

Institutional Arrangements in Educational Systems: A Cross- National Analysis

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Literature Review

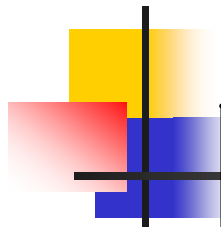
- Educational inputs do not matter
 - Hanushek (1986, 2003)
- Educational institutions do matter
 - Bishop (1997, 1998, 2006)
 - Bishop & Wößmann (2004)
 - Fuchs & Wößmann (2006)
 - Wößmann (2003)
- Differential effects across the distribution
 - Maasoumi et al (2005)
 - Eren & Millimet (2007)

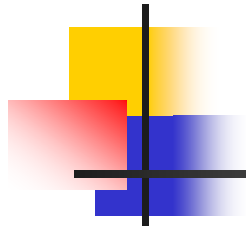


Data

- Trends in International Mathematics and Science (TIMSS) 1999
- Institutional Arrangements
 - Influences on Curriculum
 - External Exams, Individual Teachers, Subject Teachers, Teachers Collectively, Teachers' Unions
 - Distribution of Responsibility
 - Hiring Teachers, Deciding School Budget, Purchasing Supplies, Determining Teacher Salaries

Institutional Arrangement	Responsibility Held by:	Total Observations
	Neither	26,597
Hire Teachers	School Teacher	125 74,088
School Budget	Neither School Teacher	9,907 945 89,958
Purchase Supplies	Neither School Teacher	4,452 12,912 83,446
Salary	Neither School Teacher	68,437 250 32,123





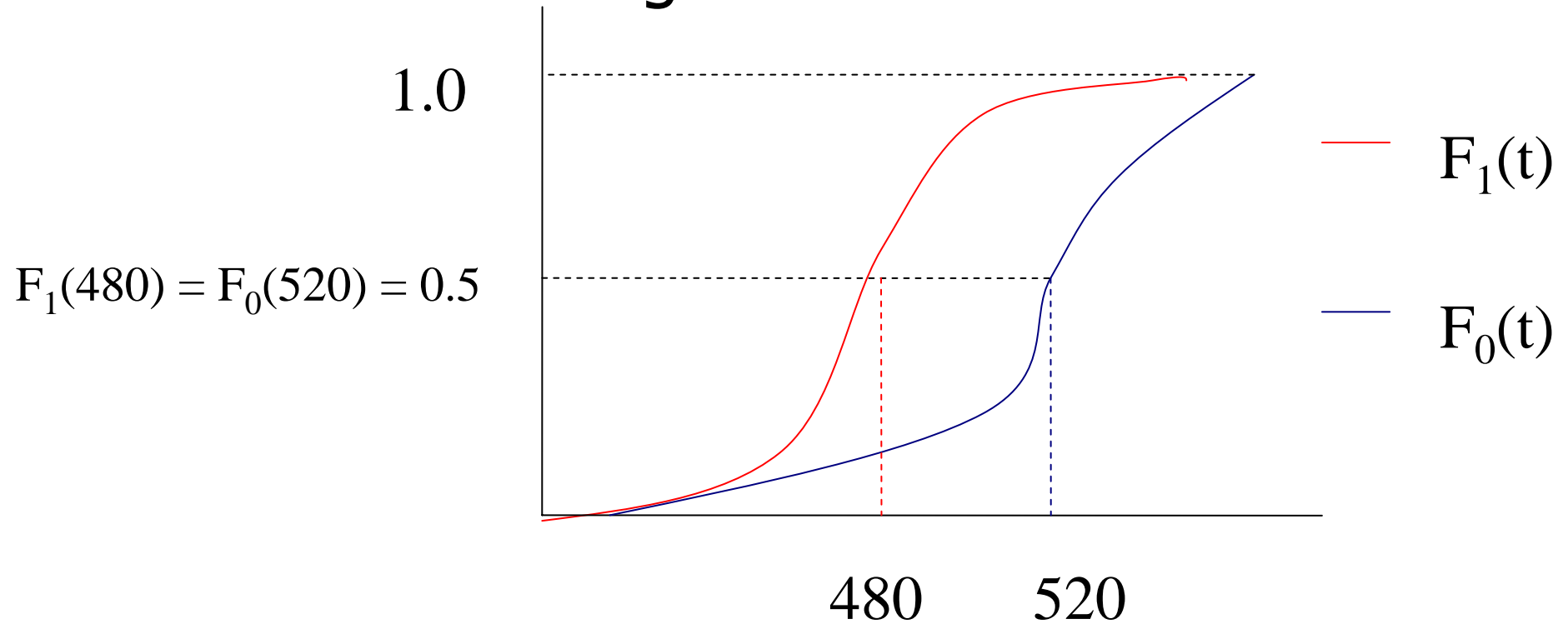
Institutional Arrangement	Influence on Curriculum	Total Observations
External Exams	None	82,255
	Large	18,555
Teachers Individually	None	79,295
	Large	21,515
Subject Teachers	None	52,147
	Large	48,663
Teachers Collectively	None	54,061
	Large	46,749
Teachers' Unions	None	99,963
	Large	847



