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POLICY BRIEF

School-to-Work Transitions and Wage Outcomes of Texas Colonia Populations

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What We Studied

This study assesses the human capital development and wage performance of low-income students from geographically isolated and substandard housing settlements known as colonias. The research follows Texas high school students from the classroom to employment over a span of two decades and, specifically, tracks the three border regions where most colonia communities are located. In addition, education and wage regressions are modeled to quantify the adverse effects of residential segregation. Findings indicate that colonia students are more likely to enroll in high school Tech Prep, count on community college credentials, and earn lower wages; the latter largely driven by work experience, educational attainment, type of employment, and gender. Recommended policy prescriptions include improving the high school-to-college-to-work pipeline for students with technical education, especially for women, as well as increasing their college transitions to 4-year programs.

In the urban periphery of Texas border cities, large numbers of Hispanics reside in informal housing found in what are termed colonias and their substitute model subdivisions. Their existence is well established in studies of poverty, housing and informality along the U.S.-Mexico border (Davies and Holz 1992; Ward 1999; Larson 2002; Donelson and Esparza 2010; Durst 2016; Olmedo and Ward 2016).

Poor infrastructure, unregulated code compliance and incremental self-building over many years has consequently led to some of the worst quality housing and hazardous health conditions. Residents further face economic challenges from their geographic disconnection, including transportation barriers; costly commute times; lack of social and information networks to access job opportunities; higher levels of informal and seasonal work; and persistent job, income and food insecurity (Olmedo 2013). Little systematic scholarship, however, has investigated the intersection between housing informality, residential segregation and human capital, a void this research fills by addressing two central questions:

1. *What are the school-to-work and wage outcomes for high school students from colonias?*
2. *Does residential segregation adversely affect the education and work outcomes of colonia students?*[1]

How We Analyzed the Data

Texas student trajectories are tracked by linking education and industry data from TEA, THECB and TWC administrative records housed at the ERC. The target population comprises the three regions that house the majority of

[1] The literature has typically looked at the plight of Black inner-city workers and their spatial disconnection to the suburbanization of jobs. In this context, the concept is relegated to peri-urban and rural colonia populations.

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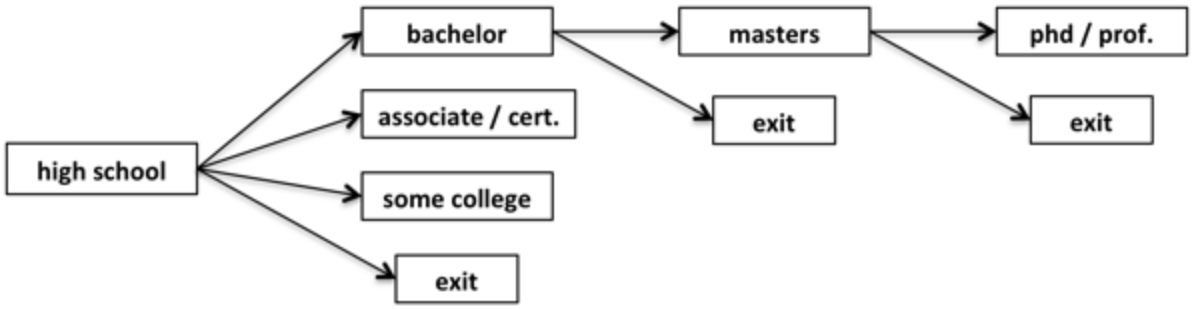
peri-urban and rural colonias – El Paso County, Webb County and the Lower Rio Grande Valley (LRGV) which consists of Cameron, Hidalgo, Starr, and Willacy counties. To distinguish colonia from other Texas students, the last high school attended is used as proxy for where students resided since they are typically bound by school attendance zones. This operationalization is performed in GIS whereby a categorical variable is created for high schools servicing: (1) urban Texas; (2) rural Texas; (3) urban El Paso/LRGV/Webb (urban border); and (4) colonias from El Paso/LRGV/Webb. The completed database joins 3.139 million unique Texas records with non-missing demographic information from the time students exit high school to when they enter Texas post-secondary education and/or the Texas labor market (unfortunately, records from training schools were not available). The sample spans from 1994 to 2012, so the earliest student cohorts can only be tracked until their late-30s. In total, 58,821 are students classified as exiters from a high school that primarily or exclusively serviced colonias, with the highest concentrations in the LRGV, followed by El Paso and Webb.

