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Immigration, Trade and Home Country Development: State-Level Variation in the US Immigrant-Export Link

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Abstract This article examines the pro-trade influence of immigrants using data on state-level exports from the 48 contiguous USA to 28 countries during the year 1993. Immigrants from lesser developed countries are found to exert stronger proportional effects on state-level exports relative to the immigrants from more developed countries. Calculation of absolute immigrant effects at state, regional and national levels also reveal influences of immigrants from developing countries are of greater magnitude; however, results depend on the metric employed to categorize countries as developing or developed. The findings emphasize the importance of immigrants' connections to business and social networks and allow for an improved understanding of the role that information asymmetries play in fomenting opportunities for immigrants to enhance trade.

Résumé Nous examinons l'influence pro-commerce des immigrés en utilisant des données sur les exports au niveau national des 48 états contigus des États-Unis, à 28 pays pendant l'année 1993. On trouve que les immigrés des pays moins développés exercent de plus forts effets proportionnels sur les exports au niveau national par rapport aux immigrés des pays plus développés. Le calcul des effets-immigrés absolus au niveau de l'état, de la région, et de la nation révèlent aussi que les influences des immigrés des pays en voie de développement sont d'une plus grande ampleur; les résultats dépendent pourtant de la métrique employée pour caractériser les pays comme en voie de développement ou développés. Les conclusions soulignent l'importance des liens des immigrés aux réseaux commerciaux et sociaux et permettent une compréhension améliorée du rôle joué par des assymétries de renseignment dans la création des occasions pour l'augmentation du commerce par les immigrés.

Keywords Development · Gravity · Immigration · State-level exports

Mots clés développement · gravité · immigration · exports au niveau national

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Introduction

In recent years, as the public debate surrounding the USA immigration policy has become more heated and increasingly contentious, a growing literature has documented a positive relationship between immigrants and host-home country trade flows. Although numerous social ills, including job loss, crime, and a strain on social service provision are cited as anticipated results of immigration, the trade-enhancing influences of immigrants rarely, if ever, enter into discussions of immigration policy. Policy formulation would benefit from an accurate accounting of all effects attributable to immigration. To that end, we examine one facet of the immigrant–trade relationship: the influence of immigrants on US state-level exports and whether variation exists in the state-level immigrant–export link across home country development classifications. The findings provide for an improved understanding of the importance of immigrant networks as a means by which trade is facilitated and, in doing so, add to the relevant literature while also conferring benefits to the immigration policy debate.

There are two channels through which immigrants are thought to influence US exports to their home countries. First, immigrants may arrive in the host country in possession of information relating to home country markets that, if successfully exploited, reduces transaction costs and thus may increase exports. Such information could range from seemingly innocuous language skills to understanding the complexities of informal contracting procedures and/or expectations of culture-specific business practices. Second, exports may increase if immigrants maintain connections to business or social networks that ameliorate search costs associated with the matching of buyers and sellers or that act as a form of implicit insurance that fosters the completion of trade deals via a reputation-maintenance effect. In both instances, immigrants' network connections would reduce the extent of asymmetric information and potentially facilitate exports.

Gould (1994), using US data, is the first to document a positive influence of immigrants on home-host country trade. Although a detailed review of the related research is beyond the scope of this paper, to provide an indication of the voluminous literature that exists on the topic, we note that White (2007a, 2009) and Mundra (2005) extend the work of Gould (1994) and report positive immigrant influences on US trade. Similarly, pro-trade immigrant influences are reported for many other home countries: White and Tadesse (2007) for Australia; Wagner et al. (2002), Head and Ries (1998), and Helliwell (1997) for Canada; White (2007b) for Denmark; Piperakis et al. (2003) for Greece; White and Tadesse (2009) for Italy; Hong and Santhapparaj (2006) for Malaysia; Bryant and Law (2004) for New Zealand; Blanes (2003, 2006) for Spain; and Girma and Yu (2002) for the UK. Focusing on the role of networks, Combes et al. (2005) examine intra-France trade and report a pro-trade influence of migrants. Similarly, Greenaway et al. (2007) and Rauch and Trindade (2002) employ Chinese population shares to represent the presence of ethnic Chinese networks and report that such networks increase bilateral trade flows. Finally, Blanes (2005) and Blanes and Martín-Montaner (2006) for Spain and White (2008) for the US report that immigrants exert positive influences on intra-industry trade.

Several recent studies that examine the influence of immigrants on US state-level exports emphasize the role of networks but fail to consider possible variation in the trade-enhancing influences of immigrants across home countries (Tadesse and White

2008; Dunlevy 2006; Herander and Saavedra 2005; Bardhan and Guhathakurta 2005). Exceptions are Bandyopadhyay et al. (2008) and Co et al. (2004). Using data on exports from each of the 50 states and the District of Columbia to 29 countries for the years 1989–1990 and 1999–2000, the authors find that ethnic networks are important for only a subset of countries but are considerably greater in magnitude for this cohort relative to effects reported in studies that assume identical immigrant–export effects for all home countries. Several explanations are offered for the observed variation. For example, cultural and institutional differences between host and home countries would likely correspond with greater information asymmetries and afford opportunities for immigrants to increase trade. Similarly, linguistic differences, at times used as a proxy for cultural dissimilarity (Dunlevy 2006; Hutchinson 2002; Boisso and Ferrantino 1997), may impede the writing and enforcement of contracts and thus hinder the initiation and completion of trade deals. Although these explanations are certainly plausible, we consider the basis for the observed variation an open empirical question and posit that lesser-developed countries are more likely than developed countries to lack the institutions and/or formal channels that facilitate trade. Accordingly, immigrants from such countries may face relatively greater opportunities to utilize their network connections and, thus, to exert positive influences on exports.

Although findings presented in this paper are relevant to Bandyopadhyay et al. (2008), in many aspects, the work is more closely linked to that of Co et al. (2004). Employing data for state-level exports to 28 immigrant home countries during the year 1993, Co et al. (2004) examine variation in the immigrant–export relationship by stratifying their sample according to OECD membership and estimating identical regression equations for the OECD member and non-member samples. The authors then construct confidence intervals for the estimated coefficients on the immigrant stock variables. Because the confidence intervals are found to overlap, the authors conclude that there is no difference between developed and developing home countries in terms of the effects of immigrants on state-level exports. The use of sample stratification and confidence intervals to discern variation in effects is problematic. While coefficients from sub-group regressions represent group-specific effects, using confidence intervals to compare immigrant effects assumes homoskedasticity in variances across the sub-group regressions. Furthermore, although few would disagree that OECD membership correlates with economic development, this metric leads Co et al. (2004) to classify Hong Kong, Mexico, and South Korea as developing countries. As Mexico and South Korea joined the OECD in 1994 and 1996, respectively, and the per capita income of Hong Kong exceeds that of many OECD members, it is unlikely that these countries are truly representative of the developing world.

Following Co et al. (2004), we use cross-sectional data for the year 1993; however, we forgo sample stratification and instead pool our data and employ interaction terms to identify variation in immigrants' influences on state-level exports across a range of home country development classifications. In doing so, we rely upon a broader set of development classifications [OECD membership, UN Human Development Index (HDI) classifications, and World Bank income classifications] than did Co et al. (2004). Extending the related literature, we illustrate that the homoskedasticity assumption implicitly invoked by Co et al. (2004) is flawed and that there is, in fact, variation in the immigrant–export relationship. As anticipated, we find that immigrants from lesser developed countries

exert stronger proportional effects on state-level exports relative to the effects of immigrants from more developed countries. Additionally, calculation of absolute immigrant effects at state, regional, and national levels suggests that the influence of immigrants from developing countries is often of greater magnitude than the absolute effects estimated for immigrants from developed countries; however, the relative magnitudes of absolute effects depend on the metric employed to categorize home countries as developing or developed. Taken collectively, the results emphasize the importance of immigrants' connections to business and/or social networks and also allow for an improved understanding of the role that information asymmetries play in fomenting opportunities for immigrants to enhance trade flows.