Quantile Treatment Effects

- Let T_0 and T_1 represent the potential test score distribution for the populations of students under different institutional arrangements
- $F_0(t) = \Pr [T_0 < t]$ is the CDF
- $t_0^p = \inf_t \{ \Pr [T_0 < t] \geq p \}$
- $\Delta_p = t_1^p - t_0^p$

Hypothetical CDFs under two different institutional arrangements



■ $\Delta_{50} = t_1^{50} - t_0^{50} = 480 - 520 = -40$



Inverse Propensity Score Weighting

$$\hat{F}_j(t) = \frac{\sum_{i=1}^{N_j} \hat{\omega}_i I(T_j \leq t)}{\sum_{i=1}^{N_j} \hat{\omega}_i}$$

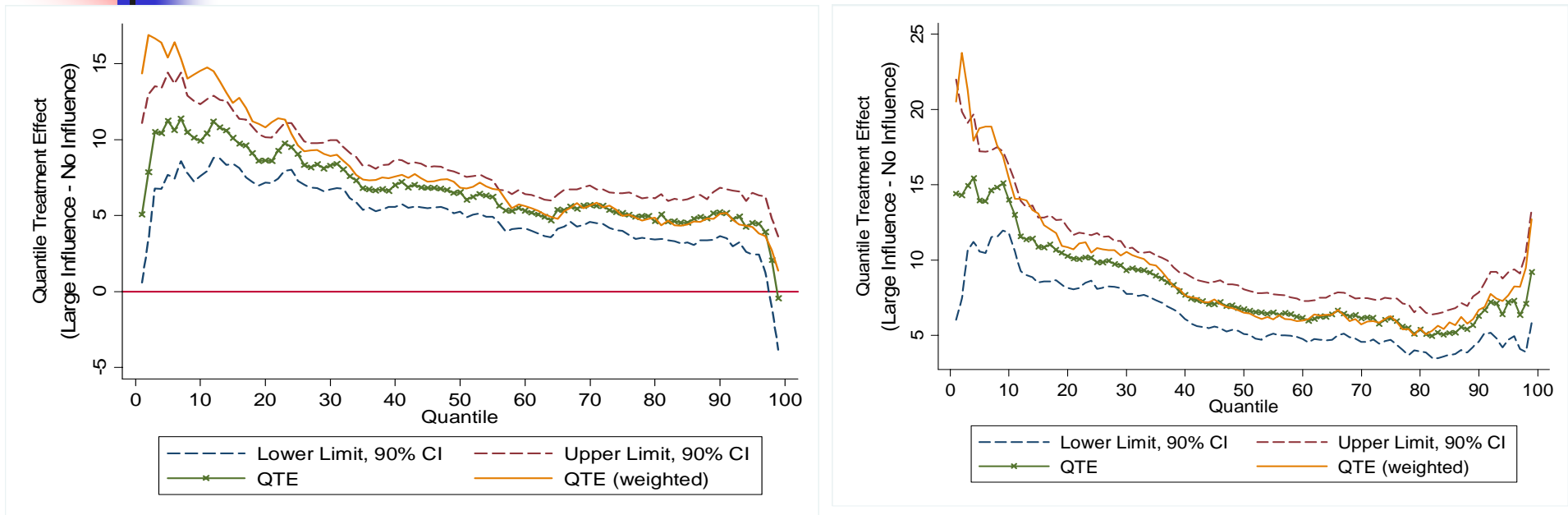
$$\hat{\omega}_i = \frac{D_i}{\hat{p}_i(x_i, R_i)} + \frac{1 - D_i}{1 - \hat{p}_i(x_i, R_i)}$$