Summary statistics shed light on the initial research question, with a focus on gender differences and high school students who are dropouts, agricultural migrants and/or enroll in Tech Prep programs; the latter designed as sequenced academic and technical instruction leading to an associate degree or certification for fast-entry employment (statutorily repealed in 2017 and replaced with P-Tech). For the second research question, the causal effects of residential segregation are assessed with education and wage regressions. In education, oftentimes the interest is on the highest level achieved, but here, the objective is on the process of attainment as it happens over time (Bouden 1974; Mare 1980, 1981). To this end, sequential logistic regression is modeled to simultaneously measure how the same set of predictors influence transitioning between education levels (Buis 2010), as illustrated in Figure 1. Under this decision tree approach, only persons who enter the branch are considered "at risk" of transitioning.

Figure 1. Sequential education transitions



In the second of models, linear regression is estimated with maximum (max) wage as the response variable – in 2013 real dollars, based on a 40-hour wage threshold, meaning that workers must earn the annual equivalent of at least minimum wage over a full-time working week. The data are clustered by school district to allow for intra-district correlation, and robust standard errors are estimated to compensate for concerns about heterogeneity and lack of normality. Lastly, working with an entire population over a period of 19 years has the unusual drawback that most of the (theoretically driven) wage predictors are highly significant. To better gain insight on which combination of variables most influence max wages, the lasso regression is estimated. Lasso is a model-building algorithm that shrinks and selects the betas with the most pull and, unlike the aggressive or "greedy" forward selection, does not eliminate predictors early in the algorithm process (Efron and Hastie 2016).

What We Discovered

RQ 1: School-to-work Summary Findings

High school students from border colonias are almost exclusively low-income and Hispanic (between 93 and 96% received free or reduced price lunch). Spanish is the primary language used at home, which consequently leads to

higher rates identified as having Limited English Proficiency (LEP) and enrolled in English as a Second Language (ESL) classes. The share of male and female students is almost equal, but a pronounced difference exists in the dropout rate, with men 10% more likely to exit high school without a diploma. One of the main findings is that colonia students are more likely to enroll in Tech Prep programs, especially in Webb where more women (52%) participated vs. men (44%) over the 19-year period.

In El Paso and the LRGV, there is a large number of agricultural migrant students (henceforth called migrants), and this is especially the case in LRGV colonias where almost one in three students (48% of which were women) were at one point identified by the TEA as they or their parents engaged in temporary or seasonal agricultural labor (in- or out-of-state). In these two regions, migratory children have a higher prevalence for taking ESL coursework and not completing high school, as well as less likely to participate in a gifted/talented program. That said, relative to other Texas migrants, those from colonias are less likely to drop out and have better educational outcomes, so support systems along the border appear to be comparatively more effective at helping these children overcome educational disruptions.

The most important post-secondary education finding is that students that originate from colonias rely on 2-year credentials as a pathway to skills acquisition, more than students from the rest of Texas. For example, of the college degree holding population of colonia women (men in parenthesis) from El Paso, the LRGV and Webb, associate/certificate is the highest award for 36% (35%), 34% (44%) and 44% (61%), respectively (the high rates in Webb are correlated to high Tech Prep levels). An analysis of highest degree majors shows that for colonia students: (1) *Engineering* is a top 3 major for men from El Paso; (2) women drive *Health professions* and *Education*, with high health percentages in the LRGV; (3) *Multi-disciplinary studies* are undertaken more by women; (4) *Law enforcement* is a male-dominated field with highest shares in Webb; (5) *Engineering technologies* from 2-year programs are highly relevant for LRGV men; and (6) *Mechanic & repair technologies* is an important male trade in the LRGV and Webb. Overall, the data support a greater propensity for men to undertake STEM fields of study.