Empirical Specification

We begin our analysis by first replicating the estimation strategy of Co et al. (2004). Using comparable data for the same 28 home countries and the same time period, we examine the assumption of homoskedasticity in variances across regressions.[1] We then estimate an alternative specification to evaluate variation in proportional immigrant–export effects across a number of home country development classifications. The ordinary least squares technique is employed for both series of estimations. Finally, we estimate average absolute immigrant–export effects at the state-level and consider the existence of potential heterogeneity in effects across development classifications.[2] Consistent with prior research, an augmented gravity specification is employed. The equation employed by Co et al. (2004) is presented as Eq. 1.[3]

$$\begin{aligned} ln\,X_{ijt+3} = {} & \alpha_0 + \beta_1\, ln\, IM_{ijt} + \beta_2\, ln\, Y_{jt} + \beta_3\, ln\, Y_{it} + \beta_4\, ln\, POP_{it} + \beta_5\, ln\, POP_{it} \\ & + \beta_6\, ln\, DIST_{ij} + \beta_7\, ln\, OPEN_{jt} + \beta_8\, ln\, PHONE_{jt} + \beta_9 ADJACENCY_j \\ & + \beta_{10} NBORDER_i + \beta_{11} SBORDER_i + \beta_{12} WCOAST_i + \beta_{13} ECOAST_i + \varepsilon_{ijt} \end{aligned} \tag{1}$$

X_{ijt+3} represents state i exports to country j during year t+3. The lag between independent variables and exports follows Co et al. (2004), which notes that Gould (1994) finds the effects of immigrants on trade begin roughly 3.8 years following arrival. Y_{ji} represents home country gross domestic product (GDP), a measure of economic mass, with higher values implying greater potential markets for domestic goods. Similarly, gross state product (Y_{it}) measures a state's capacity to export. The POP variables provide additional controls for home country and host state sizes. The

[1] Appendix A lists the 28 countries included in the data set. Collectively, these countries accounted for 67.4% of US exports in 1993 (Feenstra, 1997) and were home countries for 60.2% of the 1990 US foreign-born population (US Bureau of the Census 1993).

[2] The effect of immigrants on net exports, while an interesting issue that is particularly important for public policy, cannot be examined as import data is not available at the state level. Studies examining the immigrant–trade link using aggregate trade data, however, provide mixed results as to whether immigrants' influences generate increases or decreases in net exports.

[3] See Anderson and Van Wincoop (2003), Eaton and Kortum (2002), Feenstra et al. (2001), Deardorff (1998), Davis (1995), Bergstrand (1985), Helpman and Krugman (1985), and Anderson (1979) for theoretical foundations.

geodesic distance between each state and home country pair ($DIST_{ij}$) is a proxy for transport costs. $OPEN_{jt}$, which is given as the sum of imports and exports divided by GDP, is a measure of general propensity to trade and can be considered to represent a country's integration into the global economy. The number of home country landline telephone connections per 1,000 residents ($PHONE_{jt}$) reflects infrastructure development. A series of dummy variables ($ADJACENCY_j$, $NBORDER_i$, $SBORDER_i$, $WCOAST_i$ and $ECOAST_i$) capture potentially unique trading relationships between all states and Canada and Mexico and relationships that may exist between border/coastal states and all other trading partners.[4]

Results of estimating Eq. 1 for the full sample and for both OECD member and non-OECD member sub-groups are presented in columns a–c of Table 1. Columns d–i reproduce the results presented in Co et al. (2004). *t* tests evaluating differences in coefficients on IM_{ijt} variables across regressions indicate equivalence across the sub-groups. However, before drawing conclusions regarding differential effects from the sub-group regressions, it is important to examine the assumption of homoskedasticity in variances across regression estimations. *F* statistics corresponding to regression results presented in columns b and c, e and f, and h and i are 3.85, 4.56, and 4.62, respectively. Thus, in all cases, the null hypothesis of homoskedasticity must be rejected.

While heteroskedasticity does not bias coefficients, it does bias standard errors and creates problems regarding causal inference. Application of White's heteroskedasticity-corrected covariance matrix compensates for heteroskedasticity within regressions; however, it does not correct for unequal variances across regressions. To address this problem, we alter Eq. 1 to include a term that interacts the IM_{ijt} variable with a vector of dummy variables, LDC_j, which identifies countries as lesser developed. Specifically, LDC_j contains $NON\text{-}OECD_j$, $MEDIUM\ HDI_j$, $UPPER\ MIDDLE\ INCOME_j$, $LOWER\ MIDDLE\ INCOME_j$, $MIDDLE\ INCOME_j$ and $LOW\ INCOME_j$. OECD membership and HDI classification, being dichotomous variables, are treated as general development measures. The United Nations classifies countries as high human development if 0.8<HDI, medium human development if 0.5<HDI<0.8, and low human development if HDI<0.5. Of the 28 home countries included in the data, none are classified by the United Nations as low human development. World Bank classifications, based on per capita gross national income, provide an arguably more detailed development measure. The Bank (1997) classifies countries as low income if 1995 GNI per capita<$765, lower middle income if $765<GNI per capita<$3,035, upper middle income if $3,035<GNI per capita<$9,385, and high income if GNI per capita>$9,385. Eq. 2 presents the general estimation equation.[5]

$$\begin{aligned} ln\,X_{ijt+3} = {} & \alpha_0 + \beta_1\, ln\, IM_{ijt} + \beta_2\left(ln\, IM_{ijt} \times LDC_j\right) + \beta_3\, ln\, Y_{jt} + \beta_4\, ln\, Y_{it} \\ & + \beta_5\, ln\, POP_{jt} + \beta_6\, ln\, POP_{it} + \beta_7\, ln\, DIST_{ij} + \beta_8\, ln\, OPEN_{jt} \\ & + \beta_9\, ln\, PHONE_{jt} + \beta_{10} ADJACENCY_j + \beta_{11} NBORDER_i \\ & + \beta_{12} SBORDER_i + \beta_{13} WCOAST_i + \beta_{14} ECOAST_i \\ & + \beta_{LDC} LDC_j + \varepsilon_{ijt} \end{aligned} \tag{2}$$

[4] Appendix B lists data sources and discusses corresponding variable construction.

[5] An *F* test, comparing adjusted *R*-squared values, indicates that in all cases estimation of Eq. 2 explains a significantly larger share of the variation in exports than does estimation of Eq. 1.

Table 1 Replication of Co et al. (2004) specification and presentation of results from Co et al. (2004)

	Co et al. (2004), Specifications			Co et al. (2004), Estimation results, ITA exporter location series			Co et al. (2004), Estimation results, MISER exporter location series		
	All Countries	Developed Countries	Developing Countries	All Countries	Developed Countries	Developing Countries	All Countries	Developed Countries	Developing Countries
ln Immigrants$_{ijt}$	0.298[a]	0.267[a]	0.26[a]	0.2993[a]	0.2886[a]	0.2698[a]	0.2997[a]	0.2908[a]	0.2687[a]
	(0.052)	(0.052)	(0.067)	(0.0491)	(0.0496)	(0.0648)	(0.0495)	(0.0497)	(0.0653)
ln Gross Domestic Product$_{jt}$	0.487[a]	6.71[a]	2.053[a]	0.8676[a]	4.5495[a]	0.6911[c]	0.8688[a]	4.4527[a]	0.7212[b]
	(0.185)	(0.736)	(0.262)	(0.2423)	(0.4184)	(0.3616)	(0.2449)	(0.4203)	(0.3663)
ln Gross State Product$_{it}$	1.407[a]	0.872[b]	1.963[a]	1.3946[a]	0.8134[b]	1.8091[a]	1.3537[a]	0.8135[b]	1.7496[a]
	(0.415)	(0.413)	(0.557)	(0.3933)	(0.4041)	(0.5306)	(0.3976)	(0.4069)	(0.5371)
ln Home Country Population$_{jt}$	0.516[b]	−6.965[a]	−0.74[a]	0.1241	−4.9864[a]	0.4267	0.1008	−4.8573[a]	0.3693
	(0.21)	(0.884)	(0.242)	(0.2733)	(0.5689)	(0.3761)	(0.2760)	(0.5707)	(0.3802)
ln Host State Population$_{it}$	−0.011	0.262	−0.41	0.0233	0.2909	-0.2001	0.0729	0.2943	−0.1274
	(0.404)	(0.412)	(0.537)	(0.3826)	(0.4042)	(0.5149)	(0.3869)	(0.4070)	(0.5217)
ln Distance$_{ij}$	−0.854[a]	−0.972[a]	−1.55[a]	−0.9882[a]	−0.8492[a]	−1.1011[a]	−0.9916[a]	0.8353[a]	−1.0911[a]
	(0.117)	(0.193)	(0.2)	(0.1384)	(0.2060)	(0.2120)	(0.1408)	(0.2101)	(0.2165)
ln Open$_{jt}$	0.74[a]	−0.562[a]	0.843[a]	0.9569[b]	−1.4921[a]	1.0136[a]	0.9113[a]	−1.4547[a]	0.9309[a]
	(0.104)	(0.192)	(0.132)	(0.1503)	(0.2686)	(0.2143)	(0.1516)	(0.2690)	(0.2161)

