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POLICY BRIEF

Evaluation of the Texas Center for Educator Excellence (TXCEE) Teacher and School Leader Incentive Fund

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What We Studied

Federal policy recognizes the importance of effective educators, particularly in high-needs schools. Research has shown that the most critical school-related factor that influences student learning and achievement is teacher quality (Hanushek, 2011). The Texas Center for Educator Excellence (TxCEE) aims to address the research-based and policy-based need to improve educator quality in Texas. TxCEE's mission is to equip educators to improve student achievement through the alignment of district resources, campus leadership training, and strategies to increase educator effectiveness. This report addresses the Teacher and School Leader Incentive Fund (TSL) program which impacts 4 districts including 62 high-need schools, over 2,500 professional staff, and over 39,000 students in Texas.

The data available through the Texas ERC provides comprehensive access to information across the educational pipeline, data from non-TSL districts for comparison, and the ability to determine the root causes for human capital and student achievement challenges in the participating high-need districts.

Consistent low-quality instruction leads to significantly lower achievement gains (Sanders & Rivers, 1996), which is of particular concern in high-needs schools as these schools have a higher percentage of ineffective teachers (Clotfelter, Ladd, & Vigdor, 2007; Goldhaber, Lavery, & Theobald, 2014). Yet, high-quality teachers "could substantially offset disadvantages associated with low socioeconomic background" (Rivkin et al., 2005, p.419). The lack of effective teachers in high-needs schools exacerbates the existing achievement gaps.

The Every Student Succeeds Act (ESSA), signed into law on December 10, 2015 to replace the Elementary and Secondary Education Act of 1965 (ESEA), continues the commitment to equal opportunity for all students. In particular, the ESSA emphasizes the need for high-need Title I schools to close achievement gaps and ensure that "low-income and minority children […] are not served at disproportionate rates by ineffective, out-of-field, or inexperienced teachers" (Section 1111(g)(1)(B)). The federal policy recognizes the importance of effective educators, particularly in high-needs schools.

The movement of teachers from certification program to teaching positions, between districts, and away from education is also of interest, as frequent educator turnover has negative impacts on student learning (Levy, Fields, & Jablonski, 2006; Rowan, Correnti, & Miller, 2002) and can be very costly. Teacher experience and demographics have been shown to be strong predictors of retention.

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How We Analyzed the Data

Originally, the TSL grant included 4 districts with 62 high-need schools, over 2,500 professional staff, and over 39,000 students in Texas. These four districts are representative of Texas in that they include schools with a variety of sizes and locations, which will aid in the replication efforts across the state. Each of the districts face unique challenges such as high numbers of at-risk students, low achievement, and obstacles recruiting and retaining effective educators. Across the project 84.7% of students are economically disadvantaged, 37.7% are English Language Learners (ELLs), and the student mobility rate is 20.9%.

Descriptive statistics will be the primary method for this project. Most of the research questions are concerned with the relative numbers of teachers with varying characteristics. Propensity scores were utilized to establish comparison groups for the TSL campuses.

There are twelve locale options in the 2016-2017 National Center for Education Statistics (NCES) data that include cities and suburbs of various sizes as well as towns and rural districts of varying distances from urban centers. The four TSL districts are in four different locales; fringe rural district, fringe town, distant rural district, and a large suburb. For each of these four locales, four additional districts were chosen as a source of comparison and additional insight. All of the Texas districts in these locales were categorized into quartiles by the percentage of students who receive free or reduced-price lunch (FRPL). Within each FRPL quartile and locale, a district was chosen that had a similar size and racial/ethnic distribution to the TSL district in that locale. The racial/ethnic distribution in particular was difficult to match with the TSL districts for all of the quartiles as race tends to correlate with FRPL status. Thus, the "comparison" districts are not ideal sources for comparison, although they provide additional data about teacher recruitment, retention, and promotion that lend perspective to the data from the TSL districts.