For those colonia students who enroll in Tech Prep the following is observed: 1) participants are 2.5 times less likely to drop out; 2) the percentage that attains any college degree is similar to non-tech students, but their highest education is most likely to be an associate degree; 3) a substantial share who enrolled in terminal 2-year degrees later went on to complete 4-year degrees in majors more in line with the program's intention of technical, applied and trade fields (increasing this transition rate is critically important then for outcomes to be more STEM related); and 4) they are more timely in completing associate and bachelor's degrees than their counterparts, which suggests that the focused training works well if the goal is to prepare and get students in and out of college within a shorter time frame.

An important aspect of this research is the wage outcomes of students who enter the Texas labor market.[2,3] On average, colonia students earn a max wage of $38.5 thousand, less than the comparison regions (e.g., $47.4 thousand for urban Texas). The caveat is that low paying informal work prevalent in colonias is not registered and accounted for. A gender breakdown of first-ever employment shows that *start* wages for men are only slightly higher than for women, but by the time they reach their *max* wage levels, the difference is substantial. For example, the average start wage for women from El Paso, LRGV and Webb colonias is $900, $1,600 and $1,500 less than men, respectively; that difference grows to $5,500, $8,500 and $10,600 for average max wages. For the Tech Prep colonias group, the sequenced programs help students improve their access to higher education and to mitigate wage inequality, but only to an extent. For instance, in *Health & social* which is their top employment sector, the earnings are $6.1/$4.5 thousand less than for urban Texas/urban border students; in *Oil & gas*, the wage disparity is $20.4/$8.3 thousand, respectively.

The Figure 1 bubble graph provides a 3-dimensional snapshot of North American Industry Classification System (NAICS) 2-digit sector employment and wages for students originating from colonias. The y-axis measures the

[2] Peak or max wages (inflation-adjusted) are assessed since they better capture when people are at their most stable work situation, which is usually around their late 30s or early 40s. People also continue to acquire schooling and training until their 30s, so this peak wage may also reflect terminal schooling.

[3] County-to-state migration outflows (Census 2017) show that El Pasoans who relocate are more likely to pursue education and employment opportunities in (Westerly) neighboring states – 70% of El Paso, 28% of LRGV and 20% of Webb out-migrations leave Texas.

location quotient (LQ). For interpretation, LQ > 1 means that a larger percentage of colonia students find max wage employment in a particular sector of the economy than students from the reference region of urban Texas. The bubble size is directly correlated to the mean max wage, and those in blue highlight the highest LQ sectors, followed by green, yellow and red (LQs are also estimated by region, gender, student groups, and NAICS 3-digit subsectors in the larger analysis).