Observables (vectors x & R)

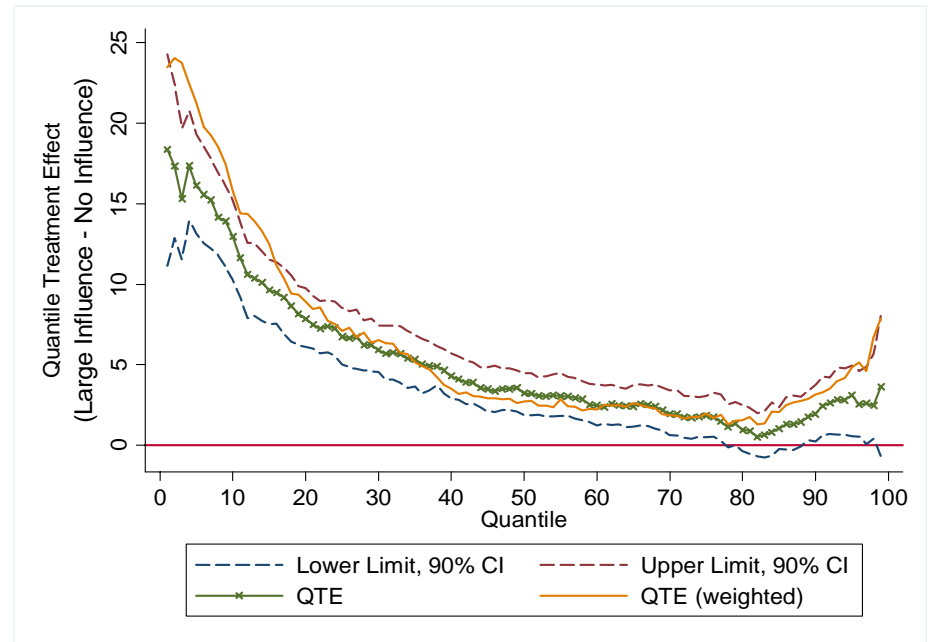
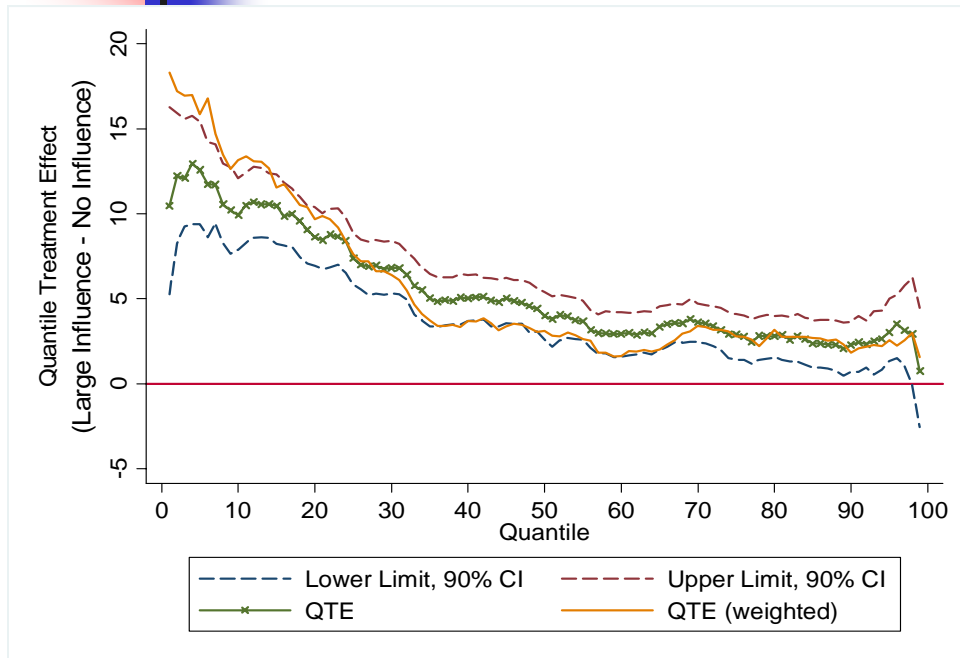
- Individual
 - Age, gender, grade, country of birth
- Family
 - Parental education, parental country of birth, number of books in home, family composition
- Teacher
 - Age, gender, experience, education, class size
- School
 - Geography, student-teacher ratio, instruction time, level of materials
- Country
 - GDP per capita, education expenditures per student, OECD, CBEEE, Gini index of income inequality, yrs since independence, continent, type of government, degree of political freedom, government expenditures as a % of GDP, % literate

