS (IV1)									2SLS (IV2)								
	OLS									OLS								
	est1	est2	est3	est4	est5	est6	est7	est8	est9	est1	est2	est3	est4	est5	est6	est7	est8	est9
<b>Panel A - Dependent variable: Patent applications take-off (binary)</b>																		
Immigrant inventors	0.0040 (0.001)***	0.0019 (0.001)***	0.0038 (0.001)***	0.0043 (0.002)*	0.0052 (0.002)**	0.0008 (0.003)	0.0067 (0.001)***	0.0104 (0.002)***	0.0036 (0.002)*	0.0059 (0.002)**	0.0042 (0.001)***	0.0048 (0.001)***	0.0128 (0.007)*	0.0147 (0.007)**	0.0118 (0.007)	0.0139 (0.018)	0.0259 (0.028)	0.0377 (0.0212)
Emigrant inventors																		
Total FDI	0.0001 (0.000)**	0.0002 (0.000)**	0.0001 (0.000)*	0.0001 (0.000)*	0.0000 (0.000)	0.0000 (0.000)	0.0001 (0.000)	0.0000 (0.000)	0.0001 (0.000)	0.0000 (0.000)	0.0001 (0.000)	0.0001 (0.000)	0.0002 (0.0002)	0.0000 (0.000)	0.0000 (0.000)	0.0002 (0.0002)	0.0000 (0.000)	0.0001 (0.000)
Total Trade	0.0001 (0.000)	0.0002 (0.000)	0.0000 (0.000)	0.0001 (0.000)	-0.0002 (0.000)	-0.0002 (0.000)	-0.0001 (0.000)	-0.0009 (0.000)***	-0.0007 (0.000)**	0.0000 (0.000)	0.0000 (0.000)	0.0000 (0.000)	0.0000 (0.000)	0.0000 (0.000)	0.0000 (0.000)	0.0000 (0.000)	0.0000 (0.000)	0.0000 (0.000)
N	105039	105039	105039	105039	105039	105039	105039	105039	105039	105039	105039	105039	105039	105039	105039	105039	105039	105039
r2	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
KP F Stat				59.94	38.38	40.35	938.44	93.47	26.07									
<b>Panel B - Dependent variable: Patent applications growth (CAGR)</b>																		
	OLS									OLS								
	est1	est2	est3	est4	est5	est6	est7	est8	est9	est1	est2	est3	est4	est5	est6	est7	est8	est9
Immigrant inventors	0.0059 (0.001)***	0.0057 (0.002)***	0.0042 (0.001)***	0.0048 (0.007)*	0.0147 (0.007)**	0.0118 (0.007)	0.0139 (0.018)	0.0259 (0.028)	0.0377 (0.0212)	0.0059 (0.002)**	0.0042 (0.001)***	0.0048 (0.001)***	0.0128 (0.007)*	0.0147 (0.007)**	0.0118 (0.007)	0.0139 (0.018)	0.0259 (0.028)	0.0377 (0.0212)
Emigrant inventors																		
Total FDI	-0.0002 (0.000)	-0.0002 (0.000)	-0.0002 (0.000)	-0.0002 (0.000)	-0.0003 (0.000)	-0.0003 (0.000)	-0.0002 (0.000)	-0.0005 (0.000)	-0.0004 (0.000)	-0.0002 (0.000)	-0.0002 (0.000)	-0.0002 (0.000)	-0.0002 (0.000)	-0.0003 (0.000)	-0.0003 (0.000)	-0.0002 (0.000)	-0.0005 (0.000)	-0.0004 (0.000)
Total Trade	0.0073 (0.003)***	0.0059 (0.003)**	0.0044 (0.003)*	0.0034 (0.003)	0.0018 (0.005)	0.0020 (0.005)	0.0187 (0.013)	0.0113 (0.023)	0.0756 (0.506)	0.0059 (0.003)**	0.0044 (0.003)*	0.0034 (0.003)	0.0034 (0.003)	0.0018 (0.005)	0.0020 (0.005)	0.0187 (0.013)	0.0113 (0.023)	0.0756 (0.506)
Baseline patent apps, log	-0.0209 (0.002)***	-0.0207 (0.002)***	-0.0208 (0.002)***	-0.0211 (0.002)***	-0.0205 (0.002)***	-0.0207 (0.002)***	-0.0205 (0.001)***	-0.0203 (0.002)***	-0.0208 (0.005)***	-0.0209 (0.002)***	-0.0207 (0.002)***	-0.0208 (0.002)***	-0.0211 (0.002)***	-0.0205 (0.002)***	-0.0207 (0.002)***	-0.0205 (0.001)***	-0.0203 (0.002)***	-0.0208 (0.005)***