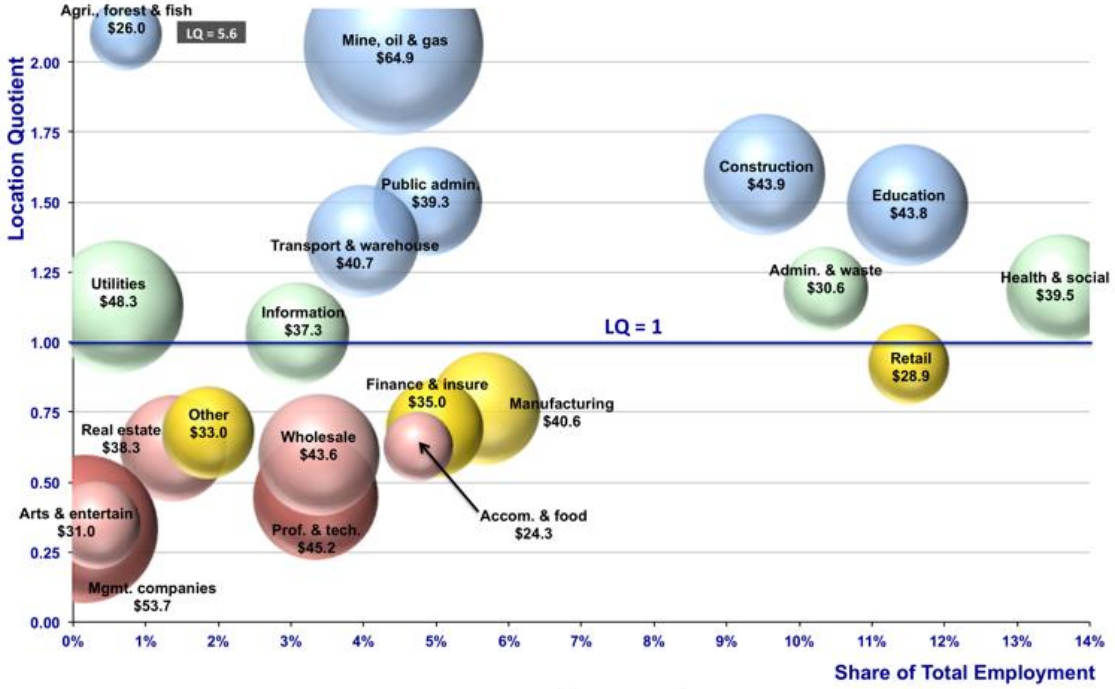


Figure 1. El Paso, LRGV and Webb colonia (combined) employment and max wages (in constant 2013 thousands of dollars)

To summarize the findings from Figure 1 alongside other analyses: **(1)** ***Agriculture*** – comprises a small share of total employment, but the LQ is high, especially for men; **(2)** ***Education*** – Roughly 11.5% earn their highest pay in this sector (vs. 8% for urban and rural Texas), with women 2.4 to 3.2 times more likely than men to be employed; **(3)** ***Health & social*** – women are 3 to 4.3 times more likely to be employed with the highest share in the LRGV, but men make 15-25% more income (lower colonia wages are correlated to a larger concentration in health support jobs); **(4)** ***Transportation & warehousing*** – men dominate border logistics, earning 25-47% more than women, with the highest concentration in Webb; **(5)** ***Mining, oil & gas*** – driven by the Eagle Ford Shale and Permian Basin oil and gas fields, by far the highest paying sector especially for men from Webb, with the drawback that less educated workers that leave this sector are vulnerable to significant income loss; **(6)** ***Construction*** – also a key employment and top paying pathway, particularly in the LRGV; **(7)** ***Manufacturing*** – El Paso women are the only group with a LQ > 1, but are poorly paid (linked to *Apparel manufacturing*); **(8)** ***Retail*** – women have LQs > 1 and men LQs < 1, with the highest concentration in Webb; **(9)** ***Professional & technical*** – men earn 22-40% more than women, but too few colonia students of either gender enter this higher paying employment, partly reflecting less STEM prospects within the border itself; and **(10)** ***Public administration*** – offers substantial opportunity in areas of government work, largely driven by border security and international flows of goods and people.

Another important outcome for colonia students is that relatively higher concentrations of the Tech Prep group find max wage employment in *Health & social*, while dropouts and migrants are likely to be in *Construction*, *Manufacturing*, *Oil & gas*, and *Administration & waste management* (namely data processing & call centers).

RQ 2: Residential Segregation Impact Findings

In the first of the regressions, sequential logit assesses how student backgrounds and residential location influence the process of educational attainment. To account for the fact that colonia students are almost exclusively Hispanic and receive free or reduced price lunch, one approach is to use the estimated odds ratios (ORs) to calculate the predicted probabilities for students with these characteristics. The results, however, simply confirm the obvious when comparing two extreme groups: namely that over time minorities from low-income, segregated housing achieve less education relative the much more advantaged non-poor, White baseline group from urban regions – hardly surprising. A more meaningful approach is to estimate the sequential logit with only the high school sample of poor Hispanics, thus comparing colonia students strictly with other low-income Texas Hispanics (Table 1). Three of the statistically significant results are that: (1) women are 30% and 67% more likely to transition from high school and complete a 2- and 4-year degree, respectively, as well as have a 22% greater chance of moving from a bachelor's to master's degree; (2) Tech Prep students are 27% and 6% more likely to attain a 2- and 4-year credential, respectively, but 11% less likely to receive a master's after completing a bachelor's degree; and (3) with few exceptions, people born in older cohorts have attained greater education similar to the process of "educational expansion" (Hout and DiPrete 2006).

