

## **ABSTRACT**

NEELY, STEPHEN ROBERT. School Finance and Education Policy. (Under the direction of Dr. Rajade Berry-James and Dr. Kevin Brady).

Presented in a multi-article format, this dissertation considers three distinct dimensions of school finance and education policy. (1) Resource dependence theory is used to gauge the impact of federal revenues on the organizational behavior of school districts. More heavily dependent districts are found to exhibit higher levels of administrative overhead, which marks a reversal of prior trends in the wake of recent federal policy changes. (2) The traditional education production function is reexamined, with improvements to model specification proposed. Results indicate that the impact of financial resource inputs on student outcomes may be consistently understated due to the absence of proper financial disaggregation and appropriate student population controls. (3) Finally, the impact of extracurricular involvement on student dropout is examined, with consideration of school level random effects. The results indicate that extracurricular participation leads to substantial reductions in the odds of student dropout, particularly among traditionally at risk populations. Throughout, particular attention is paid to the public policy implications of these analyses.

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School Finance and Education Policy

by  
Stephen R. Neely

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APPROVED BY:

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Dr. Rajade Berry-James  
Committee Co-Chair

---

Dr. Kevin Brady  
Committee Co-Chair

---

Dr. Jerrell Cogburn

---

Dr. G. David Garson

## **DEDICATION**

For the glory of Jesus Christ (Isaiah 25:1)

## **BIOGRAPHY**

Stephen Neely is a native of Pittsburgh, Pennsylvania, where he earned a Master of Business Administration from Point Park University and a Masters of Arts in Social and Public Policy Analysis from Duquesne University. He specializes in research methodology and education policy research.

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## **Introduction**

### **School Finance and Education Policy**

Academic research has long served to inform our understanding of civil rights and social justice policy. For instance, in 1954, the Supreme Court relied in large part on social scientific evidence when rendering its decision on *Brown v. Board of Education* (Ancheta, 2006). Today, public officials have increasingly come to identify education, particularly the persistent achievement gap between low-income/minority students and their wealthier counterparts, as the primary civil rights challenge of the early 21<sup>st</sup> century (see Paige and Jackson, 2004). For academic researchers and education policy analysts, this acknowledgement represents a unique opportunity to demonstrate profound relevance, and to inform and influence policy in ways that will shape the lives of Americans for generations to come.

In that spirit, I have chosen to develop this dissertation in the emerging three article format, with an eye toward addressing specific and practical policy questions in the general domain of school finance and education policy. As will be discussed below, these articles are unified by (1) a focus on practical, policy concerns in education, (2) an indirect focus on the organizational behavior of schools, particularly with regard to resource allocation, (3) a reliance on economic, organizational, and social theory as applicable, and (4) a concern for the justice and equity implications of the resulting conclusions. A brief summary of each article is provided in this introduction, and the articles are presented as individual chapters in the ensuing pages.

The first article, *The Influence of Federal Revenue on School District Organizations: A Resource Dependence Perspective*, examines the impact of external resource dependencies on the organizational behavior of school districts, particularly in response to the

implementation of the No Child Left Behind Act of 2001 (NCLB). NCLB conditioned the receipt of federal Title 1 funds on a variety of standards and accountability based reforms, reforms which required an increase in administrative activity on the part of school districts. Resource dependence theory posits that the response of any given district to such requirements will be proportionate to its dependence on those federal revenues. In other words, districts which depend more heavily on supplemental, federal funds (such as Title 1) are likely to see larger increases in administrative overhead as an effort to manage external resource dependencies, potentially leading to inefficiencies in resource allocation.

In order to test this hypothesis, a series of OLS models are constructed to measure the extent to which reliance on external funding sources (federal revenue) impacts resource allocation and administrative overhead within school districts. The results generally confirm the aforementioned hypotheses, indicating that districts which are more reliant on federal revenue are experiencing greater increases in administrative overhead, which seem to come at the expense of instructional expenditures. Theoretically, the results imply that organizations do react to environmental contingencies in a manner that is proportionate to their external resource dependencies. More practically, the results suggest that unfunded federal reporting and accountability requirements are creating potential inefficiencies at the district level which should receive further attention. These inefficiencies are particularly concerning from a justice perspective, as those districts which are most dependent on federal revenue are generally serving the largest populations of traditionally disadvantaged students. Most interestingly, these results mark a reversal in trends from pre-NCLB studies (Baker, 2003; Simon, 1999).

The second article in this collection, *Enhancing the Education Production Function: The Impact of Special Populations and Instructional Disaggregation*, contributes to a long-standing line of research on the role of financial resources in the production of education, as measured by student outcomes (see Hanushek, 1997). In particular, this research looks at the importance of controlling for special needs populations and instructional spending subcategories when constructing traditional education production functions. The results suggest that prior studies may have significantly understated the importance of instructional expenditures in shaping student outcomes by failing to account for these critical variables. In a broader sense, these results highlight the importance of considering special needs populations and the cost of educating special needs students in education policy analysis.

The third and final article in this collection, *A Hierarchical Logistic Analysis of Extracurricular Involvement and Student Dropout*, considers the policy implications of recent trends toward the elimination of extracurricular programming and/or the assessment of student participation fees. Social control theory suggests that participation in extracurricular programming, such as team sports, may lead to greater student engagement, thereby reducing the likelihood of deviant behaviors such as dropping out. Building on previous studies (i.e. McNeal, 1995), this article uses a multi-level, longitudinal dataset to account for prior academic performance and school level, random effects in the analysis of student dropout.

The results of this analysis show that participation in extracurricular programming is related to profound reductions in the likelihood of student dropout, even after controlling for other known causes and antecedents. These findings are particularly strong among African American students, who are shown to be nearly four times less likely to drop out of high

school between the 10<sup>th</sup> and 12<sup>th</sup> grade years if they are participating in extracurricular athletics. These results suggest that policies which reduce extracurricular budgeting may have profound and negative, unintended consequences, particularly for at risk students. This also suggests that the assessment of student participation fees for extracurricular activities may lead to a decrease in participation among disadvantaged students who stand to gain the most from involvement.

Collectively, these papers address a variety of concerns in school finance and education policy. As a whole, they suggest that the appropriate use of academic theory can in fact help to deepen our understanding of complex phenomenon in the educational environment. They also suggest that the consideration of diverse populations and justice concerns are essential in crafting both educational research and education policy.

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## **Chapter 1**

# **The Influence of Federal Revenue on School District Organizations: A Resource Dependence Perspective**

## **Abstract**

*This study examines the impact of resource dependencies on the organizational behavior of public school districts. Though locally organized, K-12 school districts operate in an open systems environment that is increasingly influenced by state and federal education policies. With passage of the No Child Left Behind Act (2001), the continuation of federal education funds was made contingent upon stringent accountability and reporting standards, which have created new administrative challenges and higher overhead costs for school districts. Resource dependence theory is employed to test the extent to which these changes in the policy environment have influenced the organizational behavior of school districts, specifically with regard to increased administrative costs, and particularly in at-risk districts. Results suggest that heavily resource dependent districts may be reacting with even greater intensity than others to these changes, shifting resources away from instructional areas to meet the increased administrative demand of federal education policies.*

*Keywords: administrative expenditures, education policy, resource dependence*

## **Introduction**

Despite an aura of local control, K-12 school districts in the United States operate in a context that is increasingly shaped by federal education policy. In an effort to increase equity and close achievement gaps, the federal government has expanded its role in K-12 education dramatically over the past half century (Birman and Porter, 2002). Since passage of the Elementary and Secondary Education Act (ESEA) in 1965, federal education expenditures have increased by \$60 billion (Guthrie, Springer, Rolle, and Houck, 2007), and the reauthorization of ESEA in 2001 under the No Child Left Behind Act (NCLB) has led to more direct federal involvement in standards and accountability. Specifically, NCLB conditioned Title 1 funds on several standards-based and accountability reforms, creating a variety of new administrative challenges for local school districts (McDermott and Jensen, 2005). While federal contributions remain very small in comparison to state and local funding, they can be comparatively large for high poverty districts that are unable to generate sufficient revenue from their local tax-bases (Riddle and Osorio-O’Dea, 2002).

These fundamental changes to the nature of federal education funding raise significant organizational questions that merit consideration. In particular, this article is concerned with organizational impacts that may result from resource dependencies in the school funding context, particularly with regard to financial resource allocation. Resource dependence theory (RDT) facilitates examination of these questions in a structured manner. In their seminal statement of RDT, Pfeffer and Salancik (1978) noted that most organizational research up to that point had focused on the use of resources, but not their source of acquisition. While the subsequent application of RDT has altered this focus in

many fields, research on the economics of public education has remained primarily concerned with the effect of resource inputs on educational outcomes. This article helps to address that deficiency by examining the impact of funding sources on administrative costs using Pennsylvania's public school districts as an illustration. The findings suggest that on top of across-the-board increases in administrative overhead that resulted from NCLB, those districts with larger proportional reliance on federal funding may be experiencing even greater increases in administrative overhead due to the organizational pressure to manage critical resource dependencies. The findings also suggest that increases in administrative expenditures are coming at the expense of instructional resources.

Probing these issues is significant for several reasons. First, from a practical standpoint, it is important to understand the extent to which federal policy initiatives are achieving their stated goal of improved equity. If increased organizational pressure from standards and accountability policies are creating organizational inefficiencies, instructional equity might be jeopardized, particularly in at-risk schools. Second, an improved understanding of how revenue sources influence school districts organizationally may help to improve future production function literature (e.g. Hanushek, 1997). In order to better understand how school inputs affect student performance, it is necessary to first understand the forces and contingencies which are shaping those inputs. Finally, this research is significant theoretically in that it contributes to the overall literature on resource dependence theory, which Pfeffer and Salancik (2003) suggest is still in need of further empirical application.

The next section further elaborates on resource dependence theory as a context for this study, followed by a discussion of the current school policy environment and a review of relevant literature. Based on these insights, a series of hypotheses is formed. The data sources and methods are then outlined, followed by presentation of results of the analysis and a discussion of relevant conclusions.

## **Literature Review**

### **Resource Dependence Theory**

Resource dependence theory is rooted in the notion that organizations are neither self-contained nor self-sufficient, making their relationships and dependencies of utmost importance to understanding their existence. The theory, offered by Pfeffer and Salancik (1978), draws from an open systems (e.g., Katz and Kahn, 1978) perspective, which views organizations as embedded in open environments where they interact with and are influenced by other organizations. In essence, RDT adds a level of specificity to the broad open systems approach by suggesting that a particular form of contingency, namely resource dependencies, is of unique importance. Thus, not only are organizations embedded in an open environment, but they are also dependent on other organizations for essential resources. To the extent that these resource dependencies are critical to an organization's survival, managing them becomes a task of the highest order. Consequently, Pfeffer and Salancik (1978) situated the primary challenges of management outside of the organization in the larger environment. Based on these premises, RDT is concerned with the ways in which organizations respond to

and manage their resource dependencies, how those decisions shape organizational structure and behavior, and the subsequent power dynamics that emerge.