Previous Exports Growth	-0.1239 (0.025)***	-0.1256 (0.026)***	-0.1242 (0.025)***	-0.1219 (0.026)***	-0.1254 (0.026)***	-0.1241 (0.026)***	-0.1299 (0.027)***	-0.1252 (0.026)***	-0.1380 (0.079)*	-0.1239 (0.025)***	-0.1256 (0.026)***	-0.1242 (0.025)***	-0.1219 (0.026)***	-0.1254 (0.026)***	-0.1241 (0.026)***	-0.1299 (0.027)***	-0.1252 (0.026)***	-0.1380 (0.079)*
Zero Exports in t-1	-0.0006 (0.003)	-0.0004 (0.003)	-0.0004 (0.003)	-0.0006 (0.002)	0.0000 (0.002)	-0.0001 (0.002)	-0.0008 (0.003)	0.0006 (0.003)	-0.0035 (0.024)	0.0000 (0.002)	-0.0004 (0.003)	-0.0004 (0.003)	-0.0006 (0.002)	0.0000 (0.002)	-0.0001 (0.002)	-0.0008 (0.003)	0.0006 (0.003)	-0.0035 (0.024)
N	18623	18623	18623	18623	18623	18623	18623	18623	18623	18623	18623	18623	18623	18623	18623	18623	18623	18623
r2	0.47	0.47	0.47	0.47	0.47	0.47	0.45	0.46	0.24	0.47	0.47	0.47	0.47	0.47	0.47	0.45	0.46	0.24
KP F Stat				7.74	10.57	9.91	1.49	2.40	0.01									

This table presents results of the estimation of Specification (1), using patent applications reported by the EPO to construct the dependent variable as well as patent-relevant control variables. Columns 1-3 show OLS estimations, while columns 4-9 show results for 2SLS regressions. Columns 4-6 use as instrument the 30-year lagged stock of migrants, and columns 7-9 use as instrument the predicted stock of migrant inventors based on push and pull factors. Panel A presents results for take-offs in patenting applications (limiting the sample to cases where the initial patent applications for that country-technology pair was zero), while Panel B estimates future CAGR in patent applications for country-technology pairs that already had some patenting recorded in the baseline year. All specifications include country-year and technology-year fixed effects. SEs clustered at the country level are presented in parenthesis. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table G2: Migrant inventors and patent applications take-offs and growth (PCT)

	Panel A - Dependent variable: Patent applications take-off (binary)								
	OLS			2SLS (IV1)			2SLS (IV2)		
	est1	est2	est3	est4	est5	est6	est7	est8	est9
Immigrant inventors	0.0058 (0.001)***	0.0044 (0.001)***	0.0047 (0.001)***	0.0101 (0.003)***	0.0075 (0.004)*	0.0095 (0.002)***	0.0131 (0.003)***	0.0072 (0.003)**	0.0046 (0.004)
Emigrant inventors		0.0001 (0.000)	0.0000 (0.000)	-0.0000 (0.000)	0.0078 (0.003)***	0.0030 (0.003)	-0.0000 (0.000)	-0.0003 (0.000)**	-0.0001 (0.000)
Total FDI	0.0001 (0.000)	0.0001 (0.000)	0.0000 (0.000)	-0.0000 (0.000)	-0.0003 (0.000)	-0.0002 (0.000)	-0.0000 (0.000)	-0.0008 (0.000)***	-0.0004 (0.000)
Total Trade	0.0002 (0.000)**	0.0001 (0.000)	-0.0000 (0.000)	-0.0001 (0.000)	0.0000 (0.000)	0.0000 (0.000)	0.0000 (0.000)	0.0000 (0.000)	0.0000 (0.000)
N	106327	106327	106327	106327	106327	106327	106327	106327	106327
r2	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