Table 1

District & Locale	FRPL Quartile	# of Students	%FRPL	%Black	%Hispanic
A-Fringe Rural	3	1600	71	1	80
B-Fringe Rural	4	700	98	0	98
C-Fringe Rural	3	800	71	3	86
D-Fringe Rural	2	1800	35	2	44
E-Fringe Rural	1	800	25	0	20
A-Fringe Town	3	6900	73	24	45
B-Fringe Town	4	4700	82	8	60
C-Fringe Town	3	4000	65	15	33
D-Fringe Town	2	3200	41	10	32
E-Fringe Town	1	5400	12	1	13
A-Distant Rural	2	850	41	8	14
B-Distant Rural	4	1000	76	14	25
C-Distant Rural	3	900	61	17	24
D-Distant Rural	2	810	44	6	13
E-Distant Rural	1	700	24	1	11
A-Large Suburb	4	32200	88	0	99
B-Large Suburb	4	30000	94	0	100
C-Large Suburb	3	23000	63	22	57
D-Large Suburb	2	28000	48	16	49
E-Large Suburb	1	38000	19	4	25

What We Discovered

The following are three of the important findings of this evaluation that will be discussed:

1. The percent of new hires prepared through a traditional program has decreased over time in most of the sample districts.
2. Of the newly hired teachers, the proportion who are new to teaching increases with higher percentages of economic disadvantage determined by Free or Reduced-Price Lunch (FRPL) among the students.
3. Teachers in large suburban districts on average earn higher salaries than teachers in other geographic district categories. There is also less variation in average salary between the group of large suburban districts.

Newly Hired Teacher Preparation

Teachers who are newly hired in a district are comprised of teachers who previously taught in other districts and first-time teachers. Newly hired teachers are analyzed in this report from 2008 until 2017 (2007 analysis is impossible without 2006 data).

In Texas there are two main teacher preparation pathways: traditional institutes of higher education (IHE) or alternative certification programs (ACP). Tables 2 - 5 show the distribution of preparation pathways attended by TSL district teachers as well as teachers from each set of TSL comparison districts by percent. The TSL district is always "A" and is highlighted in green. The comparison districts are "B-E" and the comparison district that fell within the same quartile for the proportion of students receiving free or reduced-price lunch as the TSL district in that locale is highlighted in blue.

Table 2: Percentage of Newly Hired Teachers by Preparation Pathway- Fringe Rural Areas

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
A-Fringe Rural	ACP	41%	41%	33%	47%	*	31%	53%	41%	43%	41%
	IHE	56%	59%	67%	47%	*	62%	48%	56%	53%	33%
	Total	32	22	27	15	9	26	40	32	30	27
E-Fringe Rural	ACP	*	*	24%	*	*	50%	*	*	*	*
	IHE	*	*	67%	*	*	50%	*	*	*	*
	Total	10	8	21	5	5	10	8	10	7	6
D-Fringe Rural	ACP	*	*	*	*	*	*	38%	*	*	40%
	IHE	*	*	*	*	*	*	62%	*	*	60%
	Total	18	11	17	18	<5	16	13	10	15	15
C-Fringe Rural	ACP	37%	*	*	*	*	33%	31%	28%	53%	*
	IHE	63%	*	*	*	*	67%	69%	72%	47%	*
	Total	27	20	15	9	<5	24	16	18	15	14
B-Fringe Rural	ACP	46%	*	*	*	38%	*	50%	67%	44%	*
	IHE	46%	*	*	*	56%	*	46%	33%	52%	*
	Total	13	8	8	<5	16	17	24	24	25	7

* Cells with numbers less than five.

The group of districts located in fringe-rural areas appear to hire a larger percentage of teachers from IHE programs. The masked cells indicate that the number/percent is too small or low to report.

Table 3: Percentage of Newly Hired Teachers by Preparation Pathway- Fringe Towns

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
A-Fringe Town	ACP	53%	53%	45%	50%	46%	11%	47%	56%	44%	20%
	IHE	44%	44%	53%	44%	47%	61%	45%	39%	47%	31%
	Total	100	89	51	64	57	76	95	139	112	97
E-Fringe Town	ACP	21%	38%	36%	44%	*	27%	36%	32%	59%	41%
	IHE	74%	62%	64%	50%	*	70%	62%	68%	41%	59%

	Total	53	47	14	18	14	33	50	37	46	22
D-Fringe Town	ACP	32%	31%	46%	39%	*	43%	38%	45%	44%	37%
	IHE	68%	69%	54%	57%	*	57%	58%	50%	56%	60%
	Total	57	36	24	23	8	42	40	42	48	35
C-Fringe Town	ACP	24%	32%	22%	13%	*	21%	14%	25%	37%	25%
	IHE	73%	68%	78%	79%	*	79%	86%	75%	57%	69%
	Total	49	28	45	38	25	28	43	48	46	32
B-Fringe Town	ACP	55%	48%	69%	48%	35%	57%	48%	47%	57%	57%
	IHE	38%	50%	30%	52%	65%	41%	52%	49%	43%	35%
	Total	60	62	70	50	17	58	60	83	100	60

* Cells with numbers less than five.