Since its introduction, RDT "... has become one of the most influential theories in organizational theory and strategic management" (Hillman, Withers, and Collins, 2009, p. 1404). Primarily, RDT has been applied to the analysis of private sector concerns, where it has helped to explain organizational behaviors such as mergers and acquisitions, joint ventures, board strategies, and executive succession to name a few (Hillman et al., 2009). Though RDT has been applied to public and voluntary sector concerns with less frequency, it has not been absent. Several studies have directly applied a resource dependence perspective to government and nonprofit organizations (e.g.'s , Hodge and Piccolo, 2005; Malatesta and Smith, 2011). Pfeffer and Salancik also saw the relevance of their theory to organizational relationships involving public actors (Pfeffer, 1972).

Of particular concern in this article are the contingent conditions often associated with resource dependencies, as well as the potential influence exerted by dominant actors in cases of asymmetrical dependence. On the first matter, Pfeffer and Salancik (1978) note that external resource providers often attach conditions to the continuation of resource provision. Frequently these conditions come in the form of accountability requirements, which have become a centerpiece of federal education policy in recent years. On the second matter, and based on premises established in prior research (e.g.'s, Emerson, 1962; Jacobs 1974), Pfeffer and Salancik (1978) note several conditions which are likely to "affect the extent to which an organization will comply" (p. 44) in the face of external demands. Chief among these concerns are the recipient's degree of dependence on the resource in question, the viability of

alternative sources, and the extent to which the resource provider is codependent on the recipient for additional outcomes. In the educational policy environment, these factors vary on a district by district basis. While federal policymakers are dependent on local school districts to achieve their goal of educating at-risk students, districts vary in the degree to which they depend on federal funds to achieve these goals. Based on the premises of RDT, a school district's efforts toward compliance may be expected to increase proportionally with its degree of dependence on federal revenues.

### **The Current Education Environment**

Though governance of K-12 education generally occurs at the local level, school districts are embedded within a broader external environment which constrains their organizational behavior and outcomes. These environmental influences range from micro level concerns, such as community and student -body characteristics, to macro level factors, such as state and federal regulations (DiPaola and Tschannen-Moran, 2005; Simon, 1999). Among the most significant constraints imposed by this environment are organizational dependencies on external sources of information, legitimacy, and resources. For many districts, these dependencies are increasingly shaped by federal education policy (Fusarelli, 2002), which is the focus of this paper. Of particular concern is how expanding federal influence may be shaping organizational behavior, operationalized as financial resource allocations, in heavily resource-dependent school districts.

The time is ripe for such considerations, as federal influence has reached unprecedented scope within the past decade. Traditionally, federal education policy has

focused on addressing inequities in resource allocation by providing supplemental support to schools with high populations of traditionally disadvantaged students (Hanushek, 1989).

This goal was explicitly set forth in Title 1 of the Elementary and Secondary Education Act (ESEA) of 1965, and through four and a half decades of federal education reforms, “Title 1 has remained the cornerstone of federal education policy” (Gordon, 2008, p. 302). In 1994 Title 1 was reauthorized under the Improving America’s Schools Act (IASA), which introduced standards based reform and accountability into federal education policy. These reforms, however, did not become systematically enforced at the federal level until the No Child Left Behind Act (NCLB) of 2001. NCLB also reauthorized Title 1 funding, though for the first time, the continuation of this funding was made contingent upon verifiable performance outcomes (Gordon, 2008), marking a dramatic expansion of the federal government’s influence in K-12 public education (Goertz, 2005).

The shift to outcomes based contingencies under NCLB was in line with a general trend on the part of federal legislators toward greater exertion of influence through conditional financial arrangements (McDermott and Jensen, 2005). On a broad level, these increased accountability measures for nonprofit and local government organizations tend to significantly affect internal organizational structure and behavior. Specifically, they can compel organizations to “... adopt new administrative procedures, add professionals, institute new financial management practices, and in some cases, modify physical structures”, all leading to an increase in overhead expenses (Smith, 2006, p. 235). In the case of Title 1 funding, McDonnell (2005) notes that the implementation of NCLB has required school districts to change both their priorities and their organizational behavior. Recent research

found that school administrators, in the wake of the evolving policy environment, are compelled "... to design entirely new formal organizational structures in their schools that support tighter coupling between policy, administration, and instruction" (Spillane and Kenny, 2012, p. 551). These responses are consistent with the basic premises of resource dependence theory, which argues that organizations manage their resource dependencies, in part, by adapting to environmental requirements in order to secure needed resources (Pfeffer and Salancik, 1978).

Tying the current educational environment back to resource dependence theory, this dependence upon federal dollars, does not, in and of itself, constitute an organizational problem for school-districts. In an earlier application of structural contingency theory to school expenditures, Simon (1999) found both federal and state support revenues to have a stabilizing effect, even reducing administrative expenditures per pupil in comparison to districts with "less reliable" sources of revenue. This conclusion aligned with previous findings on government revenues in the nonprofit sector (Gronjberg, 1991). A further analysis of school district resource allocations conducted by Baker (2003) found mixed evidence suggesting that federal revenue did not lead to increases in administrative expenditure shares, though it was related to increased administrative staffing shares. In each of these studies, administrative costs were most significantly influenced by organizational factors such as district/school size and available resources/core technologies, as well as school-level environmental factors such as student body characteristics (i.e. poverty and special needs).

These previous studies have helped to broaden our understanding of internal resource allocation and organizational behavior within school districts. However, each of these major analyses was conducted using data that predated the implementation of NCLB. In the wake of NCLB, the increasingly contingent nature of federal education funds raises new questions about the potential effects of federal revenue on the organizational behavior of school districts, particularly for districts that are heavily reliant on these federal revenues. As suggested by RDT, given a lack of viable alternatives (i.e. a weak local tax base), these heavily dependent districts are likely to respond to accountability demands even more aggressively in order to maintain their existing revenue flows.

If school districts are altering their organizational behavior/resource allocations in order to secure/maintain federal funding, one result may be a move toward greater administrative bloat and thus less efficiency at the school district level in response to federal education policy. This would be significant in the sense that it would counter previous findings and challenge the wisdom of overly encumbering Title 1 funding with accountability and reporting requirements. The remainder of this article empirically tests these concerns to determine if federal policy has fundamentally influenced organizational behavior within schools. The section that follows develops a series of central hypotheses based on the preceding discussion.

## **Hypotheses**

Based on the previous discussion, several core hypotheses are tested regarding the influence of resource dependencies on the organizational behavior of school districts.

*Hypothesis 1:* School districts with greater dependencies on federal revenue will have higher administrative expenditures on a per pupil basis.

*Hypothesis 2:* School districts with greater dependencies on federal revenue will spend more on administration as a share of total current expenditures.

Resource dependence theory argues that the acquisition and maintenance of resources is the primary driver of organizational behavior and managerial strategy (Pfeffer and Salancik, 1978). Thus the accountability and reporting requirements now associated with Title 1 funding suggest that a greater proportion of organizational resources will be required to maintain revenue streams than in the previous policy environment, particularly as dependence on federal revenue increases. As noted above, this implies a larger administrative component for many school districts (Spillane and Kenny, 2012). The use of both per pupil and expenditure share variables is based on the conventions of previous research (Baker, 2003; Monk and Hussain, 2000). Per pupil increases in administrative expenditures would not necessarily signify a threat to organizational efficiency if current expenditures were rising across the board. However, if resource dependencies are increasing administrative expenditures as a share of total expenses, then such questions could be legitimately raised.

*Hypothesis 3:* School districts with greater dependencies on federal revenue will have higher support service expenditures on a per pupil basis.

*Hypothesis 4:* School districts with greater dependencies on federal revenue will spend more on support services as a share of total current expenditures.

Administrative expenditures (in hypotheses 1 and 2) refer to expenditures at both the superintendent and principal level, but it is possible that increased expenditures associated with maintaining federal funding could fall outside of those categories as well. Thus Support Service expenditures in hypotheses 3 and 4 capture a broader range of expenses including not only administration, but also board services, legal services, community relations, business expenses, and other miscellaneous support services.

*Hypothesis 5:* School districts with greater dependencies on federal revenue will have lower instructional expenditures on a per pupil basis.

*Hypothesis 6:* School districts with greater dependencies on federal revenue will spend less on instruction as a share of total current expenditures.

Research has consistently shown a significant link between instructional expenditures and student outcomes (e.g. 's Dee, 2005; Jacques and Brorsen, 2002; Wenglinsky, 1997). If increases in administrative overhead come at the expense of instruction, then recent changes to federal policy may prove counterproductive. Existing research shows that state and local governments respond to Title 1 funds by decreasing their own financial contributions to schools (Gordon, 2004; Matsudaira, Hosek, and Walsh, 2012). This would suggest that the increased administrative cost of maintaining federal revenue may actually be “crowding out” valuable instructional expenditures.

## Methods

### Data

This study uses district level variables for the Commonwealth of Pennsylvania's public schools in the 2009-10 school year. The data have been collected from a variety of reports compiled by the Pennsylvania Department of Education. Several factors make Pennsylvania school districts a relevant data sample for this analysis. First, Pennsylvania's school districts are operated at the municipal level and endowed with taxing authority (Stoicescu and Hartman, 2004). This means that disparities in property value, the main source of local tax revenue, are not masked by county level aggregation, as is the case in many Mid-Atlantic States (Guthrie et al., 2007). Second, municipal level aggregation allows for a larger sample size (N=458), and thus greater statistical power. Finally, school districts in Pennsylvania receive more revenue on average from local taxes than districts in other states. This ensures that external resource dependencies will be pronounced for districts with lower property values and smaller tax-bases. Table 1 contains basic descriptors for public school revenues in Pennsylvania for the 2009-10 school year.

Table 1.1  
Descriptive Statistics for Public School Revenues in Pennsylvania, 2009-10 SY

| Revenue Source* | Mean* | Standard Deviation* | Minimum* | Maximum* |
|-----------------|-------|---------------------|----------|----------|
| Local           | 53%   | 18.99%              | 12%      | 89%      |
| State           | 40    | 16.10               | 10       | 71       |
| Federal         | 6     | 3.52                | 0        | 18       |
| Other           | 0     | 0.66                | 0        | 5        |

\* As a percentage of total revenues

## **Dependent Variables**

Based on previous conventions (Baker, 2003; Monk and Hussain, 2000), this study operationalizes both the base and share effects of administrative overhead and instructional expenditures, where base effects equal the total dollar amount spent on a specific function, and share effects equal the percent or share of total expenditures dedicated to that function. Administrative overhead is operationalized in two ways: (1) as direct administrative expenditures and (2) more broadly as support service expenditures. Base effects for each spending category are measured as expenditures per pupil, calculated by dividing the expenditure category by Average Daily Membership (ADM):

$$\textit{Base Instructional Expenditures} = \textit{Instructional Expenditures}/\textit{ADM}$$

This step is repeated for base administrative expenditures and base support service expenditures. Share effects for all three categories are measured as a percentage of total current expenditures. For example, instructional share is calculated as follows:

$$\textit{Instructional Share} = (\textit{Total Instructional Expenditures}/\textit{Current Expenditures})*100$$

## **Independent Variables**

Five independent variables are employed in each regression model. Resource dependencies are operationalized as the percentage of total revenue derived from federal funding. Based on previous studies, two organizational control variables are included: (1) Average Daily Membership (ADM), which is used as a proxy for organizational size, and (2)

total per pupil expenditures, each measured on a scale of thousands. A negative relationship has been found between ADM and administrative expenses in previous studies (Baker, 2003; Monk and Hussain, 2000; Simon, 1999). This is expected due to the administrative economies of scale that are gained as organizations become larger, though this effect is believed to wane after districts reach an optimal size (Andrews, Duncombe, and Yinger, 2002). Total per pupil expenditures is necessary to control for differences in district wealth. For instance, it might be reasonably expected that a wealthy district will have higher administrative expenditures simply due to the scope of its available resources and not necessarily as a result of managing resource dependencies. Two additional variables are included to control for contingencies in the local school environment: (1) the percentage of students from low-income families, and (2) the percentage of students classified as having special needs. These account for the instructional and administrative costs associated with each district's unique student body, and they are consistent with inclusion in previous studies (Baker, 2003; Monk and Hussain, 2000; Simon, 1999).