KP F Stat				54.56	41.29	35.09	664.82	100.84	27.92
	Panel B - Dependent variable: Patent applications growth (CAGR)								
	OLS			2SLS (IV1)			2SLS (IV2)		
	est1	est2	est3	est4	est5	est6	est7	est8	est9
Immigrant inventors	0.0057 (0.002)***	0.0060 (0.001)***	0.0044 (0.002)**	0.0145 (0.006)**	0.0171 (0.006)***	0.0040 (0.005)	-0.0256 (0.023)	0.0160 (0.019)	0.0068 (0.021)
Emigrant inventors		0.0002 (0.000)	0.0002 (0.000)	0.0002 (0.000)	0.0000 (0.000)	0.0000 (0.000)	0.0005 (0.000)	0.0001 (0.000)	0.0004 (0.001)
Total FDI	0.0003 (0.000)	0.0002 (0.000)	0.0002 (0.000)	0.0002 (0.000)	-0.0053 (0.004)	-0.0057 (0.004)	0.0167 (0.011)	-0.0046 (0.011)	0.0117 (0.016)
Total Trade	-0.0248 (0.003)***	-0.0247 (0.003)***	-0.0247 (0.003)***	-0.0248 (0.003)***	-0.0245 (0.003)***	-0.0245 (0.002)***	-0.0247 (0.003)***	-0.0245 (0.002)***	-0.0246 (0.003)***
Baseline patent apps, log	-0.0684 (0.023)***	-0.0687 (0.023)***	-0.0692 (0.023)***	-0.0700 (0.023)***	-0.0711 (0.022)***	-0.0714 (0.022)***	-0.0629 (0.026)**	-0.0709 (0.022)***	-0.0647 (0.024)***
Previous Exports Growth	-0.0052 (0.002)**	-0.0052 (0.002)**	-0.0051 (0.002)**	-0.0047 (0.002)**	-0.0048 (0.002)*	-0.0047 (0.002)*	-0.0069 (0.002)***	-0.0048 (0.003)*	-0.0066 (0.002)***
Zero Exports in t-1									
N	17323	17323	17323	17323	17323	17323	17323	17323	17323
r2	0.59	0.59	0.60	0.59	0.59	0.59	0.57	0.59	0.57
KP F Stat				7.98	17.58	8.61	1.49	0.84	0.31

This table presents results of the estimation of Specification (1), using patent applications reported by the PCT to construct the dependent variable as well as patent-relevant control variables. Columns 1-3 show OLS estimations, while columns 4-9 show results for 2SLS regressions. Columns 4-6 use as instrument the 30-year lagged stock of migrants, and columns 7-9 use as instrument the predicted stock of migrant inventors based on push and pull factors. Panel A presents results for take-offs in patenting applications (limiting the sample to cases where the initial patent applications for that country-technology pair was zero), while Panel B estimates future CAGR in patent applications for country-technology pairs that already had some patenting recorded in the baseline year. All specifications include country-year and technology-year fixed effects. SEs clustered at the country level are presented in parenthesis. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table G3: Migrant inventors and granted patent take-offs and growth (USPTO)

	Panel A - Dependent variable: Patent applications take-off (binary)													
	OLS					2SLS (IV1)					2SLS (IV2)			
	est1	est2	est3	est4	est5	est6	est7	est8	est9					
Immigrant inventors	0.0048 (0.001)***		0.0045 (0.001)***	0.0084 (0.004)**		0.0090 (0.005)*	0.0113 (0.002)***		0.0106 (0.002)***					
Emigrant inventors		0.0025 (0.001)***	0.0009 (0.001)		0.0051 (0.002)**	-0.0008 (0.003)		0.0135 (0.003)***	0.0016 (0.004)					