In general, the districts in fringe towns appear to hire a higher percentage of IHE prepared teachers with the exception of A-Fringe Town and somewhat B-Fringe Town which hires a mixed up and down of the percent of teachers from ACP and IHE programs.

Table 4: Percentage of Newly Hired Teachers by Preparation Pathway- Distant Rural Areas

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
A-Distant Rural	ACP	33%	*	*	*	*	38%	*	36%	*	38%
	IHE	67%	*	*	*	*	62%	*	57%	*	38%
	Total	18	7	13	8	7	13	9	28	12	21
E-Distant Rural	ACP	*	*	*	*	*	*	*	*	*	*
	IHE	*	*	*	*	*	*	*	*	*	*
	Total	7	8	7	<5	6	7	6	5	11	8
D-Distant Rural	ACP	*	29%	*	*	*	*	*	*	28%	*
	IHE	*	65%	*	*	*	*	*	*	67%	*
	Total	13	17	15	8	5	9	11	8	18	8
C-Distant Rural	ACP	*	*	35%	*	*	*	*	*	*	*
	IHE	*	*	60%	*	*	*	*	*	*	*
	Total	18	8	20	12	8	17	16	18	18	14
B-Distant Rural	ACP	*	*	*	*	*	*	*	29%	*	*
	IHE	*	*	*	*	*	*	*	62%	*	*
	Total	14	22	16	19	10	14	17	21	20	<5

* Cells with numbers less than five.

For the numbers able to be reported, districts in the distant rural areas appear to hire a substantially higher percent of teachers from IHE programs.

Table 5: Percentage of Newly Hired Teachers by Preparation Pathway- Large Suburbs

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
A-Large Suburb PSJA	ACP	61%	65%	58%	53%	55%	51%	55%	58%	57%	36%
	IHE	38%	32%	37%	44%	43%	46%	42%	39%	39%	16%
	Total	264	395	260	189	205	229	273	213	235	226
E-Large Suburb Leander	ACP	19%	22%	24%	33%	33%	29%	25%	32%	31%	38%
	IHE	74%	76%	73%	64%	64%	67%	71%	65%	66%	59%
	Total	397	390	309	302	168	326	336	353	438	284
D-Large Suburb Pflugerville	ACP	32%	31%	31%	36%	29%	38%	31%	37%	40%	40%
	IHE	66%	65%	69%	62%	68%	60%	68%	59%	56%	56%
	Total	344	329	245	243	234	304	346	352	331	247
C-Large Suburb	ACP	29%	35%	34%	37%	32%	35%	35%	34%	43%	40%

Judson	IHE	69%	62%	60%	59%	66%	59%	62%	62%	57%	59%
	Total	352	251	231	264	177	209	337	429	207	182
B-Large Suburb	ACP	57%	64%	58%	53%	59%	57%	58%	65%	60%	66%
La Joya	IHE	42%	34%	41%	44%	37%	41%	40%	34%	39%	32%
	Total	316	259	238	223	161	223	220	209	173	106

* Cells with numbers less than five.

Large Suburban districts tended to have less consistent patterns of percent of teachers hired from ACP and IHE programs. A-Large Suburb and B-Large Suburb consistently hired more ACP teachers. Whereas, C-Large Suburb, D-Large Suburb, and E-Large Suburb consistently hired more IHE teachers. Diversification in the state market of preparation options observed in prior research (Lincove et al., 2015) could partially explain this trend.

Overall, the percent of new hires prepared through a traditional program has decreased over time in most of the sample districts. Consistent across districts, there is a drop off in the number of newly hired teachers from the 2011 to 2012 school year, likely attributable to the large budget cuts to education passed during the 2011 legislative session. According to the snapshot of data provided by the tables above most districts have not returned to the pre-2011 levels of hiring, and larger districts appear slower to rebound.

Newly Hired Teachers and Percentage FRPL

Table 6 shows the distribution of newly hired teachers by the proportion of students receiving FRPL.