### **Regression Models**

OLS regression models were run to test each hypothesis independently. The data for each independent variable were centered to improve both the ease and relevance of interpretation. The special needs and per pupil expenditure variables were calculated using ADM as the denominator, whereas the percentage of students from low-income families was calculated using *total enrollment*. While ADM and total enrollment are attained through different pupil accounting standards, they were highly correlated ( $r=0.98$ ), suggesting that the

inclusion of the low-income variable was not spurious. Models initially included an additional control variable for the percentage of total revenue obtained from state funding. This variable was highly correlated with the federal revenue measure ( $r = 0.8$ ), suggesting multicollinearity (O'Sullivan and Rassel, 1999). The state revenue variable was therefore eliminated from the models in order to better capture the independent effect of federal revenues. Model effect sizes ( $R^2$ ) were not significantly influenced by the removal of the state revenue variable. School districts receiving more than five percent of their total revenue from sources other than local, state, and federal governments were eliminated from the analysis to prevent the normal pattern of revenues from being obscured by one-time factors such as bond and asset sales. After removing these cases, as well as those for which complete information was not available, the models were run with an effective sample size of  $N=458$ . This was down 42 cases from an initial sample size of 500 school districts.

## **Results**

Table 2 reports the results for six OLS regression models; the coefficients provided are unstandardized. Collectively, the models provide preliminary support for the notion that the management of resource dependencies is leading to increased administrative overhead and altering organizational behavior. Furthermore, there is evidence that these shifts in financial resource allocation are in fact coming at the expense of instructional spending. While the effect sizes are moderate in some areas, these results represent a significant departure from the findings of previous studies (e.g.'s Baker, 2003; Simon, 1999). In sum,

they suggest that changes in the nature of federal funding may be fundamentally changing organizational behavior in public school districts.

Controlling for organizational and environmental factors, federal revenue dependencies were a significant predictor of base and share effects for both administrative expenditures and support service expenditures (Models 1-4). In each case, the relationship between federal revenue and overhead expenses was positive, indicating that increased dependency on federal revenue led to higher administrative costs. The results for instructional expenditures (Models 4 and 5) were mixed. Federal revenue was not significantly related to base effects for instructional expenditures, but it was associated with lower instructional expenditures as a share of total current expenditures. The decrease in instructional share appears to be offset by a concurrent increase in support services for each additional percent of federal revenue.

The parameter estimates for federal revenues in the first model were small, showing an increase of \$7.78 per pupil in administrative expenditures for each additional percent of federal revenue. The parameter estimate for support service expenditures was slightly higher. Model 3 shows a \$27.76 increase per pupil in support service expenditures for each one percent increase in federal funding. In essence, this includes the \$7.78 increase in administrative expenditures as well as an additional \$20 of increases per pupil in the other support service categories. These findings suggest that a considerable amount of the organizational response to federal policy is occurring in support areas other than the main administrative offices. Thus, future research may consider the influences of federal funding

dependencies on organizational behaviors such as legal services, board services, and business functions.

The parameter estimate for administrative share was also small, showing a 0.06 percent increase in administrative share for each one percent increase in federal funding (Model 2). For support services, share effects increased by 0.18 percent for each one percent increase in federal funding (Model 4). This means that a six percent increase in federal funding would equate to a 1.08 percent increase in support services as a share of total expenditures. This seems to directly counter an equal reduction in instructional share ( $B = -0.18$ ) for each additional percent of federal funding (Model 6). This suggests that a six percent increase in federal funding would result in a one percent shift in total current expenditures away from instruction and into various support services. Given the substantially heavier dependence of some schools on federal revenues (see Table 1), this suggests meaningful differences in resource allocation patterns among districts throughout the state based on their degree of dependence on federal resources. The control variables behaved largely as expected based on previous studies. As a measure of available resources, total expenditures per pupil was significant in five of the six models, and it generally represented the largest standardized effect. It was positively associated with expenditures in each category, though it had a slightly negative relationship to administrative share. As a measure of organizational size, ADM was significantly related to lower administrative expenditures and higher instructional share, as would be expected given the economies of scale gained by larger districts. Low income and special needs populations were each significant predictors in four of the six models, though their parameter estimates tended to be

Table 1.2

## Base and Share Effects for Administrative, Support Service, and Instructional Expenditures

|  | Administrative Expenditures (Models 1-2) |          | Support Service Expenditures (Models 3-4) |           | Instructional Expenditures (Models 5-6) |           |
|--|--|----------|---|-----------|---|-----------|
|  | Base                                     | Share    | Base                                      | Share     | Base                                    | Share     |
| Percent Federal Revenues               | 7.782*                                   | .063**   | 27.759**                                  | .183**    | -11.063                                 | -.183*    |
| Size (ADM in thousands)                | -1.583*                                  | -.014*   | -2.398                                    | -.024     | 4.824                                   | .035*     |
| Total Expenditures p/pupil (thousands) | 56.039***                                | .000     | 311.604***                                | .249***   | 507.120***                              | -.242**   |
| Percent Low Income                     | .278                                     | .000     | -5.650**                                  | -.050***  | 7.937**                                 | .049**    |
| Percent Special Needs                  | -3.652                                   | -.049*   | -1.628                                    | -.102*    | 34.166**                                | .144**    |
| Intercept                              | 802.304***                               | 6.732*** | 3981.460***                               | 33.280*** | 7730.224***                             | 64.711*** |
| R-Squared                              | .379                                     | .040     | .785                                      | .079      | .830                                    | .080      |
| F                                      | 55.151***                                | 3.727**  | 329.745***                                | 7.749***  | 441.921***                              | 7.841***  |

Note: Model output are unstandardized coefficients

\*p<.05; \*\*p<.01; \*\*\*p<.001

quite small. Both were positively related to instructional expenditures, which can be expected given the higher cost of educating at-risk and special needs students (Duncombe and Yinger, 2005). Both were also negatively related to support service expenditures, which appears counterintuitive, though it may be a reflection of the higher instructional expenditures dedicated to these students. This dynamic may be explainable in part by legislative efforts to reduce class-sizes, but this would require further research to verify.

### **Discussion**

In 1999, Simon's analysis concluded that revenue sources were not associated with larger administrative expenditures. Since that time, the passage of NCLB has significantly changed the education policy environment, making the continuation of Title 1 funding contingent upon new standards and accountability requirements. These changes to the policy environment have led to increased testing, tracking, and reporting requirements for school districts, among other administrative challenges (McDermott and Jensen, 2005). As predicted by resource dependence theory, districts faced with heavy reliance on federal funding seem to have made pronounced changes in organizational behavior, particularly financial resource allocation, in order to shore up and maintain these revenue streams. This is evidenced by the increased administrative and support service expenditures associated with the percentage of revenue from federal sources. In response to changes in the federal policy environment, the trends observed by Simon (1999) seem to have changed, leading to a meaningful association between federal revenues and administrative overhead expenses. This study found a significant relationship between reliance on federal revenue and financial

resource allocations, particularly with regard to increased shares of administrative and support service expenses, which appear to come at the expense of instructional expenditures.

The implications of these findings are both practical and theoretical. From a practical standpoint, the trends observed in this analysis suggest that federal (and state) lawmakers should proceed with caution when attaching bureaucratic strings to education funding. Loeb and Strunk (2007) found that accountability policies work best when local control is at its greatest. Loosening some of the administrative strings might result in more efficient resource allocations as well as more effective accountability policies. In particular, lawmakers should be concerned about the reduction in instructional share associated with increased dependency on federal revenue. Research has consistently shown instructional expenditures to be a key input in the production of desired education outcomes (e.g. 's Dee, 2005; Jacques and Brorsen, 2002; Wenglinsky, 1997). In an effort to “do no harm”, lawmakers should ensure full-funding of accountability requirements before sending them to the states and to local districts for implementation.

Concerns also arise at the district level, particularly as administrative offices become of greater importance in the acquisition and maintenance of financial resources. Pfeffer and Salancik (1974; 1978) have noted that given the importance of external resources to organizational survival, internal organizational power tends to accrue to those organizational subunits that are most effective at procuring and maintaining needed resources. In the case of school districts, this would suggest a shift in organizational power toward administrative offices/positions, potentially at the expense of instructional personnel. The focus of organizational decision making could thus be shifted by these emerging power dynamics,

which may prove detrimental to the core mission of pupil education. Research has already suggested a “bureaucratic substitution effect” by which the growing size of educational bureaucracies leads to a reduction in pupil performance (Anderson, Shughart and Tollison, 1991). For school leaders, avoiding these pitfalls will require new approaches to managing environmental contingencies and resource dependencies. Contingent federal funding may have backed dependent districts into an organizational corner, but acceptance of those funds is optional and alternative management strategies are increasingly available. For example, strategies such as nongovernmental, alternative funding are growing in popularity (Hansen, 2008). In the long run, changes to the policy environment may serve as the impetus for creative funding solutions in order to reduce federal dependencies.

From a theoretical perspective, the results help to further affirm the relevance of resource dependence theory to the public sector, namely because the findings suggest a resource dependency effect on administrative costs even after controlling for the policy effect of NCLB. They also raise significant methodological concerns for future production function research. Given the differences in internal resource allocation that arise from reliance on different revenue sources, it is no longer sufficient to employ total per pupil expenditures as a proxy for resource inputs. This practice masks significant, nonrandom differences in organizational behavior and internal resource allocation.

## **Conclusions**

This analysis faces some limitations, chiefly the challenge to external reliability presented by differing state education policy environments. Additional research should

consider the extent to which these trends are replicable in other state systems. As we approach a decade since the implementation of NCLB (2003), a longitudinal analysis would also help to advance this research and uncover trends such as the rate and permanence of changes in organizational behavior in response to changes in the federal policy environment. Finally, future case study analyses might help to see beneath the aggregated financial numbers to understand which managerial strategies are working most effectively to protect the instructional mission of school districts while also maintaining necessary resource relationships with the external environment.