Figure 3. Quantile Treatment Effects of the Level of Influence of Subject Teachers on Student Achievement



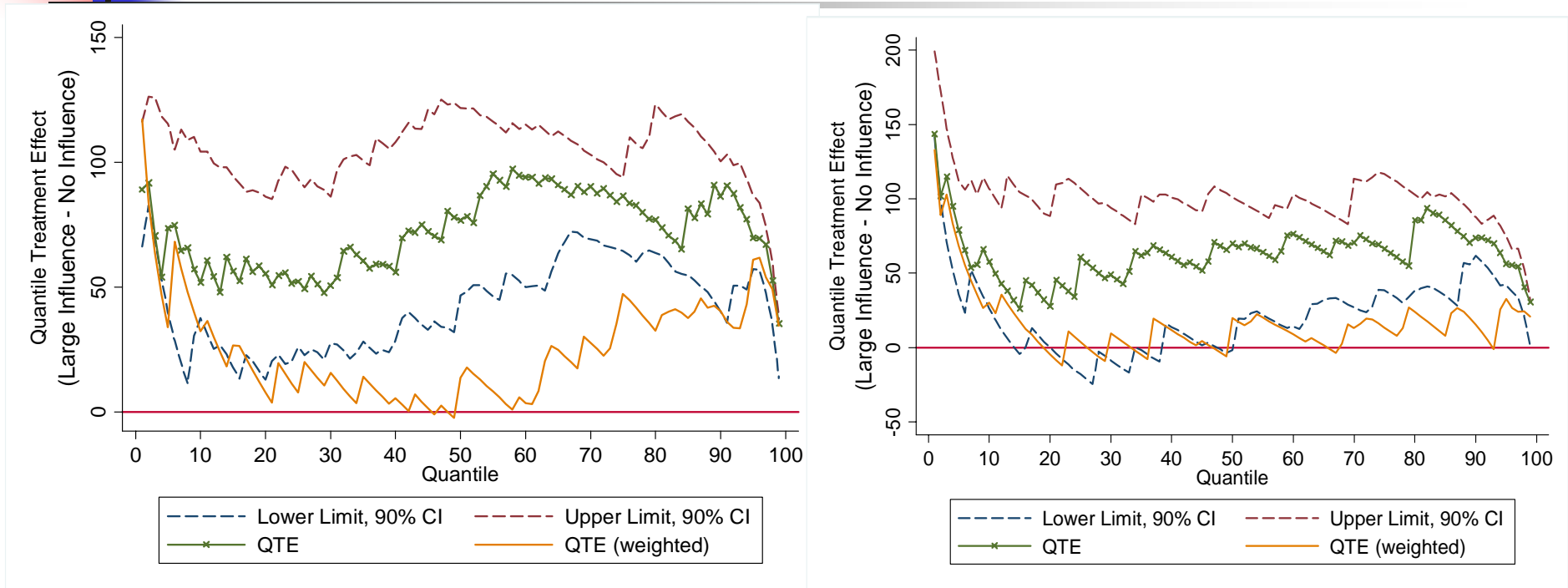
Institutional Arrangement	Control Group	Treatment Group	ATE Math	ATE Science
Subject Teachers	None	Large	6.696	8.243

Figure 4. Quantile Treatment Effects of the Level of Influence of Teachers Collectively on Student Achievement