Table 6: Percentage of Newly Hired Teachers

	FRPL %	2012	2013	2014	2015	2016	2017
A-Fringe Rural	50-75%	*	*	*	*	*	*
	75-100%	*	*	*	*	*	*
A-Fringe Town	25-50%	*	7%				7%
	50-75%	61%	49%	36%	32%	38%	31%
	75-100%	*	45%	63%	66%	56%	47%
A-Distant Rural	25-50%	100%	100%	100%	100%	100%	100%
A-Large Suburb	50-75%	*	*	*	*	5%	*
	75-100%	*	*	*	*	95%	*

* Count <5 and or including complementary cell masking.

In terms of newly hired teachers, it is evident that within the larger districts (A-Large Suburb and A-Fringe Town), the bulk of new hires within high %FRPL schools are newly hired. A-Fringe Town's proportion of new-to-teaching teachers is similar to results for the large suburban districts observed.

On average, the proportion of newly hired teachers in a district varies substantially, especially for smaller districts. This is not necessarily surprising as it takes fewer teachers to influence this proportion in smaller districts. The newly hired teachers increases with higher percentages of economic disadvantage students at the campus at which a teacher teaches.

Teacher Salaries

The tables and graphs below show changes in average teacher salaries over time grouped by district geographic locales. The salaries were computed by dividing the pay by the full-time equivalent (FTE) to weight the salary by the amount of time they spent teaching.

Table 7: Teacher Total Salary- Fringe Rural Areas

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
A-Fringe Rural	Mean	$42,300	$42,831	$46,109	$46,775	$47,277	$46,825	$48,229	$47,931	$50,006	$52,102	$55,916
	Min	$30,635	$30,227	$35,501	$19,999	$39,000	$39,000	$40,200	$28,842	$42,396	$45,000	$48,000
	Max	$109,304	$61,472	$63,945	$64,945	$64,205	$64,038	$65,654	$66,894	$70,000	$70,048	$73,729.
E-Fringe Rural	Mean	$47,204	$48,687	$49,825	$49,940	$50,556	$50,824	$51,989	$53,328	$54,048	$55,633	$58,253
	Min	$39,500	$41,000	$42,000	$19,003	$19,343	$44,000	$45,100	$45,635	$46,500	$48,080	$49,750
	Max	$63,133	$64,333	$66,206	$64,520	$65,230	$64,756	$66,051	$68,033	$70,040	$72,841	$136,104
D-Fringe Rural	Mean	$41,307	$44,299	$44,582	$47,843	$46,523	$47,020	$47,046	$45,473	$48,639	$50,301	$50,954
	Min	$31,193	$33,500	$33,500	$35,500	$30,150	$35,600	$36,000	$36,000	$37,500	$40,000	$41,000
	Max	$68,500	$71,500	$73,000	$128,903	$77,501	$79,000	$80,500	$82,000	$83,500	$84,900	$84,900
C-Fringe Rural	Mean	$40,056	$40,233	$40,750	$44,298	$46,731	$45,980	$42,885	$47,519	$48,234	$49,958	$50,298
	Min	$29,500	$30,500	$12,679	$32,108	$32,109	$32,110	$32,110	$25,000	$37,320	$37,910	$38,750
	Max	$58,398	$65,060	$60,394	$64,525	$64,525	$66,307	$65,525	$68,587	$68,589	$70,087	$84,847
B-Fringe Rural	Mean	$42,000	$42,873	$43,353	$43,281	$44,052	$42,670	$43,943	$44,616	$45,169	$42,166	$42,994
	Min	$33,500	$34,000	$34,000	$31,884	$36,400	$35,999	$36,000	$20,944	$24,846	$34,842	$36,000
	Max	$73,200	$73,200	$64,000	$59,301	$58,279	$55,980	$58,380	$99,505	$72,044	$63,573	$60,478