ln Phone Connections$_{jt}$ (per 1 k residents)	0.579[a]	0.483	0.348[a]	0.2664[b]	0.1316	0.6095[a]	0.2605[c]	0.1034	0.6035[a]
	(0.113)	(0.351)	(0.111)	(0.1343)	(0.3371)	(0.1635)	(0.1357)	(0.3394)	(0.1655)
Adjacency$_j$	0.347[c]	−0.572	−1.503[a]	0.2698	−0.8480[b]	−0.1970	0.3267	−0.6464	−0.2137
	(0.203)	(0.357)	(0.381)	(0.2352)	(0.3891)	(0.4242)	(0.2390)	(0.3968)	(0.4318)
Border-North$_i$	−0.222[c]	0.006	−0.286	−0.2256[c]	0.051	−0.3415[c]	−0.2236[c]	0.0492	−0.3384[c]
	(0.134)	(0.126)	(0.179)	(0.1329)	(0.1173)	(0.1821)	(0.1341)	(0.1180)	(0.1838)
Border-South$_i$	−0.968[a]	−0.325[c]	−1.196[a]	−0.9675[a]	−0.3400	−1.2497[a]	−0.9218[a]	−0.3429[b]	−1.1826[a]
	(0.197)	(0.17)	(0.255)	(0.1927)	(0.1574)	(0.2564)	(0.1998)	(0.1573)	(0.2667)
Coastal-West$_i$	0.308	0.759[a]	0.273	0.3003	0.7414[a]	0.1151	0.3004	0.7222[a]	0.1201
	(0.251)	(0.19)	(0.326)	(0.2494)	(0.1741)	(0.3428)	(0.2518)	(0.1758)	(0.3460)
Coastal-East$_i$	0.162	−0.134	0.261[b]	0.1751[c]	−0.0906	0.3181[b]	0.1950[c]	−0.0925	0.3511[b]
	(0.102)	(0.099)	(0.133)	(0.1027)	(0.0919)	(0.1407)	(0.1042)	(0.0920)	(0.1430)
Constant	−36.847[a]	−65.459[a]	−55.652[a]	−40.183[a]	−32.000[a]	−45.693[a]	−39.288[a]	−31.940[a]	−44.775[a]
	(4.72)	(7.131)	(6.704)	(5.0225)	(6.3446)	(6.7698)	(5.0860)	(6.4081)	(6.8506)
Adjusted R^2	0.7263	0.8514	0.6961	0.7306	0.8655	0.6873	0.7255	0.8658	0.6816
N	1,344	432	912	1,344	432	912	1,344	432	912

Heteroskedastic-consistent standard errors in parentheses. Countries classified as "developed" are OECD members while "developing" countries are not

ITA International Trade Administration, *MISER* Massachusetts Institute for Social and Economic Research

[a] Significance from zero at 1% level

[b] Significance from zero at 5% level

[c] Significance from zero at 10% level

Equation 2 maintains the lag structure employed in Co et al. (2004). This is done to allow for comparison of our estimation results to those of Co et al (2004) and to avoid the potential problem of endogeneity.[6] Interpretation of the coefficients on the immigrant stock variables and the interaction terms is straightforward. Coefficients on the IM_{ijt} variables, $\hat{\beta}_1$, apply to both developed and developing countries, while coefficients on LDC_j dummy variables, $\hat{\beta}_{LDC}$, indicate differences across development classifications. As such, coefficients on interaction terms, $\hat{\beta}_2$, represent differences in slopes between developing country regression lines and developed country regression lines. Thus, $\hat{\beta}_1$ indicates the proportional change in the dependent variable (i.e., state-level exports), applicable to developed home countries, expected to result from a 1% increase in the number of immigrants from such countries. The sum of the coefficients on the immigrant stock variable and the interaction term, $\hat{\beta}_1 + \hat{\beta}_2$, is thus the proportional change in state-level exports expected to result from a 1% increase in the number of immigrants from developing countries. As is evident, this approach simplifies testing whether immigrant–export effects differ across development classifications as significant coefficients on interaction terms indicate significant differences across developed and developing country classifications.

Tables 2 and 3 present descriptive statistics. Exports to OECD members, high HDI, and high-income countries are greater than exports to non-OECD members, medium HDI, and middle and lower income countries, respectively. Only lower middle income countries have average immigrant stocks significantly different from the overall mean. Developed countries are less open to trade as are lower middle income countries; however, low-income countries are more open to trade than the average countries in the sample. Regarding the infrastructure proxy variable, OECD countries, high HDI countries, and high-income countries are significantly above the average level. Developing countries generally have larger populations and smaller economies as do medium HDI as compared to high HDI countries and lower income (low, lower middle, and upper middle income) countries relative to high-income countries.

Estimation Results

Tables 4 and 5 present results obtained from the estimation of Eq. 2. Employing OECD membership as an indication of relative development, variation in immigrant–export links is reported in column a. Coefficient estimates for the immigrant stock variable (IM_{ijt}) and the interaction term ($IM_{ijt} \times NON\text{-}OECD_j$) imply that a 1% increase in the immigrant stock from an OECD country leads to an estimated increase in state-level exports to the home country of 0.117%, while a like increase in the immigrant stock from a non-OECD member country yields an 0.33% increase in state-level exports. Since the coefficient on the interaction variable is significant, we can say that, while immigrants from both sets of home countries are found to exert positive and statistically significant influences on state-level exports, the influence of immigrants from developing countries is of greater proportional

[6] Results from estimation of ancillary regression specifications, where only the immigrant stock variable is lagged, correspond to the conclusions presented in "Estimation Results". All estimation results and data are available upon request.