Total FDI	-0.0000 (0.000)	0.0000 (0.000)	-0.0000 (0.000)	-0.0001 (0.000)	-0.0001 (0.000)	-0.0001 (0.000)	-0.0002 (0.000)*	-0.0002 (0.000)***	-0.0002 (0.000)					
Total Trade	0.0001 (0.000)	0.0002 (0.000)*	0.0000 (0.000)	-0.0002 (0.000)	-0.0001 (0.000)	-0.0001 (0.000)	-0.0004 (0.000)***	-0.0012 (0.000)***	-0.0005 (0.000)					
N	106620	106620	106620	106620	106620	106620	106620	106620	106620					
r2	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.09					
KP F Stat				60.25	37.25	41.17	738.22	95.44	26.70					
Panel B - Dependent variable: Patent applications growth (CAGR)														
	OLS													
	OLS					2SLS (IV1)					2SLS (IV2)			
	est1	est2	est3	est4	est5	est6	est7	est8	est9					
Immigrant inventors	0.0026 (0.001)**		0.0012 (0.001)	0.0167 (0.010)*		-0.0012 (0.009)	0.1321 (0.163)		0.1240 (0.162)					
Emigrant inventors		0.0038 (0.001)***	0.0033 (0.002)**		0.0198 (0.014)	0.0206 (0.019)		0.0275 (0.034)	0.0184 (0.070)					
Total FDI	0.0004 (0.000)	0.0004 (0.000)	0.0004 (0.000)	0.0003 (0.000)	0.0001 (0.000)	0.0001 (0.000)	-0.0003 (0.001)	0.0000 (0.001)	-0.0005 (0.002)					
Total Trade	0.0002 (0.001)	-0.0005 (0.001)	-0.0007 (0.001)	-0.0037 (0.002)	-0.0066 (0.005)	-0.0065 (0.005)	-0.0357 (0.046)	-0.0095 (0.011)	-0.0404 (0.048)					
Baseline patent apps, log	-0.0170 (0.002)***	-0.0168 (0.002)***	-0.0168 (0.002)***	-0.0175 (0.002)***	-0.0164 (0.002)***	-0.0164 (0.002)***	-0.0215 (0.006)***	-0.0163 (0.003)***	-0.0208 (0.007)***					
Previous Exports Growth	-0.1291 (0.044)***	-0.1300 (0.044)***	-0.1298 (0.044)***	-0.1275 (0.045)***	-0.1324 (0.041)***	-0.1327 (0.039)***	-0.1144 (0.048)**	-0.1336 (0.043)***	-0.1181 (0.053)**					
Zero Exports in t-1	-0.0025 (0.005)	-0.0022 (0.004)	-0.0023 (0.004)	-0.0027 (0.005)	-0.0013 (0.004)	-0.0013 (0.004)	-0.0046 (0.006)	-0.0009 (0.005)	-0.0035 (0.008)					
N	17032	17032	17032	17032	17032	17032	17032	17032	17032					
r2	0.50	0.50	0.50	0.49	0.49	0.49	-0.30	0.47	-0.30					
KP F Stat				10.74	9.75	7.46	0.35	0.50	0.35					

This table presents results of the estimation of Specification (1), using granted patents by the USPTO to construct the dependent variable as well as patent-relevant control variables. Columns 1-3 show OLS estimations, while columns 4-9 show results for 2SLS regressions. Columns 4-6 use as instrument the 30-year lagged stock of migrants; and columns 7-9 use as instrument the predicted stock of migrant inventors based on push and pull factors. Panel A presents results for take-offs in patenting applications (limiting the sample to cases where the initial patent applications for that country-technology pair was zero), while Panel B estimates future CAGR in patent applications for country-technology pairs that already had some patenting recorded in the baseline year. All specifications include country-year and technology-year fixed effects. SEs clustered at the country level are presented in parenthesis. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$