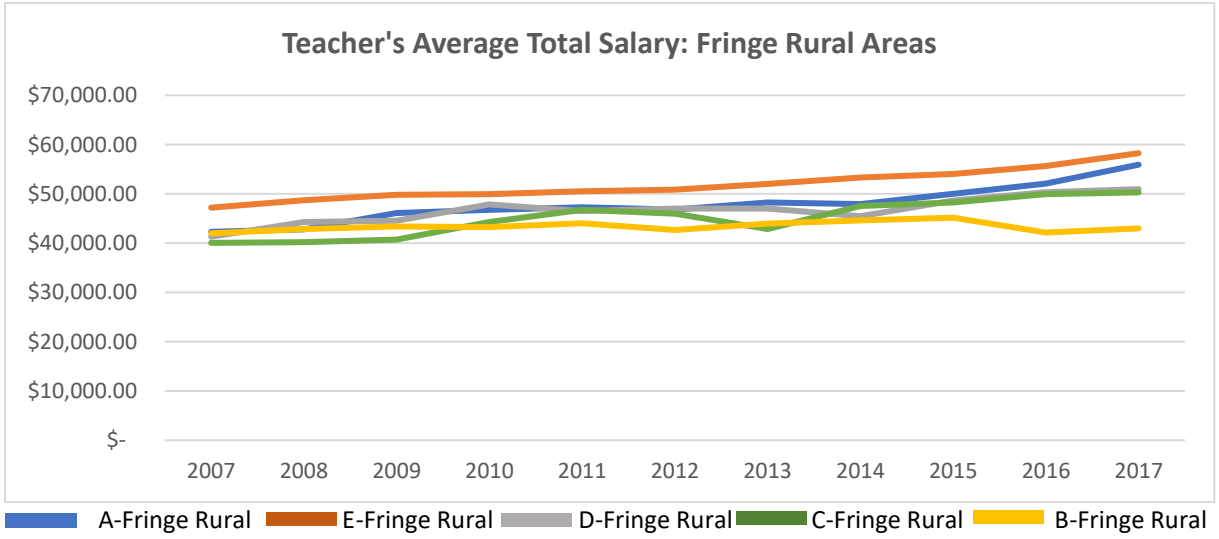


Table 8: Teacher Total Salary- Fringe Town Areas

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
A- Fringe Towns	Mean	$45,617	$48,165	$50,239	$51,251	$51,030	$50,795	$50,495	$51,288	$51,304	$54,033	$53,766
	Min	$66	$50	$15,041	$16,286	$15,410	$13,821	$21,168	$17,028	$16,187	$15,815	$15,815
	Max	$77,716	$82,599	$83,161	$90,518	$78,119	$89,496	$86,600	$104,200	$90,941	$306,815	$119,410
E-Fringe Towns	Mean	$46,955	$47,697	$49,899	$50,145	$50,514	$51,106	$50,819	$52,505	$53,927	$55,377	$55,662
	Min	$16,029	$38,000	$42,500	$42,500	$14,006	$19,026	$20,817	$20,121	$15,748	$48,950	$20,000
	Max	$95,972	$109,500	$104,440	$88,200	$89,000	$123,520	$137,955	$90,571	$91,664	$94,453	$95,003
D-Fringe Towns	Mean	$42,266	$42,124	$43,822	$46,157	$46,181	$45,323	$45,540	$45,721	$47,134	$48,797	$49,011
	Min	$35,300	$14,212	$35,924	$39,640	$39,200	$36,000	$32,993	$36,999	$41,998	$43,260	$43,260
	Max	$65,743	$67,254	$68,363	$171,441	$70,168	$69,160	$72,757	$80,000	$103,283	$78,451	$94,099
C-Fringe Towns	Mean	$41,846	$43,029	$42,717	$43,589	$43,877	$44,751	$43,931	$42,921	$44,188	$45,932	$46,592
	Min	$28,420	$31,002	$31,000	$32,100	$15,550	$29,755	$24,900	$27,000	$27,111	$26,558	$28,526
	Max	$91,000	$97,000	$95,000	$103,700	$75,978	$76,000	$76,000	$76,800	$74,000	$75,026	$76,406
B-Fringe Towns	Mean	$44,709	$45,456	$46,252	$48,560	$49,654	$47,759	$47,679	$50,157	$52,134	$52,776	$52,673
	Min	$13,547	$39,425	$40,000	$18,513	$23,025	$22,125	$19,866	$11,063	$24,188	$47,500	$2,437
	Max	$76,442	$81,201	$70,186	$75,360	$80,000	$78,845	$90,299	$84,015	$432,371	$82,000	$90,840