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## **Chapter 2**

# **Enhancing the Education Production Function: The Impact of Special Populations and Instructional Disaggregation**

## **Abstract**

*State budget constraints and rising trends in special needs student enrollments underscore the need to identify the core relationships between educational inputs and student outcomes. This paper revisits the education production function literature in pursuit of improved model specification, particularly through the use of disaggregated instructional expenditures and enhanced control of student population variables. Using middle school standardized test scores as an outcome variable, production function models are constructed a sample of Pennsylvania public school districts. The results suggest that the relationship between financial expenditures and student outcomes may commonly be understated due to a failure to control for special needs/gifted populations as well as for instructional expenditure subcategories such as vocational and special education. Implications for future productivity research are discussed.*

*Keywords: Education Economics, Instructional Expenditures, Special Populations, Production Function, Resource Allocation*

## Introduction

Among the chief ambitions of education policy are the organization of schools and the allocation of resources in those manners that maximize positive student outcomes. Whether gauging the potential impact of new resources or reconsidering their current distribution, policymakers and school administrators alike are interested in how scarce, limited inputs can be most efficiently applied to the attainment of educational goals. To this end, economists and policy analysts have adopted the language and methodologies of manufacturing and production in order to gauge the value of resource inputs in the educational process. Developing econometric models called “education production functions”, researchers have applied the logic of the factory to a variety of education policy concerns, such as the impact of class-size reductions on student outcomes, the importance of high-quality teachers, and the predicted influence of increased educational spending on student test-scores.

While this approach holds potential for improving student educational productivity (Monk, 1989), the cumulative research up to this point has been contradictory and inconclusive. Rice and Schwartz (2008) noted that studies examining the relationship between per pupil expenditures and student performance have been “frustratingly inconsistent in their findings” (p. 136). As a result, meta-analyses have often concluded that increases in education funding are unlikely to produce any measurable improvements in student outcomes (Hanushek, 1997, 2003), a conclusion which has become nearly axiomatic in many policy circles. However, some researchers have challenged these early findings, in part by arguing for improved model specification through factors including disaggregated

expenditures and value-added outcome variables (e.g. Ferguson and Ladd, 1996). Following this logic, some analyses have been able to disaggregate financial inputs into major expenditures categories, and they have tended to find a common and significant statistical relationship between instructional expenditures and student performance (ex., Dee, 2005; O'Connell Smith, 2004; Wenglinsky, 1997).

As economic challenges further constrain state budgets, understanding the linkages between financial resources and educational production becomes increasingly important at both the macro and micro policy levels. Additional trends highlight the need to revisit production function specification, especially the steady growth of special education student enrollments, and the rising costs of educating students with special needs and disabilities. Using data from a sample of Pennsylvania school districts, this article builds on previous literature by seeking to improve model specification in two significant ways: (1) by controlling for increasingly important student body characteristics, namely special needs and gifted student populations, and (2) by examining more deeply disaggregated expenditure categories in order to further advance our understanding of the relationship between financial inputs and productivity in K-12 education.

The results of this analysis suggest that the relationship between expenditures and educational productivity may be understated in many early studies by a failure to control for student body characteristics such as special needs and gifted populations. The findings also indicate that deeper disaggregation of instructional expenditures may improve the demonstrated impact of financial resources on student outcomes, though further research is required. In particular, even in financially disaggregated models, special and vocational

education expenditures may cause the impact of instructional resource inputs to be understated. While caution is suggested with regard to over-interpreting the parameter estimates of district level analyses, the findings do point toward a general relationship which warrants further attention from both researchers and policymakers.

## **Literature Review**

### **The Production Function Model**

Production function research applies the logic of manufacturing firms to the production of educational outcomes in an effort to better understand the relationships between resource inputs/allocation and student outcomes. Monk (1989) notes that

... a production function... describes the maximum level of outcome possible from alternative combinations of inputs. It summarizes technical relationships between and among inputs and outcomes. The production function tells what is currently possible. It provides a standard against which practice can be evaluated on productivity grounds (p.31)

Previously, researchers have pointed out the operational challenges of applying the production metaphor to educational concerns (see Summers and Wolfe, 1979), but since the publication of the Coleman Report (1966), production function analysis has become a mainstay of both economic and educational research. The essential elements of a production function model vary based on the observed level of aggregation; for school district level

aggregation, which this article employs, the linear expression of the production function model is essentially as follows:

$$(1) \quad Y_{d,t} = b_0 + b_1S_{d,t} + b_2P_{d,t} + b_3O_{d,t} + b_4E_{d,t},$$

where  $Y_{d,t}$  represents a measure of student outcomes for  $d$  district at time  $t$ ;  $S_{d,t}$  represents proxy measures of schools inputs for  $d$  district at time  $t$ ;  $P_{d,t}$  represents relevant measures of “peer-group” or student body characteristics such as race and socio-economic status for  $d$  district at time  $t$ ;  $O_{d,t}$  represents organizational characteristics such as average daily membership for  $d$  district at time  $t$ ; and  $E_{d,t}$  represents environmental characteristics such as urban or rural settings for  $d$  district at time  $t$ .

By controlling for factors that are believed to influence student outcomes, such as peer-group and environmental characteristics, production functions allow researchers to capture the impact of those variables which lie within the influence of policymakers, such as school resources. In essence, the production function allows parameter  $b_1$  to be isolated, highlighting the anticipated marginal impact of a one unit increase in a given school resource. Interpretation of production function models requires caution, as the analysis cannot account for intangible interaction factors such as student motivation. However, production function analysis does allow for a general understanding of the direction and magnitude of relationships between resource inputs and those student outcomes which are most desirable from a policy standpoint.

## **Previous Studies**

The initial focus on resource inputs in education evolved from early 20<sup>th</sup> century, closed-system theories, which emphasized the role of internal dynamics in the production of organizational outcomes (Marion and Flanigan, 2001). These long held assumptions were challenged by the publication of the Coleman Report (1966), which concluded instead that environmental factors such as student background and socioeconomic status were the primary predictors of educational outcomes. In the wake of Coleman's surprising conclusions researchers scrambled to examine his claims, and within 30 years Hanushek (1997) was able to conduct a meta-analysis of over 377 published models. While Hanushek's "vote-counting" method has been criticized (see Greenwald, Hedge, and Laine, 1996), his analysis found strong support for Coleman's initial conclusions. Of the 377 models considered in his analysis, 163 examined per pupil expenditures as an input variable. As a predictor of positive student outcomes, expenditures were only statistically significant 27% of the time.

While this "non-relationship" between financial inputs and student outcomes has been a popular theme in many policy debates, subsequent studies have begun to challenge this assertion through improved model specification. For example, Wenglinsky (1997) disaggregated total per pupil expenditures into four categories and found that instructional expenditures were in fact associated with gains in student achievement. These results have been affirmed by additional research, which has also found a significant link between instructional expenditures and positive student outcomes (i.e. 's Dee, 2005; Ferguson and Ladd, 1996; O'Connell Smith, 2004). In essence, these studies suggest that the relationship

between financial inputs and student outcomes is more significant, though nuanced, than was suggested by earlier production function models. As Wenglinsky (1997) noted, it seems that “... some spending measures play a role in student achievement while others do not” (p. 229).

This article takes further steps toward improving model specification by pursuing deeper financial disaggregation while also introducing additional pupil characteristics such as the proportion of special needs and gifted students. Detailed data from the Pennsylvania Department of Education allow for the disaggregation of instructional expenditures into specific subcategories, such as regular instructional programs, special education, and vocational education. Inclusion of such subcategories in production function models is increasingly important, as recent estimates suggest that the costs associated with educating special needs students may be as much as 3.1 times higher than the cost of educating traditional students (Harr, Parish, and Chambers, 2008). This suggests that the impact of instructional expenditures on student outcomes may still be understated when factors such as special education costs are not held constant.

As an extension of this consideration, the influence of expenditures may also be understated when student body characteristics such as gifted and special needs populations are not considered. These control variables have generally been absent from previous production functions models, most likely due to a lack of available data (Sebold and Dato, 1981). Some more recent studies have considered special needs populations (Jacques and Brorsen, 2002; Marcotte, 2007), which are believed to negatively influence average test scores, though they have generally not controlled for gifted populations, which may

positively influence student outcomes such as standardized test scores. Given rapid increases in special education enrollment over recent years (Harr, et al., 2008), it seems increasingly important for production function models to take these factors into account. This article considers special needs (disability/learning difference) and gifted populations as two separate independent variables in order to account for these different hypothesized relationships.

### **Methods**

This study uses district level variables for the Commonwealth of Pennsylvania's public schools in the 2009-10 school year. These data have been collected from multiple reports compiled by the Pennsylvania Department of Education. While district level aggregation has been employed in a number of quality production functions models (e.g.'s Gyimah-Brempong and Gyapong, 1991; Ferguson and Ladd, 1996; Sebold and Dato, 1981), some objections have been raised on grounds of omitted variable biases (Hanushek, Rivkin, and Taylor, 1995). However, district level analyses can be useful in spite of methodological criticisms (Ferguson and Ladd, 1996), particularly for highlighting general relationships between resource inputs and student outcomes. Due to within-district variation, it is important to avoid over-interpretation of parameter estimates and instead to focus on the larger district-level trends which may inform both policymakers and future researchers.

### **Dependent Variables**

Educational productivity is measured as average district scores on the Pennsylvania System of School Assessment (PSSA) exams. Separate models are carried out at each

middle-school grade level (6<sup>th</sup> – 8<sup>th</sup> grades) for both reading and mathematics assessments. While standardized tests have been criticized as incomplete embodiments of educational goals (Barrow and Rouse, 2007), they remain the most commonly employed measure of student outcomes in production function analysis (Rice and Schwartz, 2008), due in part to their ease of availability in relation to other outcome variables. Researchers have also suggested that test scores are a good proxy for future labor market returns (Murnane, Willett, Duhaldeborder, and Tyler, 2000), lending further credence, particularly from a human capital perspective, to their use as a measure of educational production.

### **Independent Variables**

Financial resource inputs are considered at two different levels of aggregation. The first level disaggregates current expenditures into three exhaustive categories: (1) Instructional Expenditures, (2) Support Service Expenditures, and (3) Non-Instructional Expenditures. The second level of analysis retains the Support Service and Non-Instructional categories but further disaggregates Instructional Expenditures into (1) Regular Instructional Programs, (2) Special Education, (3) Vocational Education, and (4) Other Instructional Programs.

Organizational control variables include Average Daily Membership (ADM) and teaching experience. ADM is employed as a proxy for district size. While economies of scale have been hypothesized with regard to ADM in previous models (Klick, 2000), several studies have actually found a negative relationship between student outcomes and district size, suggesting perhaps that smaller districts may be more efficient as mechanisms of

educational production (Fowler and Walberg, 1991; Robertson, 2007). This paper utilizes the natural log of ADM to consider the potential for nonlinear diminishing economy of scale returns. Teaching experience is measured in “total years of service” as a district-level average for classroom teachers. Rivkin, Hanushek, and Kain (2005) note the critical role of quality teachers in efficient educational production, but operationalizing this construct has proven elusive. Teacher experience serves as an imperfect proxy for quality by accounting for factors such as professional experience and institutional knowledge.