Table 2 Descriptive statistics, full sample, and by OECD and UN HDI classifications

Variable/sample	All countries	Developed (OECD member)	Developing (non-OECD)	High HDI	Medium HDI
$Exports_{ijt+3}$	211,131,284	447,356,072[a]	99,235,332[a]	410,058,456[a]	82,413,703[a]
	(832,714,761)	(1,204,172,940)	(545,176,862)	(1,114,665,910)	(544,976,083)
t stat	–	3.80	3.86	3.71	4.34
Gross Domestic $Product_{jt}$ (in millions US$)	428,804.66	829,041.59[a]	239,218.75[a]	715,335.68[a]	243,402.24[a]
	(596,491.73)	(700,790.14)	(424,540.56)	(679,843.65)	(447,037.69)
t stat	–	10.69	8.82	8.49	8.21
Gross State $Product_{it}$ (in millions PPP$)	116,189	–	–	–	–
	(140,278.01)	–	–	–	–
Home Country $Population_{jt}$	98,630,332	47,260,200[a]	122,963,553[b]	43,083,209[a]	134,572,588[a]
	(252,786,629)	(36,868,073)	(302,846,558)	(35,400,723)	(318,114,512)
t stat	–	7.22	2.00	7.86	2.74
Host State $Population_{it}$	5,134,396	–	–	–	–
	(5,450,320)	–	–	–	–
$Distance_{ij}$ (in miles, great circle method)	4,121.66	4,340.24[b]	4,018.12	4,851.78[a]	3,649.22[a]
	(2,248.98)	(1,504.76)	(2,520.26)	(1,775.06)	(2,393.41)
t stat	–	2.30	1.00	7.40	4.55
Immigrant $Stock_{ijt}$	9,685.15	8,333.78	10,325.27	8,134.35	10,688.61
	(75,922.20)	(19,123.53)	(91,232.03)	(19,859.18)	(96,129.78)
t stat	–	0.60	0.17	0.69	0.25
$Openness_{jt}$	0.6458	0.4959[a]	0.7168[a]	0.6294	0.6564
	(0.4142)	(0.2256)	(0.4617)	(0.4838)	(0.3621)
t stat	–	9.57	3.73	0.68	0.62
Number of Landline $Phones_{jt}$ (per 1 k residents)	182.73	409.11[a]	75.49[a]	403.79[a]	39.68[a]
	(188.77)	(94.31)	(111.85)	(91.11)	(34.76)
t stat	–	32.99	16.91	34.02	27.04
N	1,344	432	912	528	816

Mean values presented. Standard deviations in parentheses

[a] Statistical significance between sub-group values and the full sample at 1% level

[b] Statistical significance between sub-group values and the full sample at 5% level

magnitude relative to the corresponding influence of immigrants from developed countries.

Before considering alternative development classifications, it is important to note that the coefficients on the remaining variables in Tables 4 and 5 generally conform to expectations. Higher transport costs, as represented by greater geodesic distances between home countries and states, reduce state-level exports. Higher home country GDP and higher GSP values correspond with greater exports. Thus, it appears that larger economies import more from US states, and states that produce more output

Table 3 Descriptive statistics, full sample, and by World Bank income classifications

Variable/sample	All countries	High income	Upper middle income	Middle income	Lower middle income	Low income
$Exports_{ijt+3}$	211,131,284	523,901,666[a]	222,884,000	100,586,584[a]	32,643,400[a]	52,041,743[a]
	(832,714,761)	(1,269,469,820)	(1,007,770,000)	(612,099,236)	(84,655,300)	(182,541,914)
t stat	–	4.56	0.17	3.37	7.73	6.33
Gross Domestic $Product_{jt}$ (in millions US$)	428,804.66	916,057.51[a]	209,379[a]	116,242.18[a]	64,499.60[a]	508,446.68[c]
	(596,491.73)	(696,012.62)	(176,473)	(139,142.4)	(73,200.1)	(648,418.32)
t stat	–	12.47	11.05	18.24	21.88	1.92
Gross State $Product_{it}$ (in millions PPP$)	116,189	–	–	–	–	–
	(140,278.01)	–	–	–	–	–
Home Country $Population_{jt}$	98,630,332	51,373,663[a]	29,473,400[a]	21,105,357[a]	16,456,400[a]	342,530,833[a]
	(252,786,629)	(37,169,941)	(30,472,600)	(23,589,848)	(17,052,200)	(468,104,124)
t stat	–	6.61	9.64	11.15	11.83	8.58
Host State $Population_{it}$	5,134,396	–	–	–	–	–
	(5,450,320)	–	–	–	–	–

$Distance_{ij}$ (in miles, great circle method)	4,121.66	4,624.28[a]	4,165.13	3,500.49[a]	3,131.24[a]	4,900.89[a]
	(2,248.98)	(1,915.69)	(1,876.43)	(2,065.23)	(2,074.87)	(2,635.91)
t stat	–	4.35	0.32	6.18	8.45	4.67
Immigrant $Stock_{ijt}$	9,685.15	8,741.82	22,277.80	11,108.82	4,903.80[a]	7,621.01
	(75,922.20)	(19,897.09)	(172,241.00)	(104,038.14)	(21,968.00)	(33,592.99)
t stat	–	0.41	1.11	0.32	2.06	0.72
$Openness_{jt}$	0.6458	0.6914	0.6434	0.6024[a]	0.5797[a]	0.6861[c]
	(0.4142)	(0.5526)	(0.4042)	(0.3330)	(0.2839)	(0.3569)
t stat	–	1.50	0.09	2.54	3.73	1.69
Number of Landline $Phones_{jt}$ (per 1 k residents)	182.73	437.63[a]	229.30[a]	110.26[a]	44.12[a]	11.95[a]
	(188.77)	(76.63)	(115.88)	(114.02)	(22.76)	(5.35)
t stat	–	39.42	5.13	10.70	26.33	33.10
N	1,344	384	240	672	432	288

Mean values presented. Standard deviations in parentheses

[a] Statistical significance between sub-group values and the full sample at 1% level

[b] Statistical significance between sub-group values and the full sample at 5% level

[c] Statistical significance between sub-group values and the full sample at 10% level

Table 4 Estimation results (dependent variable: ln $Exports_{ijt+3}$) OECD/non-OECD and high/medium HDI home country classifications

Variable/specification	(a)	(b)
ln $Immigrants_{ijt}$	0.117[b]	0.141[a]
	(0.054)	(0.052)
ln $Immigrants_{ijt}$ × Non-OECD $Member_j$	0.213[a]	–
	(0.054)	–
ln $Immigrants_{ijt}$ × Medium HDI_j	–	0.221[a]
	–	(0.057)
ln Gross $Domestic\ Product_{jt}$	1.707[a]	0.813[a]
	(0.2)	(0.197)
ln Gross $State\ Product_{it}$	1.545[a]	1.483[a]
	(0.405)	(0.411)
ln Home Country $Population_{jt}$	−0.579[a]	0.282
	(0.213)	(0.212)
ln Host State $Population_{it}$	−0.134	−0.077
	(0.393)	(0.401)
ln $Distance_{ij}$	−1.248[a]	−0.902[a]
	(0.123)	(0.122)
ln $Open_{jt}$	0.656[a]	0.821[a]
	(0.097)	(0.106)
ln Phone $Connections_{jt}$ (per 1 k residents)	0.412[a]	0.778[a]
	(0.106)	(0.135)
$Adjacency_j$	−0.47[b]	−0.026
	(0.236)	(0.224)
$Border\text{-}North_i$	−0.196	−0.195
	(0.128)	(0.13)
$Border\text{-}South_i$	−0.931[a]	−0.974[a]
	(0.191)	(0.195)
$Coastal\text{-}West_i$	0.405[c]	0.34
	(0.242)	(0.251)
$Coastal\text{-}East_i$	0.131	0.151
	(0.098)	(0.102)
Developing Home $Country_j$ (Non-OECD Member)	0.269	–
	(0.391)	–
Medium HDI Home $Country_j$	–	−0.372
	–	(0.465)
Constant	−46.768[a]	−42.072[a]
	(4.797)	(5.323)
Adjusted R^2	0.7440	0.7336
N	1,344	1,344

Dependent variable in all specifications is ln $Exports_{ijt+3}$. Heteroskedastic consistent standard errors in parentheses

[a] Significance from zero at 1% level

[b] Significance from zero at 5% level

[c] Significance from zero at 10% level

tend to export more. Countries that have relatively more developed infrastructure, as represented by a higher number of phone connections per 1,000 residents, also tend to import more from US states. Similarly, those home countries that are relatively more open to trade tend to import more from US states. Coefficients on variables

Table 5 Estimation results (dependent variable: ln $Exports_{ijt+3}$) World Bank Income Classifications