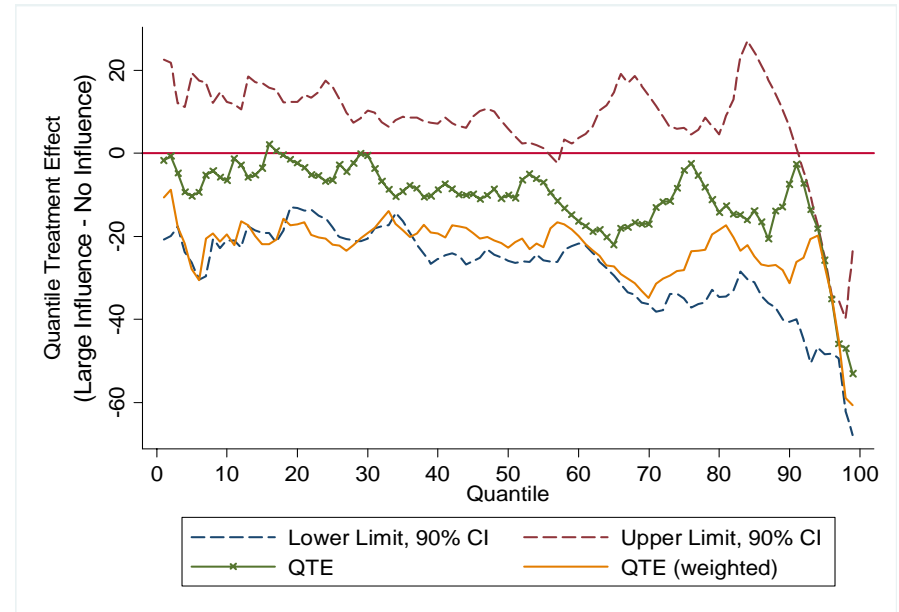
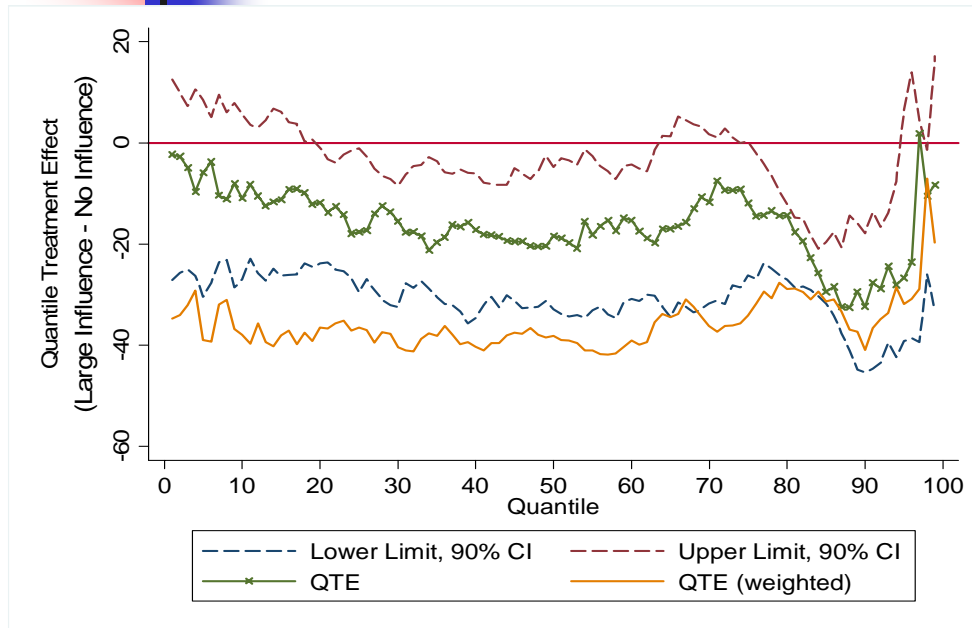
Institutional Arrangement	Control Group	Treatment Group	ATE Math	ATE Science
Teachers Collectively	None	Large	5.409	5.238

Figure 1. Quantile Treatment Effects of the Level of Influence of External Exams on Student Achievement