Student body characteristics are measured as (1) the percentage of ADM classified as “special needs”, (2) the percentage of ADM classified as “gifted”, (3) the percentage of ADM classified as “non-white”, and (4) the percentage of total enrollment classified as “low-income”<sup>1</sup>. Since the initial findings of the Coleman Report (1966), production function models have continued to identify a negative relationship between socioeconomic factors, such as poverty, and student achievement (Hanushek, 1997, 2003). In a previous study of Pennsylvania school districts, Klick (2000) found poverty to be the most consistent predictor of student outcomes. Two additional environmental controls are included in the form of dummy variables for urban and rural metropolitan settings. Urban and rural settings are also believed to be negatively related to student outcomes given the challenges associated with education and staffing in those areas (ex., see Duncombe and Yinger, 1997; Ingersoll, 2004; Jacob, 2007).

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<sup>1</sup> The special needs, gifted, and non-white control variables were calculated using ADM as a denominator, while the low-income variable was available using total enrollment as a denominator. While ADM and total enrollment are calculated using different pupil-accounting standards, they are highly correlated ( $r=0.98$ ), suggesting that the inclusion of low-income as a percentage of enrollment creates a comparable ratio.

## **Regression Models**

Initially, separate OLS models were run for reading and mathematics at each grade level with only high level financial aggregation and without special needs/gifted population controls to establish a baseline for comparison prior to the hypothesized specification improvements. Subsequent models were then run incorporating the special needs and gifted population controls. A third and final set of models then replaces the instructional expenditures category with the disaggregated subcategories discussed above. After removing those cases for which complete information was not available, the models were run with an effective sample size of  $N=448$ . The independent variable measures were centered for both ease and relevance of interpretation. Initial diagnostics suggested that heteroskedasticity was not significant for the student body control variables; however, out of caution, a robust standard error was employed in each model. Cited concerns over multicollinearity (Butler and McNertney, 1991) were also considered, though no predictor variables exhibited a correlation greater than  $r=.700$ , suggesting that no modifications were required (Tabachnick and Fidell, 2013).

## **Results**

### **Baseline Models**

Table 1 contains the unstandardized results of six initial regression models. By including the essential elements of a traditional production function, these results establish a baseline for comparison with the hypothesized specification improvements. These models start with current expenditures disaggregated into three core categories: (1) Instructional Expenditures,

(2) Support Service Expenditures, and (3) Non-Instructional Expenditures, each measured in thousands per pupil. While the parameter estimates for instructional expenditures are non-significant, on an exploratory basis the coefficients do suggest a negative relationship, which is contrary to the findings of many previous studies (Dee, 2005; O'Connell Smith, 2004). This may be explained in part by a simultaneity effect wherein compensatory or supplementary funding will flow disproportionately to poorly performing districts (Ferguson and Ladd, 1996; Hanushek, 2003). Also noteworthy in these baseline models is a tendency toward significant, positive relationships between non-instructional expenditures and standardized test scores on reading, controlling for other variables in the model.

The baseline models are consistent with the open-systems conclusions established by the Coleman Report and subsequent studies with regard to the preeminence of environmental characteristics in explaining student outcomes. The percentage of low-income students is consistently a significant predictor of educational productivity, with test scores dropping between two and three points for each additional percent of low-income students in the district. The percentage of non-white students is also negatively associated with student outcomes, though the parameter estimates are smaller than those for a one unit increase in poverty. The natural log of ADM is significantly related to student outcomes in two-thirds of the models, though unlike the aforementioned studies (Fowler and Walberg, 1991; Robertson, 2007), this relationship is significant and positive in four of the six baseline models. These results suggest that accounting for diminishing economies of scale may be important for accurately capturing the relationship between district size and student outcomes. Teacher experience is also significantly related to student outcomes in most

Table 2.1  
Baseline Production Function Models

|                      | 6th Grade |         | 7th Grade |         | 8th Grade |          |
|----------------------|-----------|---------|-----------|---------|-----------|----------|
|                      | Math      | Reading | Math      | Reading | Math      | Reading  |
| Instructional \$     | -2.51     | -1.24   | -1.80     | -1.79   | -5.38     | -3.42    |
| Support Service \$   | 6.46      | 4.10    | 9.03      | 9.27*   | 8.73      | 7.47     |
| Non-Instructional \$ | 45.24     | 53.08*  | 31.56     | 56.83** | 28.48     | 67.23**  |
| Low-Income           | -2.32**   | -2.57** | -2.73**   | -2.63** | -2.40**   | -3.03**  |
| Non-White            | -0.45     | -0.37   | -1.03**   | -0.56** | -0.94*    | -0.57*   |
| ADM (ln)             | 0.59      | 6.01    | 17.76**   | 11.88** | 19.94**   | 12.71**  |
| Teacher Experience   | 3.83*     | 3.51*   | 3.50*     | 2.31*   | 2.91*     | 1.66     |
| Urban                | -6.08     | -8.97   | 2.02      | 4.72    | 1.38      | 15.52    |
| Rural                | -12.18    | -3.46   | -19.78*   | -10.09* | -17.97*   | -14.41** |
| Intercept            | 1514.17   | 1348.30 | 1388.32   | 1333.08 | 1311.47   | 1404.65  |
| R <sup>2</sup>       | 0.39      | 0.59    | 0.54      | 0.67    | 0.49      | 0.64     |

\*p ≤ 0.05, \*\*p ≤ 0.01

models, though this again raises simultaneity issues given the mobility of experienced teachers toward higher performing districts. While the relationships between teacher experience and ADM are interesting in and of themselves, these models serve primarily as baselines for comparison with the enhanced specification models discussed below.

### **Enhanced Student Population Controls**

Table 2 presents results for the same six regression models with specification enhanced to include special needs and gifted populations. As the output suggests, the inclusion of these populations has a significant impact on the overall production function. In each case, the model  $R^2$  was increased, suggesting that the overall explanation of test score variance was improved by two percentage points through the inclusion of special needs and gifted populations. The percentage of special needs students in a district is significantly and negatively associated with student outcomes in each of the six models. A one-percent increase in special needs students is associated with a decrease in average test scores of between 2.75 and 5.49 points depending on the subject matter and grade level under analysis. Gifted populations are also significantly associated with student outcomes in two-thirds of the models, indicating substantial increases in test scores for each one percent increase in gifted students.

Also of importance is the shift in relationship between instructional expenditures and student outcomes. In five of the six models, the parameter estimate for instructional expenditures has taken on a positive coefficient in relation to student outcomes (compared to negative coefficients in each of the baseline models). While the t-tests for these parameter

Table 2.2  
Production Function Models with Special Needs and Gifted Student Populations

|                      | 6th Grade |         | 7th Grade |         | 8th Grade |          |
|----------------------|-----------|---------|-----------|---------|-----------|----------|
|                      | Math      | Reading | Math      | Reading | Math      | Reading  |
| Instructional \$     | 3.63      | 3.10    | 2.89      | 1.16    | -2.36     | 0.70     |
| Support Service \$   | 4.94      | 2.71    | 7.56      | 7.11    | 7.40      | 5.15     |
| Non-Instructional \$ | 30.58     | 42.53*  | 20.18     | 48.97** | 20.93     | 56.65**  |
| Special Needs        | -5.49**   | -3.91** | -4.22**   | -2.77** | -2.75*    | -3.80**  |
| Gifted               | 3.53*     | 2.91*   | 3.11      | 3.56**  | 2.51      | 4.06**   |
| Low-Income           | -1.56**   | -2.01** | -2.12**   | -2.14** | -1.97**   | -2.40**  |
| Non-White            | -0.78**   | -0.61** | -1.28**   | -0.74** | -1.11**   | -0.81**  |
| ADM (ln)             | -0.39     | 5.22    | 16.91**   | 10.93** | 19.26**   | 11.62**  |
| Teacher Experience   | 2.95*     | 2.86*   | 2.80      | 1.77    | 2.43      | 0.96     |
| Urban                | -11.59    | -13.27  | -2.59     | 0.244   | -2.09     | 10.16    |
| Rural                | -13.51*   | -4.36   | -20.76**  | -10.57* | -18.55**  | -15.16** |
| Intercept            | 1522.48   | 1355.00 | 1387.48   | 1340.78 | 1317.11   | 1413.60  |
| R <sup>2</sup>       | 0.43      | 0.61    | 0.56      | 0.69    | 0.50      | 0.66     |

\*p ≤ 0.05, \*\*p ≤ 0.01

estimates are not significant at the  $p \leq .05$  level, the shift is still notable, particularly because the sample (N=448) represents approximately 90% of the Commonwealth's total school district population (N=500), suggesting that the results may be indicative of a real and present relationship that is unlikely to be due to sampling error.

Once again, the low-income and non-white student percentages demonstrate consistent and significant negative coefficients, further supporting the previously established link between socioeconomic environmental factors and schooling outcomes. The statistical significance of teaching experience is mildly reduced by the inclusion of special needs and gifted populations, though average years of experience does remain a significant predictor in one-third of the models. The significant relationship between logged ADM and student outcomes also persists in two-thirds of the models. The rural environmental control is significant in five of the six models, supporting previously established claims regarding the challenges of delivering cost-effective, quality education to rural schools (for discussion see Howley, Rhodes, and Beall, 2009). The urban control variable does not demonstrate a statistically significant relationship with student outcomes, though the relatively small number of urban districts in the analysis (N=16) may account for this outcome.

### **Disaggregated Instructional Expenditures**

The final series of production function models, which are presented in Table 3, build upon the previous models by further disaggregating instructional expenditures into four subcategories: (1) regular instructional programs, (2) special education, (3) vocational education, and (4) other instructional programs. Each subcategory is measured in thousands

Table 2.3  
 Comprehensive Production Function Models, Disaggregated Expenditures

|                      | 6th Grade |         | 7th Grade |          | 8th Grade |          |
|----------------------|-----------|---------|-----------|----------|-----------|----------|
|                      | Math      | Reading | Math      | Reading  | Math      | Reading  |
| Instructional \$     | -         | -       | -         | -        | -         | -        |
| Regular Programs     | 7.19      | 5.85    | 6.47      | 4.40     | 0.16      | 3.10     |
| Special Education    | 0.11      | 2.37    | 4.80      | -0.28    | -6.17     | -1.22    |
| Vocational Education | 3.90      | -10.85  | -39.63**  | -26.74** | -35.75*   | -23.22*  |
| Other Programs       | -2.46     | -4.26   | -10.30    | -8.42    | 7.39      | 2.34     |
| Support Service \$   | 3.83      | 1.82    | 6.37      | 6.38     | 7.23      | 4.70     |
| Non-Instructional \$ | 26.19     | 34.51   | 2.08      | 36.12**  | 12.19     | 48.48*   |
| Special Needs        | -5.32**   | -3.85** | -4.22**   | -2.59**  | -2.30     | -3.56**  |
| Gifted               | 3.46      | 2.78*   | 2.80      | 3.33**   | 2.21      | 3.85**   |
| Low-Income           | -1.50**   | -1.92** | -1.92**   | -2.01**  | -1.94**   | -2.34**  |
| Non-White            | -0.78**   | -0.66** | -1.42**   | -0.81**  | -1.17**   | -0.87**  |
| ADM (ln)             | -2.42     | 4.68    | 15.13**   | 9.95**   | 18.69**   | 11.04*   |
| Teaching Experience  | 2.64      | 2.62*   | 2.49      | 1.52     | 2.58      | 0.93     |
| Urban                | -13.13    | -14.65  | -5.03     | -2.72    | -5.16     | 8.13     |
| Rural                | -13.40    | -3.82   | -19.26**  | -9.57*   | 17.28**   | -14.25** |
| Intercept            | 1521.30   | 1359.10 | 1400.99   | 1348.26  | 1321.26   | 1417.90  |
| R <sup>2</sup>       | 0.43      | 0.61    | 0.57      | 0.70     | 0.51      | 0.66     |

\*p ≤ 0.05, \*\*p ≤ 0.01

per pupil. As with the parameter estimates for instructional expenditures above, the slope coefficients for regular instructional programs are not significant at the  $p \leq .05$  level, though as a near population level analysis, they are still instructive. In each case the parameter estimate for regular instructional programs is substantially larger than the equivalent estimate for instructional expenditures in the previous models. This can be explained by the negative slope parameters associated with special education, vocational, and other program expenditures. Particularly, in two-thirds of the models, vocational expenditures are significantly related to dramatic decreases in average student test scores. To extrapolate upon Wenglinsky's (1997) earlier findings, this suggests that within the broader category of instructional expenditures, some subcategories are associated with higher student achievement while others are not. In particular, isolating expenditures dedicated to regular instruction may be more important to uncovering the underlying relationship sought by production function researchers. The parameter estimates of these financial disaggregations should not be over-interpreted for prediction purposes, but the overall trends that they point toward should receive further attention.