Variable/specification	(c)	(d)
ln $Immigrants_{ijt}$	0.084	0.054
	(0.057)	(0.056)
ln $Immigrants_{ijt}$ × Middle $Income_j$	0.213[a]	–
	(0.055)	–
ln $Immigrants_{ijt}$ × Low $Income_j$	0.483[a]	0.516[a]
	(0.1)	(0.099)
ln $Immigrants_{ijt}$ × Upper Middle $Income_j$	–	0.311[a]
	–	(0.084)
ln $Immigrants_{ijt}$ × Lower Middle $Income_j$	–	0.199[a]
	–	(0.06)
ln Gross Domestic $Product_{jt}$	0.405[c]	0.788[a]
	(0.241)	(0.274)
ln Gross State $Product_{it}$	1.429[a]	1.447[a]
	(0.406)	(0.394)
ln Home Country $Population_{jt}$	0.55[b]	0.231
	(0.235)	(0.262)
ln Host State $Population_{it}$	−0.045	−0.047
	(0.396)	(0.387)
ln $Distance_{ij}$	−0.784[a]	−0.688[a]
	(0.127)	(0.13)
ln $Open_{jt}$	0.828[a]	0.959[a]
	(0.122)	(0.125)
ln Phone $Connections_{jt}$ (per 1 k residents)	0.201[c]	0.524[a]
	(0.12)	(0.119)
$Adjacency_j$	0.567[b]	0.938[a]
	(0.222)	(0.237)
Border-$North_i$	−0.197	−0.196
	(0.125)	(0.124)
Border-$South_i$	−0.979[a]	−0.985[a]
	(0.191)	(0.189)
Coastal-$West_i$	0.298	0.279
	(0.241)	(0.239)
Coastal-$East_i$	0.151	0.169[c]
	(0.1)	(0.099)
Middle Income Home $Country_j$	−2.289[a]	–
	(0.458)	–
Low Income Home $Country_j$	−5.489[a]	−3.722[a]
	(0.776)	(0.847)
Upper Middle Income Home $Country_j$	–	−2.632[a]
	–	(0.592)
Lower Middle Income Home $Country_j$	–	−0.591
	–	(0.588)

Table 5 (continued)

Variable/specification	(c)	(d)
Constant	−31.837[a]	−39.588[a]
	(4.959)	(4.97)
Adjusted R^2	0.7518	0.7568
N	1,344	1,344

Dependent variable in all specifications is ln Exports_{ijt+3}. Heteroskedastic consistent standard errors in parentheses

[a] Significance from zero at 1% level

[b] Significance from zero at 5% level

[c] Significance from zero at 10% level

representing home country and host state population levels, adjacency, borders, and coasts produce mixed results across the estimations presented in columns a–d. While this is likely the result of the inclusion of the various development classification dummy variables, we note that the coefficients on the immigrant stock variables and interaction terms are largely consistent across estimations in terms of sign and statistical significance and interpret this as an indication of the robustness of our principle findings.

While OECD membership is a useful indicator of a country's level of economic development, we also consider additional indicators of development. We begin with the estimation results presented in column b, where home countries are classified as being either at high or medium stages of human development based on the UN HDI. Similar to our previous specification, the dummy variable that identifies the lesser developed country cohort (LDC_j)—in this case, MEDIUM HDI_j—is interacted with the immigrant stock variable (IM_{ijt}). We find that a 1% increase in the immigrant stock from a medium HDI country yields an estimated 0.362% increase in state-level exports. A similar increase in the immigrant stock from a high HDI country increases exports by only 0.141%. As with the results obtained when classifying countries by OECD membership, the immigrant–export effect is positive and significant for both classifications. Given the high correlation (0.86) between classification as high HDI and OECD membership, these results are expected. Effectively, using medium HDI instead of non-OECD membership to identify developing countries reclassifies Hong Kong and South Korea as developed countries. Since the coefficient on the interaction term is significant, the results further support the existence of variation in immigrant–export effects across home country development classifications.

To provide a more in-depth examination of heterogeneity in immigrant–export effects, we employ World Bank income classifications to categorize the countries in our sample. Column c presents results when home countries are classified as high, middle, or low income. The coefficient on the immigrant stock variable is positive but insignificant. This suggests that immigrants from high-income countries typically do not exert discernable influences on state-level exports. For middle and low-income countries, however, we do find positive and significant immigrant–export effects. More specifically, in response to an assumed 1% increase in a state's immigrant stock from the typical middle-income country, state-level exports to the respective home

country are estimated to increase by 0.297%. A similar increase in the immigrant stock from the typical low-income country increases exports by 0.567%. We consider this to be compelling support for our notion that the opportunities available to immigrants, in terms of utilizing their connections to business and social networks as a means to overcome information asymmetries and, hence, to facilitate trade, are relatively more abundant for immigrants from lesser developed countries and significantly less prevalent for immigrants from developed countries.

Modifying the specification such that the middle-income classification is further decomposed into upper middle and lower middle income groupings permits a more detailed examination of the immigrant–export relationship. Corresponding estimation results are presented in column d. As in the previous regression (column c), the coefficient on the immigrant stock variable is positive but insignificant, again suggesting that immigrants from high-income countries exert no discernable effects on state-level exports. In response to an assumed 1% increase in the number of immigrants from a low-income country, state-level exports are estimated to increase by 0.57%. As one would expect for these two development classifications, the results are nearly identical to those reported in column c. The decomposition of the middle-income classification into upper middle and lower middle income groupings, however, reveals further variation in immigrant–export effects. Assume that 1% increases in the number of immigrants from upper middle and lower middle income countries are estimated to generate increases in state-level exports of 0.365% and 0.253%, respectively. The larger proportional immigrant–export effect for the upper middle income classification relative to the lower middle income classification may seem at odds with our hypothesis that a lack of development corresponds with greater information asymmetries and, thus, increased opportunities for immigrants to facilitate trade. However, given that the upper middle income classification consists of Greece, Mexico, Portugal, South Korea, and Trinidad and Tobago, it may well be that the inclusion of Mexico and/or South Korea is responsible for the larger coefficient estimate.

Results obtained when estimating each of the four regression specifications indicate that immigrants from lesser developed countries exert positive and significant influences on state-level exports. We also find that the magnitude of proportional immigrant–export effects is inversely related to the general level of development and that, in two of the four estimations, no significant immigrant–export effect is found for the most developed countries. This is consistent with the notion that immigrants from lesser developed countries face greater opportunities to exploit their connections to business and/or social networks as a means of overcoming trade-related information asymmetries. However, it is also important to note that, while the results presented in this study may indicate general findings or tendencies regarding the presence and relative magnitudes of immigrant–export effects, as is stated in Bandyopadhyay et al. (2008), networks may also be very important for state-level exports to developed countries, and the lack of statistical significance should be interpreted as an indication of no measurable immigrant–export effects rather than as confirmation that no immigrant–export effect exists.

While we have identified variation in proportional immigrant–export effects across the home country development classifications, immigrant stock and export levels also differ across states and regions. Thus, variation in absolute effects may also exist. Table 6 presents estimates of the average marginal effects of additional