As it relates to the question of residential influence, with the exception of the master's-to-PhD pathway, LRGV and Webb colonia students are more likely to transition from high school to a 2-year credential than poor Hispanics from both the urban border and urban Texas. Meanwhile, El Paso, LRGV and Webb colonia students are less successful than their urban border counterparts in transitioning into a 4-year degree from high school, but show a higher probability of doing so than Texas urban students. These findings indicate that marginalized Hispanic students from border MSAs perform better at different stages of the higher education process when compared to students with some similar characteristics from larger Texas urban regions. One possible explanation is that along the border there may be more concerted policy aimed at tackling educational inequalities since there are broad concentrations (like colonias) rather than just pockets of disadvantaged students. For researchers that study housing informality, one take away is that there may be some measureable benefit to residing in self-help housing communities versus, for example, growing up in inner-city public housing or dilapidated rental units.

Table 1. Education sequential logit (lower income Hispanic population)

education transitions	HS to some college			HS to associate			HS to >= bachelor			bachelor to >= master			master to phd/prof.		
	OR	sd		OR	sd		OR	sd		OR	sd		OR	sd	
female	1.50	0.06	**	1.30	0.01	**	1.67	0.02	**	1.22	0.04	**	0.48	0.04	**
immigrant	1.22	0.08	**	1.12	0.03	**	1.35	0.03	**	1.16	0.07	*	1.08	0.19	
lim english prof	1.33	0.07	**	1.18	0.02	**	0.94	0.01	**	0.75	0.04	**	0.60	0.11	**
eng second lang	0.87	0.05	*	0.84	0.01	**	0.62	0.01	**	0.96	0.06		0.81	0.19	
special educ	0.33	0.03	**	0.47	0.01	**	0.20	0.01	**	0.89	0.09		0.87	0.27	
gifted	1.59	0.09	**	1.38	0.03	**	4.04	0.06	**	1.66	0.06	**	1.78	0.15	**
tech prep	1.22	0.05	**	1.27	0.02	**	1.06	0.01	**	0.89	0.04	**	0.87	0.11	
high school cohort (base: 1994 -1996)															
1997 - 2001	1.77	0.18	**	0.82	0.01	**	0.94	0.01	**	0.68	0.02	**	1.20	0.11	*
2002 - 2006	2.98	0.29	**	0.66	0.01	**	0.63	0.01	**	0.22	0.01	**	0.98	0.14	
2007 - 2010	1.05	0.11		0.14	0.00	**	0.00	0.00	**	0.41	0.11	**	3.98	2.24	*
region (base: urban Texas)															
rural TX	0.47	0.03	**	1.23	0.02	**	1.03	0.01	*	1.16	0.05	**	0.75	0.09	*
EP urban	0.85	0.06	*	1.10	0.02	**	1.76	0.03	**	1.26	0.06	**	0.93	0.13	
EP colonias	0.71	0.09	**	0.88	0.03	**	1.11	0.04	**	1.20	0.12		0.94	0.27	
LRGV urban	1.46	0.09	**	1.35	0.03	**	2.17	0.03	**	1.17	0.05	**	0.94	0.11	
LRGV urban colonias	1.07	0.08		1.43	0.03	**	1.65	0.03	**	1.01	0.06		0.84	0.13	
LRGV colonias	1.02	0.10		1.85	0.05	**	2.15	0.05	**	1.22	0.07	**	0.78	0.14	
Webb urban	0.04	0.02	**	1.79	0.05	**	2.42	0.06	**	1.35	0.09	**	0.72	0.14	
Webb colonias	0.00	0.00		2.17	0.09	**	1.97	0.10	**	1.09	0.16		0.88	0.39	
constant	0.00	0.00	**	0.09	0.00	**	0.11	0.00	**	0.18	0.01	**	0.21	0.02	**

N = 670,564 ** p < 0.01 * p < 0.05

Notes: Agricultural migrants are excluded since these data are only available from 2000 onwards. "LRGV urban colonias" designate colonias that have been consolidated into city extraterrestrial jurisdictions.