As in the previous models, the importance of controlling for special needs and gifted populations is underscored. The negative relationship between special needs populations persists in five of the six models even after disaggregating instructional expenditures. Gifted populations also continue to demonstrate a positive influence on student outcomes, though this trend is more significant in the analysis of readings scores than in mathematics. At each grade level, the production function models presented above explain a greater degree of variance in reading scores than in mathematics. As in the previous models, the low-income

and non-white variables continue to demonstrate a consistently significant and negative relationship with educational productivity, as measured by standardized test performance. The statistical significance of teaching experience is largely eliminated by the inclusion of disaggregated instructional expenditures, though the slope coefficients remain consistent throughout each stage of the analysis. The parameter estimates for both ADM and rural environments remain significant at both the 7<sup>th</sup> and 8<sup>th</sup> grade levels for each subject area, suggesting an important underlying relationship in each case. Through both the overall goodness of fit measures and the individual variable coefficients, the results seem to suggest that financial disaggregation and enhanced student body controls lead to improved model specification in production function analysis.

### **Discussion**

Despite the conclusions of the Coleman Report (1966) and many subsequent studies, education economists and policy analysts have continued to pursue more robust specifications of the production function model, holding to the premise that resource inputs *should* help to explain educational productivity. While they are far from a conclusive vindication in this pursuit, the results of this article suggest that these basic intuitions have merit and that the goals of production function research may continue to be advanced through the pursuit of more detailed data and improved model specification. Several implications for both policy and research arise from these results, particularly with regard to financial resource allocations and student body characteristics. Before proceeding to a further discussion of these matters, it is important to once more stress that a district level analysis

such as this can be very valuable for highlighting general trends and informing wider policy debates about the relationships between various resource inputs and student outcomes. However, caution should be exercised with regard to the interpretation of parameter estimates for predictive purposes. Specific prediction equations derived from a district level production function would be subject to a fallacy of division and should therefore not be employed in isolation as a predictive tool for analyzing proposed changes to resource allocation policies.

With that said, the results do suggest several significant relationships, particularly with regard to the impact of student body characteristics on educational productivity. As would be expected from previous analyses, socioeconomic characteristics such as poverty and race continue to have a consistent and significant impact on student outcomes. This article builds on the demonstrated importance of these student body characteristics by revealing profoundly significant relationships between special needs/gifted populations and standardized testing outcomes. Not only does the inclusion of these factors significantly increase the overall explanatory power of the production functions, but they also seem to moderate the initially negative effect within the instructional expenditure category itself, undoubtedly due to the higher instructional costs associated with educating special needs children. This is demonstrated by the directional change in coefficients for instructional expenditures once these factors are accounted for (Table 2). Most importantly, this suggests that many previous studies, due to a lack of available data, may have severely understated the relationship between educational expenditures and student outcomes. The increasing

availability of these student population data open the door for future production function analyses to reexamine these relationships at a variety of schooling levels and locales.

Also of significance is the further disaggregation of instructional expenditures, which reveals the potential for differing relationships within the instructional subcategories. For instance, many studies have found a significant relationship between instructional expenditures and student outcomes (Dee, 2005; Ferguson and Ladd, 1996; O'Connell Smith, 2004), but this analysis finds a strong negative relationship between the vocational expenditure subcategory and test scores. These types of counter-pressures across the subcategories suggest that the role of instructional expenditures may still be understated, even in those studies which have found them to be significant. Building on these results, future production function analysis may need to consider more detailed expenditure classifications in order to achieve truly exogenous measures of resource inputs. The goal for future analyses may be more accurately seen, not as determining whether inputs influence production, but rather understanding how different inputs influence output in different ways. The policy outcomes associated with these types of analyses would necessarily be more nuanced, though in the long run they would presumably be more effective.

A final implication which arises from this analysis is the potential for multiple production functions underlying the educational process. Monk (1989) speculated that different production functions may exist for different combinations of student characteristics, and we may add to this different combinations of school/district characteristics. For example, different combinations of outcomes may lead to different models based on gender, race, metropolitan locale, and even subject matter. At least two elements of this analysis lend

themselves to this possibility: (1) the differences in overall variance explained for reading versus mathematics tests, and (2) the significant decreases in test scores associated with rural settings. Each of these findings suggests that outcomes may be shaped by inputs differently across subject matters and environmental settings, which would be consistent with the open-systems nature of the dominant organizational theories. If the relationships that undergird educational production do vary systematically across these and other dimensions, the methodological challenges that confront future research will be dwarfed only by the normative challenges that emerge in subsequent policymaking decisions. However, these factors must be given consideration if future research is to more accurately delineate the relationships between resource inputs and educational outcomes.

### **Conclusion**

As attempts to understand the fundamental relationship between resource inputs and student performance outputs persist, these results help to focus attention on two particular areas that should be considered important in future production function models: (1) the inclusion of special needs and gifted population controls, and (2) the further disaggregation of instructional expenditures to account for potential counter-pressures among the subcategories. Results suggest that the absence of these factors from previous models may have significantly contributed to the appearance of a non-relationship between financial inputs and educational production, and failure to consider these factors in future studies may cause the impact of financial inputs to remain understated, with significant ramifications for

subsequent policy dialogs. Confirmation of these results will require further research and analysis across multiple schooling locales and varying levels of aggregation.

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## **Chapter 3**

### **A Hierarchical Logistic Analysis of Extracurricular Involvement and Student Dropout**

## **Abstract**

*Previous research has suggested that extracurricular participation is related to a reduced likelihood of high school dropout, particularly among traditionally at-risk students. While these findings have been consistent with theoretical assumptions, they have not generally accounted for school level, random effects. Building on this foundation, the current research uses social control theory to examine the impact of extracurricular participation on the likelihood of dropout among a nationally representative sample of high school students across three years of schooling. Hierarchical logistic models reveal a strong and consistent relationship between extracurricular involvement and a reduced likelihood of student dropout. Policy implications are discussed in light of recent budgetary trends.*

*Keywords: Dropout, Extracurriculars, Extracurricular Activities, Social Control Theory, Student Engagement.*

## Introduction

High school dropout is associated with a number of negative social and economic outcomes, including reduced lifetime earnings and a greater likelihood of unemployment (Chapman, Laird, Ifill, and KewalRamani, 2011), as well as higher rates of criminal activity and welfare dependency (Levin and Bellfield, 2007). The negative economic and social ramifications of high school dropout create a pressing policy concern both at the school and governmental level, and while national dropout trends are down over recent years, rates for traditionally disadvantaged groups remain well above the national average. As of 2010, status dropout rates<sup>2</sup> in the United States were 7.4 %, but dropout rates among African American and Hispanic males reached 9.5% and 17.3% respectively (Snyder and Dillow, 2012). As a result, an extensive body of academic research has focused on the antecedents and consequences of high school dropout from a variety of theoretical and disciplinary perspectives. One common area of consideration has been the potential relationship between student dropout and participation in extracurricular activities such as school sports and academic/fine arts programs.

To date, several studies have directly examined the relationship between extracurricular participation and student dropout (Davalos, Chavez, and Guardiola, 1999; Mahoney, 2000; Mahoney and Cairns, 1997; McNeal, 1995; Melnick, Sabo, and Vanfossen, 1992). Collectively, these studies have tended to demonstrate a positive relationship between extracurricular involvement and student retention (Feldman and Matjasko, 2005), which is

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<sup>2</sup> The Status Dropout rate refers to "... 16-24 year olds who are not enrolled in school and who have not completed a high-school program, regardless of when they left school. People who have completed GED credentials are counted as high school completers" (Snyder and Dillow, 2012: 183).

consistent with theoretical assumptions as well as much of the broader academic literature on extracurricular involvement and deviant behavior. However, thus far, sufficient attention has not been paid to the importance of school level effects in this line of research. Prior studies have demonstrated the importance of school level, random effects in the general analysis of student dropout (Goldschmidt and Wang, 1999; Hanushek, Lavy, and Hitomi, 2008; McNeal, 1997), suggesting that a reexamination of extracurricular involvement should be undertaken, with school level effects considered. The timing of such an analysis is appropriate, as recent fiscal constraints are leading many school districts to cut funding from extracurricular budgets, while others have begun moving toward the assessment of student participation fees for more costly activities such as organized sports and cheerleading (Hoff and Mitchell, 2007; Kronholz, 2010). A more thorough understanding of the multilevel relationship between extracurricular involvement and dropout would help to better inform such policy initiatives.

In an effort to address this gap, the current research examines the relationship between extracurricular involvement and high school dropout among a nationally representative sample of adolescents (ELS 2002/04). Hierarchical logistic models are constructed to examine the impact of various patterns of participation on the odds of high school dropout between the 10<sup>th</sup> and 12<sup>th</sup> grade years (controlling for known correlates and antecedents of school dropout). Additional models also consider potential differences across various racial/ethnic groups. The research design's time-lagged nature allows for the consideration of some previous selection bias concerns (Fredricks and Eccles, 2006; Shulruf,

2010), though additional limitations are also discussed. In light of previously mentioned trends, particular attention is paid to the policy implications of the current research.