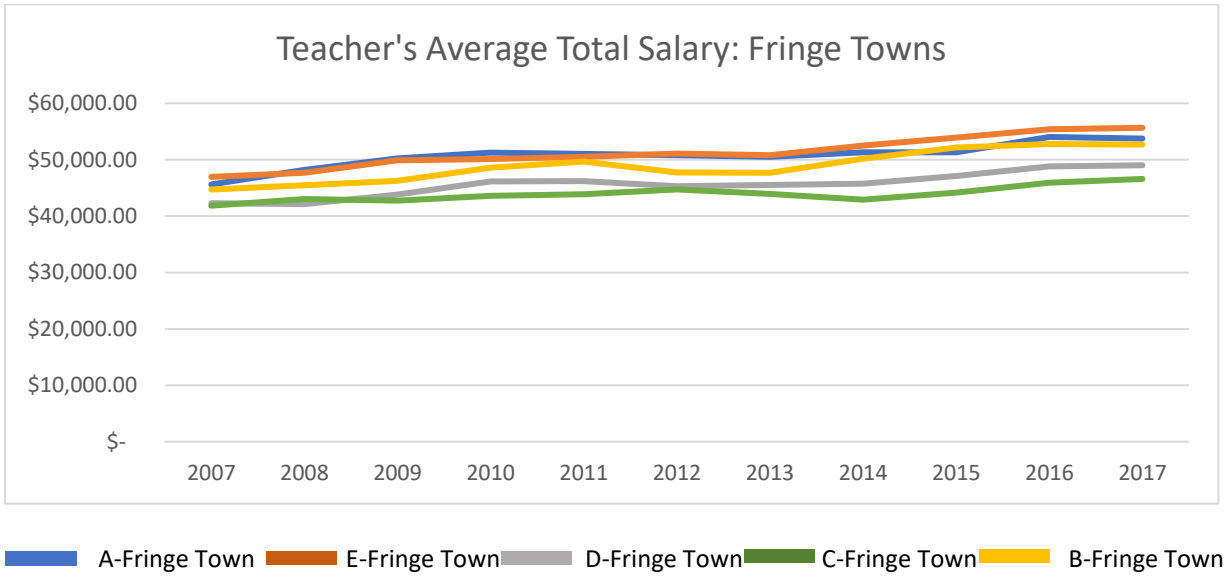


Table 9: Teacher Total Salary- District Rural Areas

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
A- Distant Rural	Mean	$39,649	$40,598	$42,624	$43,923	$42,874	$44,099	$43,866	$46,527	$46,544	$46,659	$47,721
	Min	$29,165	$33,600	$33,600	$33,600	$5,117	$34,222	$35,000	$37,000	$13,995	$14,330	$22,618
	Max	$61,005	$66,806	$69,427	$76,500	$60,112	$75,260	$62,197	$63,898	$79,919	$81,338	$71,500
E- Distant Rural	Mean	$43,376	$44,258	$44,328	$45,383	$45,830	$47,838	$48,222	$48,048	$49,136	$50,410	$50,654
	Min	$20,610	$28,820	$30,060	$30,000	$16,469	$31,560	$32,760	$34,160	$34,860	$20,000	$36,500
	Max	$73,416	$75,416	$70,001	$74,916	$75,916	$75,000	$76,500	$78,000	$78,000	$80,750	$83,000
D-Distant Rural	Mean	$43,414	$45,976	$45,892	$47,175	$47,767	$47,405	$47,429	$49,141	$49,448	$50,734	$50,562
	Min	$25,500	$31,925	$32,325	$33,529	$34,300	$33,300	$33,300	$33,800	$35,700	$36,000	$35,561
	Max	$66,114	$73,378	$76,500	$75,000	$77,251	$69,667	$77,520	$85,487	$78,280	$89,813	$81,600
C-Fringe Towns	Mean	$38,416	$39,399	$39,922	$39,971	$40,514	$40,328	$40,556	$40,934	$42,637	$45,080	$44,875
	Min	$27,320	$28,320	$28,320	$29,220	$29,220	$29,220	$29,820	$19,244	$30,340	$28,050	$31,080
	Max	$64,320	$64,520	$64,520	$62,523	$63,523	$67,100	$67,100	$72,000	$73,530	$128,000	$90,000
B-Distant Rural	Mean	$42,135	$41,734	$43,048	$43,900	$43,687	$44,029	$44,396	$44,146	$43,717	$44,426	$44,729
	Min	$29,320	$29,320	$30,820	$31,747	$18,700	$18,700	$14,500	$15,000	$12,500	$12,500	$12,500
	Max	$54,082	$53,135	$60,503	$61,430	$63,840	$75,000	$78,800	$87,200	$90,000	$90,000	$80,004