Table 6 Estimated export effect of immigration, state and regional averages

Tables 4 and 5 specifications	(a)	(a)	(b)	(b)	(c)	(c)	(d)	(d)	(d)
Home country classification	Developed countries	Developing countries	High HDI	Medium HDI	Middle income	Low income	Upper middle income	Lower middle income	Low income
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
All states	*10,517*[a]	*13,636*[a]	*13,310*[a]	*7,105*[a]	8,785	8,615	*14,814*[a,a]	7,572[a,a]	9,203[a,a]
New England	5,264	11,392	8,735	8,079	7,252	12,003	*14,033B*[a]	*4,206*[a,b]	*12,066B*[b]
Connecticut	*8,206*[c]	*16,950*[c]	13,398	11,966	13,295	19,164	*28,983B*[b]	*6,456*[b,b]	*19,164B*[b]
Maine	*4,810*[b]	*27,769*[b]	14,489	17,855	*10,875*[c]	*40,475*[c]	15,147A,B	*8,577A*[c]	*40,475B*[c]
Massachusetts	6,069	5,285	7,368	4,181	4,336	3,435	*10,939*[a,b]	*1,533*[a,c]	*3,435*[b,c]
New Hampshire	4,092	7,530	5,142	7,393	*7,510*[b]	*2,620*[b]	*9,193A*[b]	*6,412A*[c]	*2,620*[b,c]
Rhode Island	3,368	3,558	*4,709*[c]	*2,056*[c]	2,229	1,564	*5,412*[a,b]	*870C*[a]	*1,564C*[b]
Vermont	5,040	7,260	7,305	5,021	5,270	5,139	*14,524*[a,b]	*1,390C*[a]	*5,139C*[b]
Middle Atlantic	6,416	6,366	7,459	5,923	5,762	3,895	*7,775*[c,b]	*4,641C*[c]	*3,916C*[b]
New Jersey	5,249	5,423	6,395	4,623	4,844	2,453	*7,381A*[b]	3,576A,C	*2,453C*[b]
New York	5,699	3,081	*6,327*[c]	*2,601*[c]	2,673	1,805	*3,689A*[c]	2,121A,C	*1,805C*[c]
Pennsylvania	8,299	10,596	9,655	10,545	9,769	7,490	12,254A,B	8,226A,C	7,490B,C
East North Central	14,522	13,865	16,471	13,423	*14,416*[a]	*7,679*[a]	*21,681*[a,b]	*10,754C*[b]	*7,719C*[a]
Illinois	10,027	5,404	*10,909*[c]	*4,927*[c]	5,082	6,139	6,603A,B	4,191A,C	6,139B,C
Indiana	17,510	10,200	18,959	9,691	*10,816*[a]	*4,329*[a]	*16,535*[a,b]	*7,964*[b,b]	*4,329*[a,b]
Michigan	9,684	16,892	11,812	16,951	*19,486*[b]	*5,662*[b]	*43,556*[a,b]	*9,048C*[b]	*5,662C*[a]
Ohio	20,367	19,001	22,315	19,586	18,995	11,736	23,561A,B	16,097A,C	11,736B,C
Wisconsin	15,022	17,826	18,362	15,957	17,703	10,731	18,149A,B	16,469A,C	10,731B,C
West North Central	17,811	13,902	18,852	14,901	*22,945*[b]	*7,590*[b]	*37,513*[b,c]	*15,958*[b,c]	*7,630*[b,b]
Iowa	11,102	7,906	12,354	7,356	*8,708*[b]	*4,479*[b]	*11,971A*[a]	6,929A,C	*4,479C*[a]

Kansas	14,104	33,133	14,623	39,432	38,352	8,824	*4,913*^{c,c}	*48,929*^{c,c}	*8,824*^{c,c}
Minnesota	59,623	26,602	61,501	28,109	83,842	24,832	*217,756*^{b,b}	*27,245C*^{b}	*24,832C*^{b}
Missouri	*7,170*^{b}	*15,360*^{b}	8,884	15,820	14,254	11,561	15,051A,B	13,093A,C	11,561B,C
Nebraska	22,426	10,746	24,354	9,451	*11,536*^{b}	*1,368*^{b}	9,538A^{a}	*11,613A*^{b}	*1,368*^{a,b}
North Dakota	2,546	2,555	2,588	3,003	*2,823*^{c}	*1,188*^{c}	*1,423B*^{c}	*3,193*^{b,c}	*1,188B*^{b}
South Dakota	*7,706*^{a}	*1,013*^{a}	*7,661*^{a}	*1,137*^{a}	1,098	1,157	*1,942B*^{b}	*707C*^{b}	1,157B,C
South Atlantic	*10,774*^{b}	*18,814*^{b}	15,994	14,144	*16,493*^{b}	*9,281*^{b}	*20,786A*^{b}	*13,850A*^{b}	*9,330*^{b,b}
Delaware	24,657	45,750	30,383	46,005	45,162	19,178	26,033A,B	*49,819A*^{b}	*19,178B*^{b}
Florida	*1,797*^{a}	*5,215*^{a}	*2,618*^{b}	*4,988*^{b}	4,488	5,004	3,610A,B	4,557A,C	5,004B,C
Georgia	7,813	11,012	9,720	10,152	9,082	11,583	7,194A,B	9,264A,C	11,583B,C
Maryland	2,402	1,328	*2,673*^{c}	*1,122*^{c}	1,242	814	*2,576*^{a,b}	*653C*^{a}	*814C*^{b}
North Carolina	11,286	19,942	14,574	18,724	15,213	22,027	*8,543*^{b,c}	*16,869C*^{b}	*22,027C*^{c}
South Carolina	*9,792*^{c}	*19,504*^{c}	13,770	17,078	*17,354*^{b}	*8,259*^{b}	*17,661A*^{c}	*16,194A*^{c}	*8,259*^{c,c}
Virginia	6,512	4,750	*8,092*^{b}	*3,046*^{b}	2,894	4,070	*5,626B*^{a}	*1,668*^{a,b}	*4,070B*^{b}
West Virginia	21,937	43,010	*46,124*^{c}	*12,042*^{c}	*36,508*^{c}	*3,708*^{c}	*95,045*^{b,b}	*11,776C*^{b}	*3,708C*^{b}
East South Central	*13,233*^{a}	*24,574*^{a}	*16,337*^{c}	*24,664*^{c}	*23,997*^{b}	*15,121*^{b}	*24,795A*^{b}	22,250A,C	*15,201C*^{b}
Alabama	*11,084*^{c}	*21,088*^{c}	13,927	20,874	18,502	17,816	18,750A,B	17,296A,C	17,816B,C
Kentucky	19,146	13,413	*22,656*^{c}	*10,168*^{c}	*13,757*^{c}	*5,500*^{c}	*32,621*^{a,a}	*5,668C*^{a}	*5,500C*^{a}
Mississippi	*6,816*^{b}	*20,994*^{b}	*7,815*^{b}	*23,921*^{b}	18,913	25,972	*6,590*^{b,b}	*22,524C*^{b}	*25,972C*^{b}
Tennessee	*15,886*^{b}	*42,802*^{b}	*20,951*^{c}	*43,693*^{c}	*44,816*^{a}	*11,517*^{a}	*41,220A*^{a}	*43,512A*^{a}	*11,517*^{a,a}
West South Central	9,744	14,418	11,974	13,746	*14,657*^{c}	*4,854*^{c}	*10,084A*^{a}	*15,539A*^{b}	*4,880*^{a,b}
Arkansas	8,756	11,992	*14,883*^{b}	*4,322*^{b}	5,371	3,951	*9,214*^{a,a}	*3,569C*^{a}	*3,951C*^{a}
Louisiana	15,626	6,708	16,343	6,670	*7,955*^{a}	*2,486*^{a}	*8,335A*^{a}	*7,332A*^{b}	*2,486*^{a,b}
Oklahoma	6,303	30,628	6,553	36,990	36,997	8,119	*10,250B*^{c}	*45,078*^{c,c}	*8,119B*^{c}
Texas	8,291	8,343	10,117	7,002	8,304	4,964	*12,535*^{b,b}	*6,176C*^{b}	*4,964C*^{b}
Mountain	5,535	7,939	*9,109*^{a}	*3,668*^{a}	3,575	4,406	3,630A,B	3,340B,C	4,429B,C
Arizona	7,379	6,679	*11,119*^{a}	*1,804*^{a}	2,119	3,582	*4,412B*^{b}	*1,109*^{b,b}	3,582B^{b}

Table 6 (continued)