### **Theoretical Framework**

Early theoretical approaches to high school dropout focused on identifying the individual, student level factors associated with leaving school prior to graduation, such as race, socioeconomic status (SES), and family circumstances (Bradley and Renzulli, 2011; Fall and Roberts, 2012). Subsequent researchers distinguished between “push-out” and “pull-out” forces at work in student dropout decisions. Pull-out theories were derived from the logic of economic cost-benefit analyses. They suggest that students may leave school as a result of rational calculation, based on factors such as employment opportunities and family obligations (Bradley and Renzulli, 2011; McNeal, 1997; Stearns and Glennie, 2006). In contrast, push-out theories focused on systemic, school-based factors such as disciplinary issues and grade retention, which are believed to pressure students out of the academic system (Bradley and Renzulli, 2011; Fine, 1986; Stearns and Glennie, 2006). Empirical models based on these constructs have helped to identify several risk factors consistently associated with high school dropout, including poor academic achievement (Battin-Pearson, Newcomb, Abbott, Hill, Catalano, and Hawkins, 2000; Edelman, 1989), socioeconomic status (Battin-Pearson et al., 2000; Newcomb et al. 2002), race/ethnicity (Frase, 1989; Rumberger, 1987), academic risk factors (Newcomb et al. 2002; Staff and Kreager, 2008), and family/work responsibilities (Alexander, Entwisle, and Horsey, 1997; Stearns and Glennie, 2006).

Building on these earlier ideas, most recent theoretical approaches to high school dropout have focused on the more complex and dynamic processes underlying student engagement (Archambault, Janosz, Fallu, and Pagani, 2009; Fall and Roberts, 2012). While the operationalization of engagement has varied across theoretical applications (for examples, see Finn, 1989; Rumberger and Larson, 1998; Tinto, 1975;), the fundamental premise behind each is that greater engagement (attachment, involvement, belonging, etc.) leads to improved academic performance, which in turn reduces the likelihood of high school dropout (Sinclair, Christenson, Lehr, and Anderson, 2003). Recent findings have confirmed the importance of engagement as a construct in the study of high school dropout (Archambault et al. 2009; Janosz, Archambault, Morizot, and Pagani, 2008), and extensive longitudinal analysis has suggested that disengagement is not simply a near-term phenomenon, but rather a long-term process that occurs over the “life-course” of the student (Alexander et al., 1997).

The centrality of student engagement in modern dropout theories is derived largely from social control theory (Hirschi, 1969), which became one of the dominant theories of delinquency in the latter half of the twentieth century (Agnew, 1991; LaGrange & White, 1985). Similar to Hobbesian social contract theory, Hirschi’s (1969) social control framework rests on the initial assumption that delinquency is intrinsic to human nature, and thus it attempts to explain those forces which promote conformity to or compliance with desirable social norms. In the case of dropouts, this is consistent with the practical observation that students, if given the choice, would often prefer not to be in school. Their success and persistence in academic pursuits requires a motivation external to themselves.

Hirschi's (1969) theoretical construct helps to explain this motivation by examining the formation of social bonds between the individual (student) and the societal institution (schools). According to Hirschi (1969), these social bonds are comprised of four main elements: (1) attachment, (2) commitment, (3) involvement, and (4) belief. As the elements of these bonds grow stronger, the likelihood of delinquency is decreased. Hirschi's (1969) social control framework has been applied to academic contexts to explain school misbehavior (Peguero, Popp, Latimore, Shekarkhar, and Koo, 2011) as well as student dropout (McNeal, 1995). In each case, extracurricular participation was used as proxy for the involvement element of the social bond.

### **Previous Literature**

The use of extracurricular participation as a proxy for involvement in the formation of social bonds is consistent with the claim that "... extracurricular activities offer a means to express and explore one's identity, generate social and human capital, and offer a challenging setting outside of academics" (Feldman and Matjasko, 2005: 161). In consideration of this, and similar claims, an extensive and growing body of literature has examined the perceived benefits of extracurricular participation across a number of academic disciplines (Feldman and Matjasko, 2005). Extracurricular involvement has commonly been linked to positive academic achievement (Eccles and Barber, 2003; Broh, 2002; Fredricks and Eccles, 2006; Zaff, Moore, Papillo, and Williams, 2003), higher educational aspirations/outcomes (Fredricks, 2012, Gabler, 2004), and pro-social benefits such as reduced rates of delinquency/"risky behaviors" (Cohen, Taylor, Zonta, Vestal, and Schuster, 2007; Hollande

and Andre, 1987) and higher peer-status/self-esteem (Eder and Kinney, 1995). While some studies have demonstrated contradictory results (see Feldman and Matjasko, 2005 for discussion), the prevailing conclusions of prior research have generally supported extracurricular involvement as a positive contributor to both academic and social outcomes.

Studies which have directly examined the relationship between extracurricular involvement and student dropout have tended toward similar positive results, particularly with regard to athletic activities. In one early analysis, Melnick and Sabo (1992) found limited evidence that athletic participation was related to reduced dropout rates for some ethnic subgroups (black males and Hispanics). Davalos, Chavez, and Guardiola (1999) also considered racial/ethnic differences in their analysis of dropouts, and they found a strong connection between extracurricular involvement and a reduced likelihood of dropout regardless of gender and ethnicity. A subsequent logistic regression analysis conducted by McNeal (1995) found that certain types of extracurricular involvement were related to a reduced likelihood of dropout, while others were not. In particular, McNeal (1995) found athletic and fine arts programming to be related to reductions in the likelihood of dropout, while academic and vocational clubs were not. To the extent that athletic and fine arts activities have a greater task/teamwork orientation than more membership based clubs, these results may suggest support for the social bond argument discussed above. Similar results were found by Mahoney (2000), who found extracurricular participation to be related to reduced rates of dropout as well as other forms of deviance among high-risk adolescents.

While research on the benefits of extracurricular participation has tended to produce positive results, some concerns exist over the interpretation of these findings, particularly

with regard to random effects and causality/selection bias. Regarding the first concern, previous studies which have directly considered the potential impact of extracurricular participation on student dropout rates have not accounted for school level, random effects. This is now inconsistent with the current literature on high school dropout, which has identified a strong and significant school level effect on variance in student dropouts (McNeal, 1997). In order to account for these known effects, hierarchical modeling is necessary in studies of extracurricular participation and dropout.

Regarding the second concern (causality/selection bias), Shulruf (2010) recently reviewed a number of studies on the relationship between extracurricular participation and school-related outcomes, concluding that while associations are evident between the two, a strong case for causality has not been established. In summarizing his findings, Shulruf (2010) speculated that academically-inclined students may simply be more likely to participate in extracurricular activities such as academic clubs. Similar concerns have been raised in prior analyses (i.e. Fredricks and Eccles, 2006), though most studies have failed to account for potential selection bias effects. While the complete elimination of selection bias from student models is unlikely, the use of longitudinal data points with prior measures of academic orientation may help to address some concerns.

### **Hypotheses**

This article examines the impact of extracurricular involvement on high school dropout, after controlling for known predictors and antecedents. Using extracurricular participation as a proxy for *involvement* in the societal bond (Hirschi, 1969), it is expected

that extracurricular participation will strengthen the student's felt/perceived connection to the societal institution (school), thereby reducing the likelihood of deviance, in this case dropout.

*H1: Student participation in extracurricular programming during the 10<sup>th</sup> grade year will be associated with decreased likelihood of dropout between the 10<sup>th</sup> and 12<sup>th</sup> grade years, even after controlling for the known correlates of dropout.*

Additional models are also constructed in order to consider the impact that different levels of participation may have on dropout decisions. It has been suggested that both the breadth (range of extracurricular activities) and intensity (time dedicated to extracurricular activities) of extracurricular participation are significant predictors of student outcomes (Fredricks, 2012). This is consistent with Shulruf's (2010) contention that one indicator of causality would be the presence of a "dose response relationship", whereby greater amounts of participation would lead to increases in desired student outcomes, in this case, greater reduction in the likelihood of dropout.

*H2: Student participation in a greater number of extracurricular activities will lead to greater reductions in the likelihood of dropout, even after controlling for the known correlates of dropout.*

*H3: Greater time investments in extracurricular activities will lead to greater reductions in the likelihood of dropout, even after controlling for the known correlates of dropout.*

The operational usage of extracurricular and control variables is discussed in more detail in the data and methods section below.

## Methods

The data analyzed in this article are taken from the Education Longitudinal Study (ELS 2002), and they include measures from the base year survey (2002) as well as the first follow up year (2004). ELS is a nationally representative, multi-level, longitudinal survey sponsored by the U.S. Department of Education for the purpose of monitoring "...the transition of a national sample of young people as they progress from tenth grade through high school and on to postsecondary education and/or the world of work" (ELS 2002). The base year survey sample included over 15,000 students from 752 high schools.

Adjustments were made to the initial sample for the purposes of this study. With an eye toward public policy implications, only those students attending public schools at the time of the base year survey are included in this analysis (McNeal, 1997). The current study is also restricted to students who were respondents in both the base year and first follow up surveys. Students who failed to respond to the first follow up survey or joined the sample in the first follow up year or later are not included in this analysis, even if base year data were subsequently imputed. Missing data were addressed using multiple imputation in the IBM SPSS missing values module<sup>3</sup>. After these adjustments analyses were run on a sample of N=11,434 students, which was weighted to ensure representativeness. In order to test the hypotheses above, hierarchical logistic models were constructed using the generalized linear mixed modeling (GLMM) function in IBM SPSS (see Heck, Thomas, and Tabata, 2012).

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<sup>3</sup> In the case of multiple imputation, IBM SPSS produces pooled estimates for many procedures but not for generalized linear mixed modeling. Separate models were run for each data imputation; models reported in this analysis are chosen based on median Akaike Corrected Information Criteria (AIC).

Output data for the models are based on a binomial probability distribution with a logit link function.

### **Dependent Variable**

This study considers the impact of extracurricular participation on dropout rates over time (between the 10<sup>th</sup> and 12<sup>th</sup> grade years). As a result, the dependent variable for this analysis is derived from the respondent's dropout status at the time of the first follow up to the ELS survey (spring 2004). Students classified as early graduates, alternative completers (i.e. GED), or previous dropouts currently reenrolled are classified as non-dropouts for the purposes of this analysis. The binary nature of the dependent variable makes the use of a hierarchical logistic model appropriate (for discussion see Heck et al., 2012; McNeal, 1997).

### **Independent Variables**

Initially, three separate models are constructed, each for a distinct operational measurement of extracurricular involvement. (1) The first model measures the general effect of participation, which is disaggregated into athletic and academic programs. The quantity of activities is not measured, only participation or nonparticipation in the aggregate. A separate binary variable is used for both athletic and academic activities, as distinct types of extracurricular involvement potentially impact student outcomes differently (Eccles and Barber, 1999; McNeal, 1995). (2) The second model considers the breadth of extracurricular involvement by measuring the total number of extracurricular activities in which each student is involved. (3) The third and final model considers the intensity of participation by

measuring the total hours dedicated to extracurricular activities on a weekly basis. After considering the initial models, subsequent models are run for each of the three measures of extracurricular engagement across different racial ethnic categories, including African Americans, Hispanics, and Whites. These models allow for consideration of different relationships existing among different racial and ethnic groups. In order to draw reliable inferences regarding policy implications, extracurricular activities are limited in each case to organized, school sponsored programming. External or unorganized activities such as youth groups and intramural sports are not included.