The max wage regressions in Table 2 also use the high school sample of Texas poor Hispanics, and help inform whether the positive education transitions spill over into the labor market. In short, the answer is "no" – three of the four colonia variables have statistically significant negative coefficients, so residential segregation adversely affects max wages. Students from El Paso colonias fare worst, earning $2,597 less than the baseline. In the rest of the model results the coefficient signs are as hypothesized: lower wages are linked to *women* and more recent (*2007-2010*) *cohorts*, while higher wages are linked to *gifted* and *Tech Prep* programs, *start wages*, and *labor market experience* (proxied from the number of years between the start wage and when the max wage is achieved).

In Figure 2, the combination of predictors that most influence max wages are graphed from the lasso regression. From left to right, the lines show how the algorithm builds the model with the variables with the highest pull, starting with *labor market experience* – peak wages are most correlated to the number of years in the workforce (referencing Table 2, each additional year of employment increases max wage by $2,272). Next, the lasso computation selects the *start wage* beta, followed by betas related to highest education (*bachelor* is the most dominant degree), sector employment (*oil & gas* dominates), and gender (*female* is below zero because it has a negative coefficient sign – on average, women earn $5,535 less than men in max wages). Tech Prep is statistically significant in both regressions for the higher education transitions and the OLS max wages, but in the lasso, it is not one of the major drivers. Similarly, the OLS regression provides evidence that geographic disconnection is a factor, but the lasso shows that the relationship with wages is relatively weak (regardless of the coefficient magnitude). The good news is that improvements in income can be achieved through targeted interventions aimed at one of the primary drivers – transitioning students into 4-year degrees.[4]

Table 2. Max wage linear and lasso regressions (lower income Hispanic population)

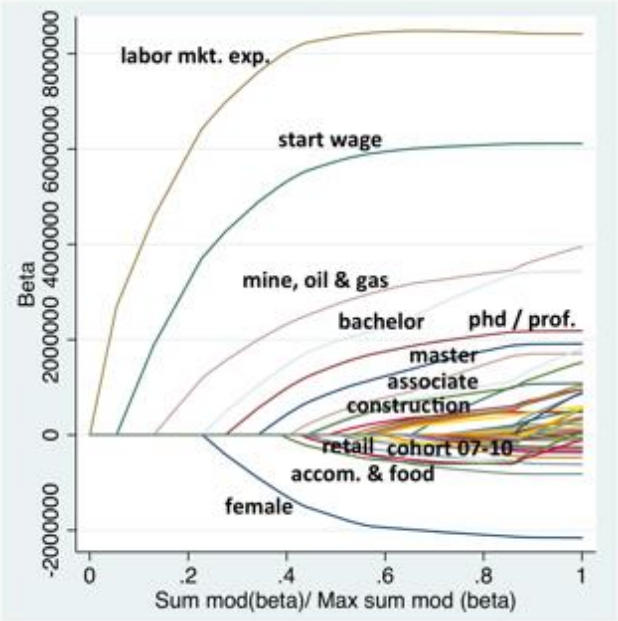
dep. max wages	coef.	cluster se		lasso coef.
female	-5,542	206	**	-5,535
immigrant	455	143	**	448
lim english prof	53	153		39
eng second lang	-376	177	*	-366
special educ	-2,942	130	**	-2,942
gifted	2,387	205	**	2,384
tech prep	432	136	**	427
high school cohort (base: 1994 -1996)				
1997 - 2001	118	162		125
2002 - 2006	-192	197		-175
2007 - 2010	-1,847	222	**	-1,828
education level (base: no high school)				
high school	3,108	113	**	3,096
some college	4,454	364	**	4,422
associate / cert.	9,234	276	**	9,218
professional cert.	10,836	1,792	**	10,748
bachelor	16,288	274	**	16,269
master	25,046	428	**	25,017
phd / prof.	76,033	4,665	**	75,987
region (base: urban Texas)				
rural TX	-160	408		-160
EP urban	-2,362	341	**	-2,349
EP colonias	-2,597	390	**	-2,577
LRGV urban	-1,600	396	**	-1,588
LRGV urban colonias	-2,064	375	**	-2,053
LRGV colonias	-633	423		-620
Webb urban	-1,942	478	**	-1,923
Webb colonias	-1,600	424	**	-1,573