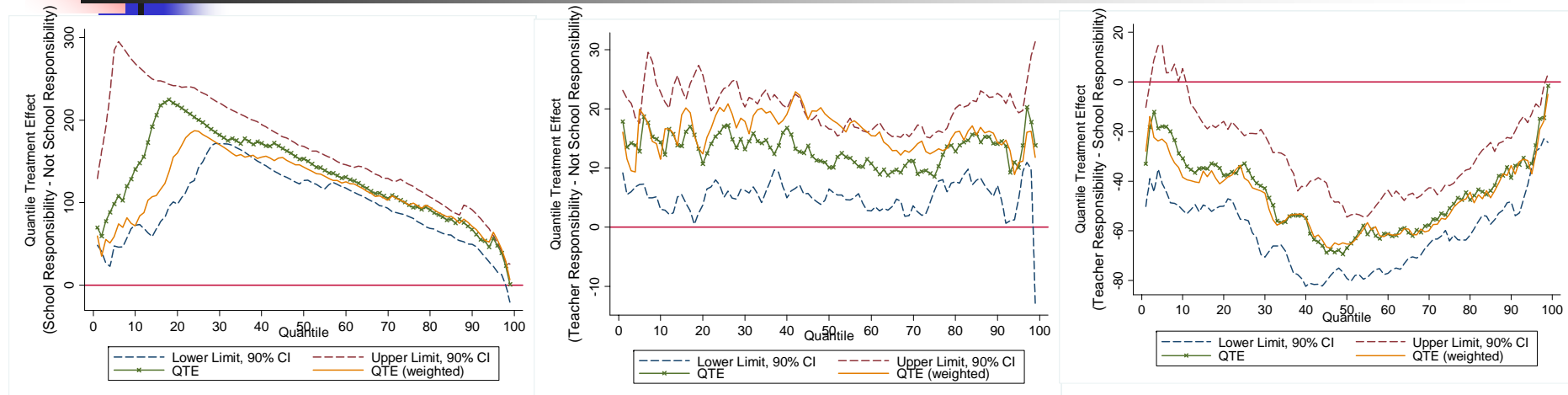
Institutional Arrangement	Control Group	Treatment Group	ATE Math	ATE Science
External Exams	None	Large	71.887	63.799

Figure 5. Quantile Treatment Effects of the Level of Influence of Teachers' Unions on Student Achievement.



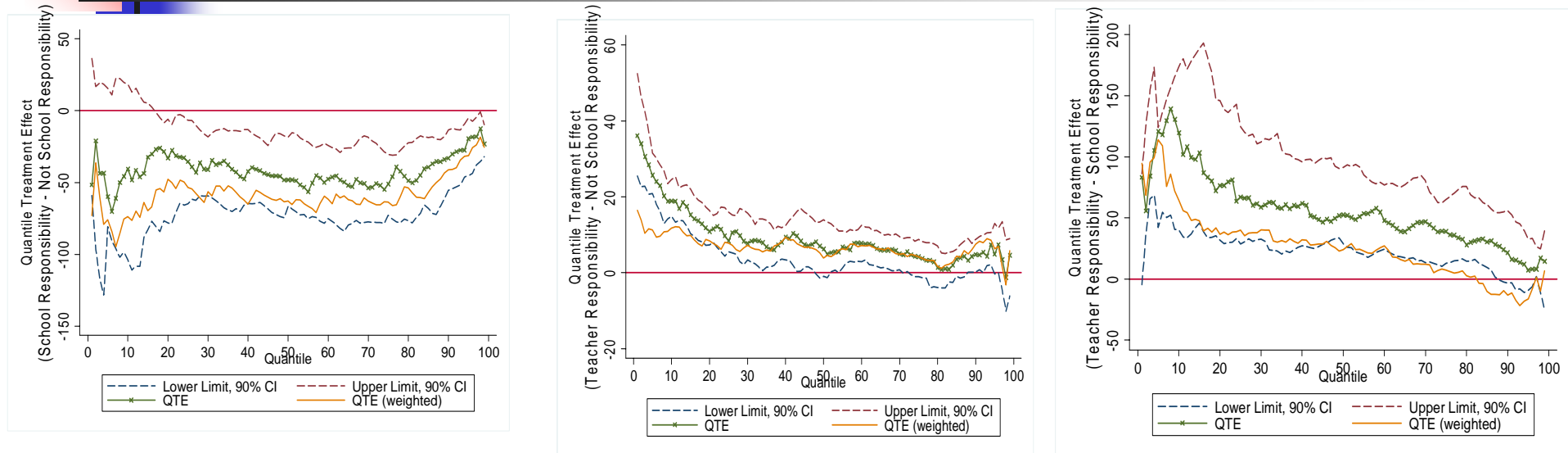
Institutional Arrangement	Control Group	Treatment Group	ATE Math	ATE Science
Teachers' Unions	None	Large	-16.142	-10.771