Tables 4 and 5 specifications	(a)	(a)	(b)	(b)	(c)	(c)	(d)	(d)	(d)
Home country classification	Developed countries	Developing countries	High HDI	Medium HDI	Middle income	Low income	Upper middle income	Lower middle income	Low income
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Colorado	11,794	12,367	*16,796*[b]	*6,577*[b]	6,636	5,366	6,246A,B	6,388A,C	5,366B,C
Idaho	14,434	15,042	*22,108*[a]	*5,358*[a]	4,450	10,277	5,140A,B	3,917A,C	10,277B,C
Montana	1,452	4,179	1,742	4,608	4,685	1,056	1,316A,B	*5,701A*[c]	*1,056B*[c]
Nevada	866	588	*1,065*[a]	*371*[a]	*322*[b]	*884*[b]	561A,B	*211A*[a]	884[a,b]
New Mexico	1,426	3,254	2,952	1,420	*2,744*[b]	*454*[b]	*5,084*[a,b]	*1,679C*[c]	*454C*[a]
Utah	5,603	18,580	15,241	6,638	5,479	10,832	5,183A,B	5,265A,C	10,832B,C
Wyoming	*1,330*[c]	*2,827*[c]	1,850	2,571	2,167	2,984	*1,096*[b,c]	*2,450C*[c]	*2,984C*[b]
Pacific	10,016	9,490	11,903	8,267	*7,105*[c]	*13,299*[c]	*7,064A*[c]	*6,695A*[c]	*13,369*[c,c]
California	4,653	2,662	*5,404*[a]	*1,908*[a]	2,129	1,464	2,131A,B	2,001A,C	1,464B,C
Oregon	8,215	10,183	10,225	8,955	9,426	7,715	9,005A,B	9,023A,C	7,715B,C
Washington	17,180	15,626	20,081	13,938	*9,759*[b]	*30,930*[b]	*10,054A*[b]	*9,060A*[b]	*30,930*[b,b]

Mean values presented with standard deviations in parentheses. Values in italics indicate statistically significant differences in mean values. The letters A, B, and C in columns 7–9 indicate there is no significant differences in mean values between the upper middle income classification as compared to lower middle income classification, upper middle income classification as compared to the low-income classification, and the lower middle income classification as compared to the low-income classification, respectively.

[a] Significance at 1% level

[b] Significance at 5% level

[c] Significance at 10% level

immigrants. These estimates are generated, at the state, region, and national levels, using coefficients presented in Tables 4 and 5 and state-level immigrant stock and export data. Regional and national mean values, for each home country classification, are derived as arithmetic means of the corresponding estimates of state-level immigrant effects. Estimates of state-level immigrant–export effects are arithmetic averages of values calculated across relevant state-home country pairs as $E(\Delta X_{ijt+3}) = (\hat{\beta}_1 \times X_{ijt+3})/\mathrm{IM}_{ijt}$ for developed countries and for developing countries as $E(\Delta X_{ijt+3}) = \left[(\hat{\beta}_1 + \hat{\beta}_2) \times X_{ijt+3}\right]/\mathrm{IM}_{ijt}$.

t tests of differences in mean values are calculated to determine whether average estimated immigrant–export effects vary across the home country development classifications. For example, the mean values (with significance noted) for the state of Connecticut, which are listed in columns 1 and 2 of Table 6, are 8,206 and 16,950 for the developed and developing country cohorts, respectively. The corresponding *t* test for a difference in mean values indicates that these values are statistically different when evaluated at the 10% level of significance. Similarly, for the state of Maryland, columns 7–9 report values of 2,576, 653, and 814, respectively, for the upper middle, lower middle and low-income country cohorts. Testing for difference in mean values, again employing a *t* test, reveals that the value presented for the upper middle income classification is higher than that of the lower middle and low-income classifications at the 1% and 5% levels of significance, respectively. However, the value presented for the lower middle income classification is not significantly different from the value presented for the low-income classification.

At the national level, we see significant variation in immigrant–export effects. Values presented in columns 1 and 2 indicate that the average export effect of immigrants from non-OECD (developing) countries ($13,636) is significantly more than the effect attributable to immigrants from developed countries ($10,517). Variation in effects, also at the national level, is reported in columns 3 and 4. However, in this case, immigrants from high HDI (developed) countries have a larger estimated average effect on exports ($13,310) than do immigrants from developing countries ($7,105). That immigrants from developing countries are estimated to contribute relatively more to state-level exports when employing coefficients from specification (a) and to contribute relatively less when coefficients from specification (b) underscores the difficulty in employing dichotomous development classifications.

Allowing for more detailed classification of home countries by relative level of development, columns 5 and 6 illustrate that, while no immigrant–export effect is found for high-income (developed) country immigrants, positive yet statistically similar average effects are found to result from immigrants from middle ($8,784) and low-income ($8,615) home countries. Segmenting the middle-income home country classification into upper middle and lower middle income classifications, columns 7–9 indicates variation in effects across development classifications. On average, immigrants from upper middle income home countries increase state-level exports by $14,814, while immigrants from lower middle and low-income home countries increase exports by an average of $7,572 and $9,203, respectively. The remainder of Table 6 indicates that, when comparing across regions and states and considering the more-detailed classification of countries, greater variation in effects is found to exist.

Discussion of Results and Concluding Thoughts

The results of the econometric analysis indicate clear and statistically significant differences, across a series of home country development classifications, in both the proportional and the absolute effects of immigrants on US state-level exports. This corrects the finding reported in Co et al. (2004) of there being no significant difference in the immigrant–export relationship across development classifications. Additionally, the results emphasize the importance of how development is measured. While OECD membership may be a useful measure of relative development, the associated dichotomous characterization is less than ideal when one attempts to discern between group-specific effects. Use of HDI classifications as an alternative measure yields similar results and, unfortunately, suffers the same shortcoming. World Bank income classifications are more detailed and, thus, permit more in-depth examination; however, it is important to bear in mind that, while average income is correlated with non-monetary measures of development, it too is an imperfect metric. Regardless of the shortcomings of each development classification scheme, the consistency of results across all three development classifications and the four estimation equations suggests that variation in immigrant–export effects does indeed exist.

A separate finding is that immigrants from developing countries typically increase state-level exports to their respective home countries proportionally more so than do immigrants from relatively developed countries. As immigrant populations and trade patterns vary across states and regions, estimates of the absolute effects of an additional immigrant are generated. Again, significant variation is reported across geographic locales, with the average immigrant from a developing country found to exert a greater absolute influence on state-level exports when OECD membership and World Bank income classifications are used to categorize countries as developing or developed. The average immigrant from a developed country is found to exert a greater absolute influence on state-level exports when countries are classified as developing or developed based on the UN Human Development Index.

As mentioned at the outset, lesser developed countries may be characterized, relative to developed countries, as more likely lacking in terms of having established, well-functioning institutions and/or formal channels that serve to facilitate trade deals. The results presented in this paper support the notion that immigrants from developing countries may face relatively greater opportunities to utilize their connections to business or social networks as a means by which trade-related information asymmetries may be ameliorated. The importance of creating and implementing an optimal immigration policy, in terms of quelling public discontent and garnering the greatest possible gains from immigration, requires an accurate accounting of all effects of immigrants on their host countries. The findings reported in this paper inform policy on an issue that is of particular public interest; however, given the importance of immigration as a public policy issue and as the analysis is undertaken using a limited number of immigrant source countries and a single year of data, this should be considered a first step of sorts in the sense that further research, using a larger data sample and a broader array of specifications, is merited.

Appendix A: Country Listing/Development Classifications

Canada[a,b,c], China[f], Colombia[e], Dominican Republic[e], Ecuador[e], El Salvador[e], France[a,b,c], Germany[a,b,c], Greece[a,b,d], Guatemala[e], Guyana[f], Honduras[f], Hong Kong[b,c], India[f], Ireland[a,b,c], Italy[a,b,c], Jamaica[e], Japan[a,b,c], Mexico[d], Nicaragua[e], Panama[e], Peru[e], Philippines[f], Portugal[a,b,d], South Korea[b,d], Thailand[e], Trinidad and Tobago[d], United Kingdom[a,b,c].

[a] OECD members; [b] High HDI countries; [c] High-Income countries; [d] Upper Middle Income countries; [e] Lower Middle Income countries; [f] Low-Income countries.