	coef.	cluster se		lasso coef.
start wage	0.94	0.02	**	0.94
labor market exp.	2,271	33	**	2,272
naics sector (base sector: agriculture & fishing 11)				
mine, oil & gas	27,580	583	**	26,749
utilities	10,546	779	**	9,704
manufacturing	9,479	473	**	8,650
manufacturing	9,192	756	**	8,359
construction	8,947	495	**	8,118
transportation	8,048	750	**	7,213
information	7,607	462	**	6,773
management	7,035	761	**	6,186
prof. & technical	6,823	537	**	5,992
wholesale	6,467	433	**	5,636
real estate	5,257	484	**	4,421
finance & insure	4,316	391	**	3,485
manufacturing	3,635	380	**	2,800
health & social	3,367	396	**	2,537
other services	3,176	390	**	2,342
warehousing	2,743	440	**	1,902
administrative	2,486	373	**	1,655
retail	2,220	350	**	1,390
public admin.	2,116	387	**	1,285
arts & entertain	806	524		
accom. & food	250	349		-572
educational	207	373		-611
retail	-745	352	*	-1,564
constant	2,999	634	**	

N = 608,383 district clusters = 1,041
R^2 = 0.45 ** p < 0.01 * p < 0.05

[4] One explanation for the dichotomy between education and wage outcomes is that the majority of colonia students remain within their respective border regions where the cost of living is less than non-border urban regions of Texas. This may be reflected in lower wages.

Figure 2. Lasso regression – Top predictors that explain max wage variation [5]



Policy Recommendations

Several of these findings offer policy lessons aimed at families living in ex-urban jurisdictions. First, there appears to be a need for greater emphasis on high school dropout prevention for men.

Second, sequenced technical and vocational training, as well as community college credentials, are key pathways to employment for colonia students. Yet these pathways only help equalize their outcomes rather than promote them to higher wages. In a proxy estimated for 2- to 4-year college transitions (condition that a student attended both but started at the 2-year), the findings show that colonia students are less likely to complete a bachelor's degree. Hence, an obvious intervention point is improving support systems for successful completion of 4-year programs for transfer students, in particular for Tech Prep and first-generation college students in areas such as tuition, transportation, childcare, coursework, and "transfer shock" assistance to help them acclimate and dedicate adequate time to a higher expectations environment. Additionally, 2-year college is the point of entry for many colonia students, but this pathway to a bachelor's degree has a lower probability of success than enrolling in a 4-year institution from the outset. Programs to help high schools increase the number of students that make a direct transition into a university translates to clear labor market benefits.

Third, many universities are also much more likely to target recruitment programs towards high schools rather than community colleges where a high proportion of minority students attend. Yet this represents a pool of transfer recruits who have already demonstrated academic commitment. Fourth, for early labor market entrants with some level of specialized training, networking, apprenticeship and work experience opportunities are much needed, with the objective of improving higher pay mobility that complements the fast entry employment, especially for women whose wages lag behind those of men. This, of course, requires a collaborative effort from stakeholders who understand labor demand and supply opportunities.

Lastly, STEM funded programs from outside sources (e.g., Microsoft's TEALS or IBM's P-TECH) oftentimes are geographically inaccessible to peri-urban and rural communities (as are charter schools). It would bode well for the Texas economy if state and regional leaders track, measure and replicate successful programs in schools that service colonia students, even if at a smaller scale.

[5] The variables whose graph lines have greatest distance from the zero baseline form the parsimonious set of predictors; those that hover about zero add less the wage explanation.

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