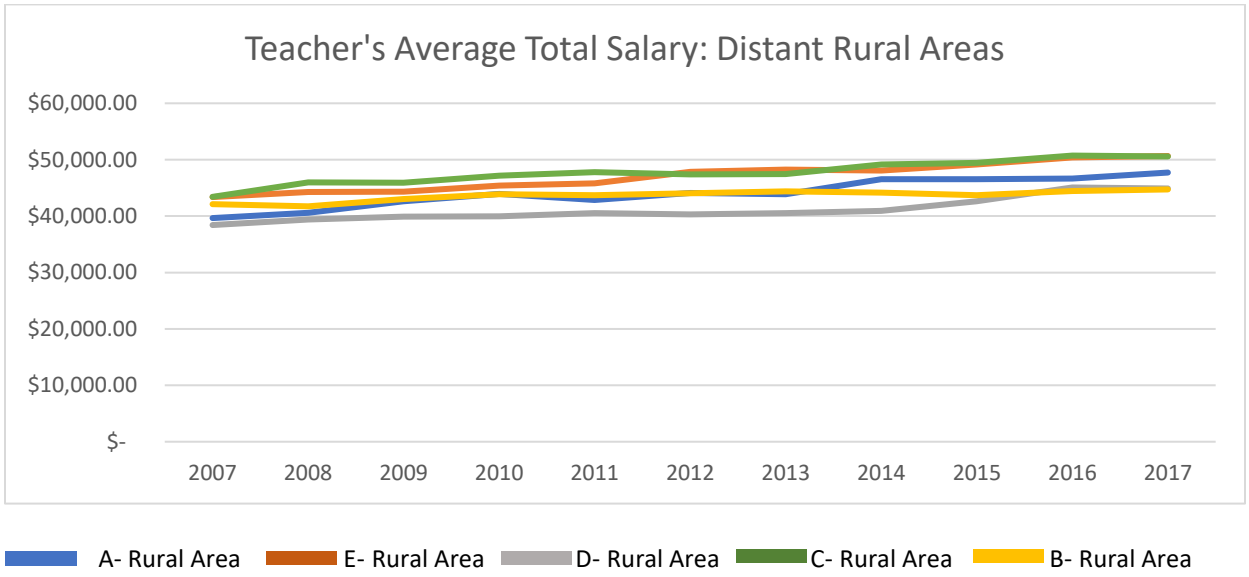
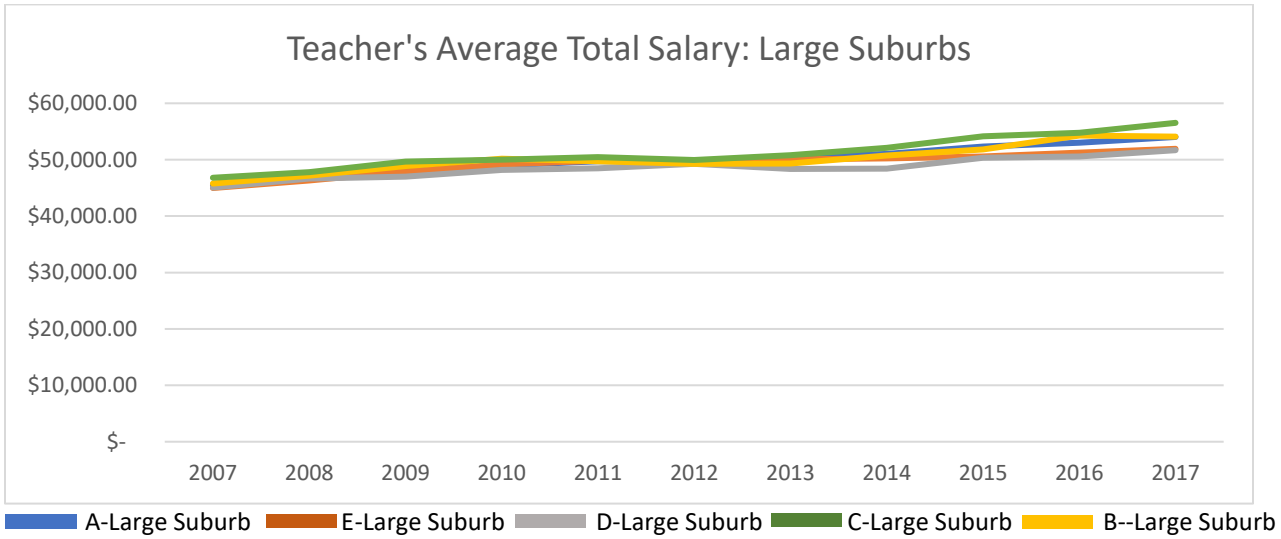