Appendix B: Data Sources

State-level export data are from Feenstra (1997). Immigrant stock values are from the US Bureau of the Census (1993). Gross state product data are from the US Bureau of Economic Analysis (www.bea.doc.gov). Home country populations and GDP and trade values, used to construct the openness variable, are from the World Bank (2003). The infrastructure proxy variable and gross national income per capita, used to classify countries as high, upper middle, lower middle and low income, are from the World Bank (2003). State population values are from the US Bureau of the Census (1996). Distance between state and home country capitols are calculated by the author using the Great Circle method. OECD membership is from the OECD (www.oecd.org). Human Development Index classifications are from the United Nations Development Programme (2004). Adjacency is a dummy variable equal to one if the home country is Mexico or Canada; zero otherwise. Border-North and Border-South equal one if the host state borders Canada or Mexico, respectively; zero otherwise. Similarly, Coastal-West and Coastal East equal one if the host state borders the Pacific Ocean or either the Gulf of Mexico or Atlantic Ocean, respectively; zero otherwise.

References

Anderson, J. E. (1979). A theoretical foundation for the gravity equation. *American Economic Review, 69* (1), 106–116.

Anderson, J. E., & van Wincoop, E. (2003). Gravity with gravitas: a solution to the border puzzle. *American Economic Review, 93*(1), 170–192.

Bandyopadhyay, S., Coughlin, C. C., & Wall, H. J. (2008). Ethnic networks and U.S. exports. *Review of International Economics, 16*(1), 199–213.

Bardhan, A. D., & Guhathakurta, S. (2005). Global linkages of subnational regions: coastal exports and international networks. *Contemporary Economic Policy, 22*(2), 225–236.

Bergstrand, J. H. (1985). The gravity equation in international trade: some microeconomic foundations and empirical evidence. *The Review of Economics and Statistics, 67*(3), 474–481.

Blanes, J. V. (2003). The link between immigration and trade in Spain. Paper presented at XXVIII Simposio de Analisis Economico, Universidad Pablo de Olavide, Seville, 11–13 December.

Blanes, J. V. (2005). Does immigration help to explain intra-industry trade? Evidence for Spain. *Review of World Economics, 141*(2), 244–270.

Blanes, J. V. (2006). Immigrant's characteristics and their different effects on bilateral trade. Evidence from Spain, WP#06.08, Universidad Pablo de Olavide, Departamento de Economía.

Blanes, J. V., & Martín-Montaner, J. A. (2006). Migration flows and intra-industry trade adjustments. *Review of World Economics, 127*(3), 567–584.
Boisso, D., & Ferrantino, M. (1997). Economic distance, cultural distance, and openness in international trade: empirical puzzles. *Journal of Economic Integration, 12*(4), 456–484.
Bryant, J., Genc, M., & Law, D. (2004). Trade and migration to New Zealand. New Zealand Treasury Working Paper 04/18.
Co, C. Y., Euzent, P., & Martin, T. (2004). The export effect of immigration into the usa. *Applied Economics, 36*(6), 573–583.
Combes, P., Lafourcade, M., & Mayer, T. (2005). The trade creating effects of business and social networks: evidence from France. *Journal of International Economics, 66*(1), 1–29.
Davis, D. (1995). Intra-industry trade: A Heckscher–Ohlin–Ricardo approach. *Journal of International Economics, 39*(3–4), 201–226.
Deardorff, A. (1998). Determinants of bilateral trade: does gravity work in a neoclassical world? In J. Frankel (Ed.), *The regionalization of the world economy*. Chicago, IL: University of Chicago Press.
Dunlevy, J. A. (2006). The impact of corruption and language on the pro-trade effect of immigrants: evidence from the American States. *Review of Economics and Statistics, 88*(1), 182–186.
Eaton, J., & Kortum, S. (2002). Technology, geography and trade. *Econometrica, 70*(5), 1741–1779.
Feenstra R. C. (1997) U.S. Exports, 1972–1994, with state exports and other U.S. Data. NBER Working Paper Number 5990
Feenstra, R. C., Markusen, J., & Rose, A. (2001). Using the gravity equation to differentiate among alternative theories of trade. *Canadian Journal of Economics, 34*(2), 430–447.
Girma, S., & Yu, Z. (2002). The link between immigration and trade: evidence from the U.K. *Review of World Economics, 138*(1), 115–130.
Gould, D. M. (1994). Immigrant links to the home country: Empirical implications for U.S. bilateral trade flows. *Review of Economics and Statistics, 76*(2), 302–316.
Greenaway, D., Mahabir, P. A., & Milner, C. (2007). "Does the presence of ethnic Chinese in trading partner countries influence bilateral trade flows with China?" Leverhulme Centre for Research in Globalisation and Economic Policy, University of Nottingham Working Paper.
Head, K., & Ries, J. (1998). Immigration and trade creation: econometric evidence from Canada. *Canadian Journal of Economics, 31*(1), 47–62.
Helliwell, J. F. (1997). National borders, trade and migration. *Pacific Economic Review, 3*(3), 165–185.
Helpman, E., & Krugman, P. R. (1985). *Market structure and foreign trade—Increasing returns, imperfect competition, and the international economy*. Cambridge, MA: MIT Press.
Herander, M. G., & Saavedra, L. A. (2005). Exports and the structure of immigrant-based networks: the role of geographic proximity. *Review of Economics and Statistics, 87*(2), 323–335.
Hong, T. C., & Santhapparaj, A. S. (2006). Skilled labor immigration and external trade in Malaysia: A pooled data analysis. *Perspectives on Global Development and Technology, 5*(4), 351–366.
Hutchinson, W. K. (2002). Does ease of communication increase trade? Commonality of language and bilateral trade. *Scottish Journal of Political Economy, 49*(5), 544–556.
Mundra, K. (2005). Immigration and international trade: A semiparametric empirical investigation. *Journal of International Trade & Economic Development, 14*(1), 65–91.
Piperakis, A. S., Milner, C., & Wright, P. W. (2003). Immigration, trade costs and trade: gravity evidence for Greece. *Journal of Economic Integration, 18*(4), 750–62.
Rauch, J., & Trindade, V. (2002). Ethnic Chinese networks in international trade. *Review of Economics and Statistics, 84*(1), 116–130.
Tadesse, B., & White, R. (2008). Cultural distance as a determinant of bilateral trade flows: do immigrants counter the effect of cultural differences? *Applied Economic Letters*, doi:10.1080/13504850701719983.
United Nations Development Programme. (2004). *Human development report 2004: Cultural Liberty in today's diverse world*. New York: United Nations.
US Bureau of the Census. (1993). *Census of population and housing, 1990: Subject summary Tape File (SSTF) 1. The Foreign Born Population in the United States*. Washington, DC: US Government Printing Office.
US Bureau of the Census. (1996). *Statistical yearbook of the immigration and naturalization service*. Washington, DC: US Government Printing Office.
Wagner, D., Head, K., & Ries, J. (2002). Immigration and the trade of provinces. *Scottish Journal of Political Economy, 49*(5), 507–525.
White, R. (2007a). Immigrant-trade links, transplanted home bias and network effects. *Applied Economics, 39*(7), 839–852.

White, R. (2007b). An examination of the Danish immigrant–trade link. *International Migration, 45*(5), 62–86.
White, R. (2008). Exploring a US immigrant–intra-industry trade link. *Eastern Economic Journal, 34*(2), 252–262.
White, R. (2009) Immigration, trade and product differentiation. *Economic Issues 14*(1), 43–63.
White, R., & Tadesse, B. (2007). Immigration policy, cultural pluralism and trade: evidence from the White Australia Policy. *Pacific Economic Review, 12*(4), 489–509.
White, R., & Tadesse, B. (2009). East–West Migration and the immigrant-trade link: Evidence from Italy. *The Romanian Journal of European Studies* (in press).
World Bank. (1997). *World development indicators*. Washington, DC: Development Data Group of the World Bank's International Economics Department.
World Bank. (2003). *World development indicators*. Washington, DC: Development Data Group of the World Bank's International Economics Department.

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