Figure 9. Quantile Treatment Effects of Assignment of Responsibility for Determining School Budgets on Student Achievement in Math




Institutional Arrangement	Control Group	Treatment Group	ATE Math
Determining School Budget	Neither	School	130.868
	Neither	Teacher	13.207
	School	Teacher	-45.091

Figure 9. Quantile Treatment Effects of Assignment of Responsibility for Determining School Budgets on Student Achievement in Science



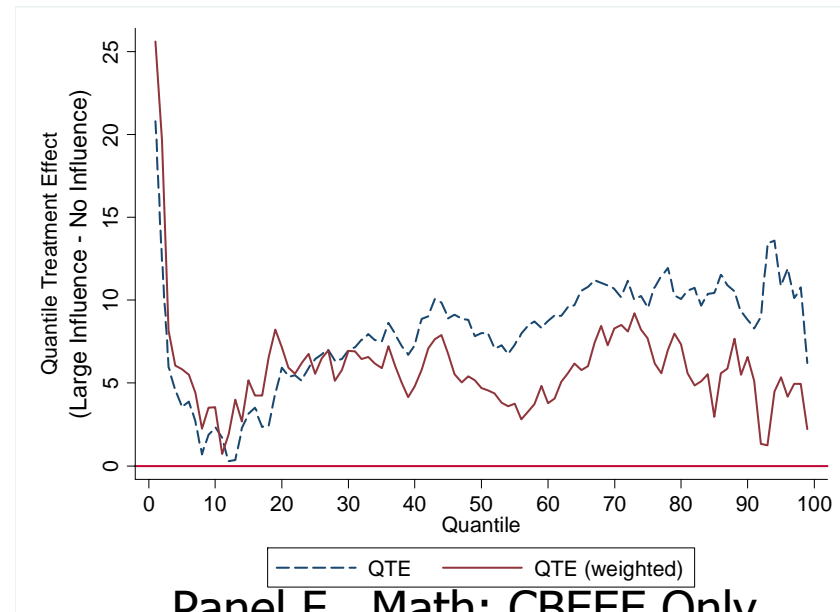
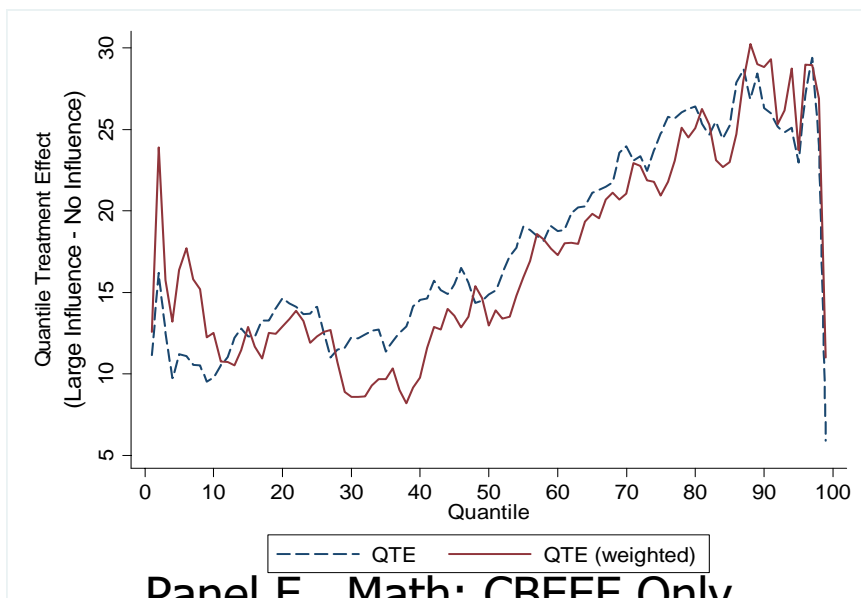
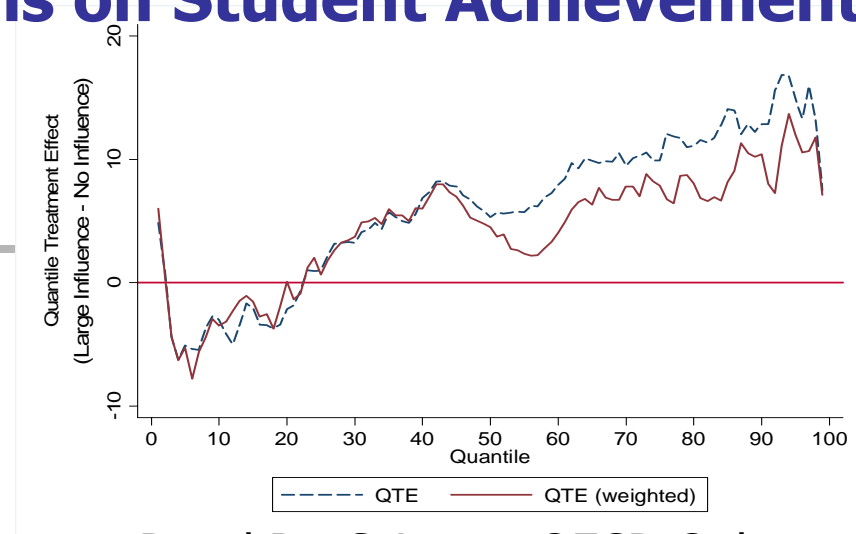
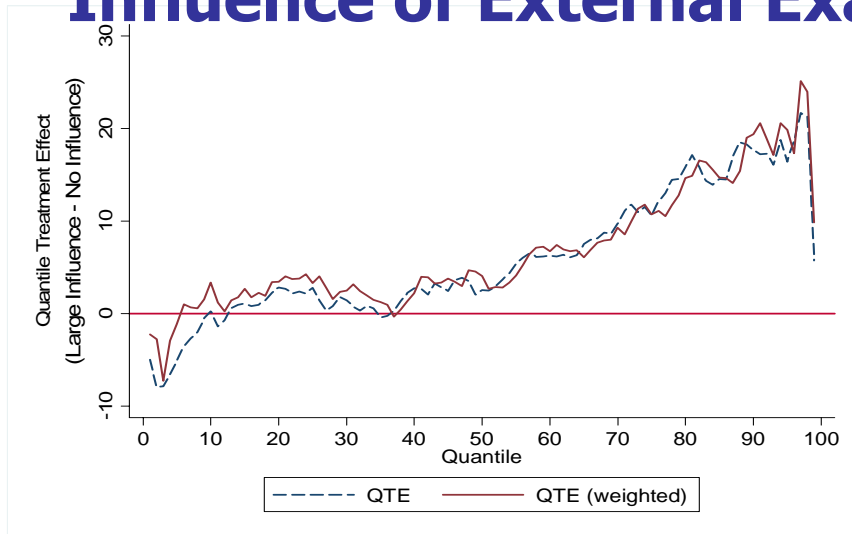
Institutional Arrangement	Control Group	Treatment Group	ATE Science
Determining School Budget	Neither	School	-41.383
	Neither	Teacher	9.189
	School	Teacher	55.140

Economically meaningful findings from Base Sample



Arrangement	Subject	Sign	Magnitude
Large influence of External Exams	Math & Science	+	0.5 - 1.0 standard deviations
School Autonomy over budgets	Math	+	0.5 – 2.0 standard deviations
School Autonomy over budgets	Science	-	0.5 – 1.5 standard deviations

Figure 1. Quantile Treatment Effects of the Level of Influence of External Exams on Student Achievement





Conclusions

- A large influence of external exit exams on curriculum has a strong positive association with math and science achievement
 - With somewhat larger associations for students with higher achievement
- School autonomy over budget decisions is associated with gains in student achievement in *math*
- There are potentially important interactions between some of the institutional arrangements (e.g. CBEEEs and the school holds responsibility for the budget in science achievement)
- Distributional analysis can uncover important differences in the impact of school reform on students in different parts of the test score distribution (e.g. high-achieving vs low-achieving students)