Table 10: Teacher Total Salary- Large Suburbs

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
A-Large Suburbs	Mean	$45,534	$46,558	$48,139	$48,971	$49,696	$49,651	$50,464	$51,012	$52,337	$52,987	$54,031
	Min	$3,800	$16,987	$17,330	$16,237	$5,745	$12,155	$19,076	$15,744	$22,748	$16,267	$12,614
	Max	$84,620	$87,726	$124,741	$93,570	$96,104	$96,182	$238,446	$93,482	$100,406	$96,985	$108,499
E-Large Suburbs	Mean	$44,983	$46,329	$47,917	$49,144	$49,811	$49,653	$50,064	$50,220	$50,545	$51,275	$51,930
	Min	$15,722	$13,762	$17,273	$18,365	$18,689	$18,194	$18,484	$18,161	$18,744	$19,711	$38,670
	Max	$85,577	$89,499.	$92,500	$94,573	$143,294	$282,575	$91,499	$104,554	$147,865	$434,002	$99,774
D-Large Suburbs	Mean	$45,062	$46,675	$47,013	$48,171	$48,475	$49,248	$48,340	$48,392	$50,328	$50,580	$51,685
	Min	$18,829	$16,129	$16,830	$18,471	$17,462	$16,637	$16,312	$17,714	$16,312	$11,382	$15,886
	Max	$76,200	$79,212	$201,800	$91,260	$95,601	$154,277	$288,462	$264,185	$315,912	$99,787	$108,384
C-Large Suburbs	Mean	$45,771	$47,146	$48,854	$50,156	$49,745	$49,290	$49,315	$50,715	$51,847	$54,280	$54,085
	Min	$12,986	$13,015	$-	$14,277	$15,888	$9,657	$13,046	$16,007	$16,276	$18,760	$9,172
	Max	$71,965	$74,967	$91,500	$200,711	$80,225	$93,842	$342,806	$97,500	$100,600	$83,076	$93,991
B-Large Suburbs	Mean	$46,797	$47,792	$49,674	$49,983	$50,481	$49,972	$50,774	$52,100	$54,160	$54,792	$56,531
	Min	$22,850	$38,999	$39,997	$13,988	$17,103	$12,155	$15,607	$19,178	$14,431	$19,164	$26,973
	Max	$89,857	$89,000	$93,672	$94,272	$96,259	$107,714	$84,666	$86,284	$107,479	$97,246	$100,977



Discussion/Policy Recommendations

Teachers in large suburban districts on average earn higher salaries than teachers in other geographic district categories. There is also less variation in average salary between the group of large suburban districts. Excluding large suburban districts, these graphs indicate that most teachers in districts shown here earned on average around $40,000 in 2007, increasing to approximately $50,000 in 2017.

1. The number of new hires prepared through a traditional program has decreased over time in most of the sample districts.
2. The percent of new hires prepared through a traditional program has decreased over time in most of the sample districts.
3. The number of newly hired teachers increases with higher percentages of economic disadvantage determined by Free or Reduced-Price Lunch (FRPL) among the students.
4. Teachers in large suburban districts on average earn higher salaries than teachers in other geographic district categories. There is also less variation in average salary between the group of large suburban districts.

References

Clotfelter, C. T., Ladd, H. F., & Vigdor, J. L. (2007). *How and why do teacher credentials matter for student achievement? (CALDER Working Paper 2)*. New York, NY: National Center for Analysis of Longitudinal Data in Education.

Goldhaber, D., Lavery, L., & Theobald, R. (2014). *Uneven playing field? Assessing the inequity of teacher characteristics and measured performance across students*. CEDR Working Paper 2014-4. Seattle, WA: University of Washington.

Hanushek, E., Kain, J., & Rivkin, S. (2004). Why public schools lose teachers. *Journal of Human Resources*, *39*(2) 326-354.

Levy, A. J., Fields, E. T., & Jablonski, E. S. (2006). *What we know and don't know about the consequences of science and math teacher turnover*. Newton, MA: Center for Science Education at Education Development Center, Inc.

Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica*, *73*(2), 417–458.

Rowan, B., Correnti, R., & Miller, R. (2002). What large-scale survey research tells us about teacher effects on student achievement: Insights from the prospects study of elementary schools. *The Teachers College Record*, *104*(8), 1525-1567.

Sanders, W. L., & Rivers, J. C. (1996). *Cumulative and residual effects of teachers on future student academic achievement*. Knoxville, TN: University of Tennessee Value-Added Research and Assessment Center.