Table 3.1  
Dependent/Independent Variables: Percentage Distributions

|                        | Yes  | No   |
|------------------------|------|------|
| Dropout                | 5.3  | 94.7 |
| Athletic Participation | 53.2 | 46.8 |
| Academic Participation | 53.6 | 46.4 |

\*Unweighted percentage distributions

### Control Variables

Based on the literature review above, several known causes and antecedents of high school dropout are controlled for in each model. At the student level, base-year controls are included for gender, socioeconomic status (SES), academic performance, student employment, and an index of student risk factors. Socioeconomic status is measured as a continuous index variable which is created by ELS through the combination of parental education, occupation, and income variables. Student employment is measured as a binary variable signifying whether or not the student was employed for income during the academic

year. Academic performance is measured as a composite of English and mathematics tests, which have been re-standardized to a national norm. Finally, the index of student risk factors includes a sum total of six potential academic risk factors, including (1) single-parent household, (2) parents without high school diplomas, (3) a sibling who has dropped out of school, (4) two or more prior school changes, (5) prior grade retention, and (6) household poverty. The relevance of these index components is consistent with the findings of previous literature (Goldschmidt and Wang, 1999).

The inclusion of composite test scores and academic risk factors accounts in part for potential selection biases among academically inclined students. Because education is a cumulative process, the inclusion of these base-year variables helps to account for academic orientation as demonstrated through prior performance. At the school level, additional controls are included for school level SES, school size, and the percentage of students classified as “Limited English Proficient”. Based on the available ELS data, both SES and school size are measured as ordinal scales, with SES operationalized as the percentage of students enrolled in free and reduced lunch programs.

## **Results**

Hierarchical modeling is employed when assumptions of uncorrelated error are violated, as is commonly the case with nested observations, such as students in schools. The null/unconditional model helps to confirm the use of hierarchical regression techniques by gauging the amount of variance in the outcome variable between schools. In this case a random effect variance (intercept) estimate of 14.6 is significant at the  $p \leq .05$  level,

demonstrating that the variability across schools is statistically significant, and that hierarchical logistic modeling is an appropriate technique for this analysis.

### **Control Variables**

Table 2 provides statistical output for each of the three initial models. Dropout is selected as the outcome category, and the log odds coefficients indicate the direction of all bivariate relationships. This means that negative coefficients are related to decreased odds of dropout, whereas positive coefficients are related to increased odds of dropout. For ease of interpretation, exponentiated odds ratios are also included (in parentheses); these denote the change in the odds of a student dropping out given a one unit increase in the independent/control variable. The control variables included in this analysis consistently followed the precedent of previous research.

Gender, composite test scores, academic risk factors, and student employment were significant in each of the initial models, each demonstrating an anticipated relationship to dropout. Socioeconomic status also demonstrated an anticipated relationship with student dropout in each of the initial models, though it was only significant at the  $p \leq .10$  level. Once all other factors were controlled, being male increased the likelihood of dropout in each of the three models. Academic risk factors were also positively related to dropout in each model; as expected, a greater number of risk factors led to a greater likelihood of dropout. For example, in model 1, the presence of each additional risk factor indicated that a student was 1.68 times more likely to drop-out of high school (*ceteris paribus*). Consistent with previous literature, higher levels of academic achievement and socioeconomic status were

both negatively related to student dropout. In other words, higher levels of SES and academic performance led to a decreased likelihood of dropout.

### **Independent/Extracurricular Variables**

As shown in Table 2, the results suggest a significant and consistent relationship between extracurricular involvement and reduced odds of student dropout. The first model gauges the impact of participation in athletic and academic activities distinctly. Both demonstrate negative coefficients, suggesting a negative orientation to the odds of dropout, and both are significant at a  $p \leq .01$  level. The odds ratio (0.483) for athletic activities indicates that participation in a school sport reduces the odds of dropout by a factor of 0.483. This can also be inverted for ease of interpretation ( $1/0.483$ ), which would indicate that students involved in at least one extracurricular sport have 2.07 times the odds of remaining in school than those who are not. This suggests that the impact of extracurricular athletics on student dropout is extremely profound. As a reference for comparison, note that the odds ratio for an increase of one academic risk factor is 1.68 in the same model. Likewise, the inverted odds ratio for participation in extracurricular academic activities ( $1/0.546$ ) is 1.83, indicating a similarly profound impact on student retention.

In the subsequent models, the breadth and intensity of extracurricular involvement were considered with regard to their impact on student dropout. In model 2, the total number of extracurricular activities was negatively related to the likelihood of dropout, with an odds ratio of 0.816. The inverted ratio ( $1/0.816$ ) indicates that for each additional extracurricular

Table 3.2  
 Extracurricular Involvement and High School Dropout (All Races)

|   | Model 1<br>(Participation) | Model 2<br>(Breadth) | Model 3<br>(Intensity) |
|---|----------------------------|----------------------|------------------------|
| Log Odds Coefficients (Exponentiated Odds Ratios) |                            |                      |                        |
| Intercept   | -3.435 (0.032)***          | -3.561 (0.028)***    | -3.837 (0.022)***      |
| Extracurricular Participation                     |                            |                      |                        |
| Athletic Activities                               | -0.728 (0.483)***          | -                    | -                      |
| Academic Activities                               | -0.606 (0.546)***          | -                    | -                      |
| Total Number of Activities                        | -                          | -0.203 (0.816)***    | -                      |
| Total Extracurricular Hours                       | -                          | -                    | -0.083 (0.920)***      |
| Control Variables                                 |                            |                      |                        |
| Gender (Male)                                     | 0.259 (1.295)*             | 0.263 (1.301)**      | 0.298 (1.347)**        |
| Socioeconomic Status                              | -0.194 (0.823)*            | -0.229 (0.796)*      | -0.222 (0.801)*        |
| Academic Risk Factors (Index)                     | 0.519 (1.680)***           | 0.533 (1.704)***     | 0.522 (1.685)***       |
| Composite Test Score                              | -0.052 (0.950)***          | -0.054 (0.947)***    | -0.051 (0.950)***      |
| Student Employment (Yes)                          | 0.587 (1.798)***           | 0.586 (1.797)***     | 0.556 (1.743)***       |
| Random Effects                                    |                            |                      |                        |
| Total Enrollment (Scale)                          | -0.049 (0.953)             | -0.034 (0.967)       | -0.020 (0.980)         |
| Percent Free Lunch (Scale)                        | 0.004 (1.004)              | 0.015 (0.985)        | -0.006 (0.994)         |
| Percent LEP                                       | 0.028 (1.028)**            | 0.028 (1.029)**      | 0.026 (1.026)**        |

\*\*\* p≤.01, \*\*p≤.05, \* p≤.10

activity (athletic or academic), students are 1.22 times less likely to dropout. Model 3 considered the average number of hours spent on extracurricular activities per week. This was also negatively related to the likelihood of dropout, with an odds ratio of 0.920. The inverted ratio ( $1/0.920$ ) indicates that for each additional hour of extracurricular activity, students are 1.09 times less likely to drop-out of high school. Collectively, these results suggest that participation in extracurricular activities reduces the likelihood of dropout as previously hypothesized.

After considering the initial models, subsequent models were run with the sample disaggregated into major racial/ethnic categories, including (1) African Americans, (2) Hispanics, and (3) Whites. Other racial/ethnic categories were excluded due to sample size constraints and/or a lack of theoretical implications. The disaggregated models for participation in athletic and academic activities are shown in Table 3 below. Several significant distinctions arise among the disaggregated models. Most relevant to the current study are differences in the impact of extracurricular activities among African American students. The inverted odds ratio for athletic participation among African American students ( $1/.254$ ) is 3.94, showing that African American students who participated in athletics during the tenth grade year had nearly four times greater odds of still being enrolled in high school two years later than African American students who did not participate. This contrasts to inverted odds ratios of 1.44 and 1.88 among Hispanics and White respectively. These findings suggest that athletic participation has a significantly greater impact on student retention among African American students than among others. Furthermore, participation in academic activities was associated with reductions in the odds of dropout among White

and Hispanic students, but it was not significantly related to dropout among African Americans.

Table 3 also shows that African American and Hispanic males have substantially greater odds of dropping out than females, though gender was not a significant factor among Whites. Academic risk factors and composite test scores remained consistent predictors of dropout across all racial/ethnic categories, though the importance of student employment was most significant among Hispanics. Hispanic students who were employed outside of school had 2.62 greater odds of dropping out than those who were not. The increased odds for white students were only 1.47, and student employment was not a significant predictor of dropout among African American students. Interestingly school level enrollment was negatively related to the likelihood dropout among White students, which may be due in part to higher rates of dropout in smaller, rural schools. The percentage of LEP students in a school was related to increased likelihood of dropout among African American and White students, though not among Hispanics, suggesting potential peer-group effects at the school level.

Tables 4 and 5 depict the breadth and intensity models, again disaggregated by racial/ethnic groups. The models continue to suggest substantially higher rates of dropout among African American and Hispanic males, as well as consistent significance of academic risk factors and composite test scores as predictors of dropout among all groups. Student employment is consistently most significant among Hispanic students, for whom it substantially increases the odds of dropout in each model. This suggests that patterns of employment among the Hispanic population may be more likely to impede the completion of

Table 3.3  
 Extracurricular Involvement and High School Dropout (Participation Models)

|   | African American<br>(N=1,763) | Hispanic<br>(N=1,793) | White<br>(N=5,835) |
|---|-------------------------------|-----------------------|--------------------|
| Log Odds Coefficients (Exponentiated Odds Ratios) |                               |                       |                    |
| Intercept   | -3.447 (0.032)*               | -3.283 (0.038)**      | -3.756 (0.023)***  |
| Extracurricular Participation                     |                               |                       |                    |
| Athletic Activities                               | -1.372 (0.254)***             | -0.694 (0.500)**      | -0.532 (0.587)**   |
| Academic Activities                               | -0.341 (0.711)                | -0.618 (0.539)*       | -0.589 (0.555)***  |
| Control Variables                                 |                               |                       |                    |
| Gender (Male)                                     | 1.454 (4.280)***              | 0.658 (1.930)***      | -0.139 (0.870)     |
| Socioeconomic Status                              | -0.469 (0.626)*               | 0.375 (1.455)         | -0.563 (0.569)**   |
| Academic Risk Factors (Index)                     | 0.565 (1.760)***              | 0.438 (1.549)***      | 0.574 (1.775)***   |
| Composite Test Score                              | -0.071 (0.932)***             | -0.083 (0.920)***     | -0.064 (0.938)***  |
| Student Employment (Yes)                          | 0.328 (1.388)                 | 0.963 (2.620)***      | 0.386 (1.471)*     |
| Random Effects                                    |                               |                       |                    |
| Total Enrollment (Scale)                          | -0.054 (0.947)                | -0.030 (0.970)        | -0.226 (0.797)*    |
| Percent Free Lunch (Scale)                        | -0.353 (0.702)                | -0.063 (0.939)        | 0.030 (1.031)      |
| Percent LEP                                       | 0.065 (1.067)**               | 0.021 (1.021)         | 0.054 (1.056)***   |

\*\*\* p≤.01, \*\*p≤.05, \* p≤.10

Table 3.4  
 Extracurricular Involvement and High School Dropout (Breadth Models)

|   | African American<br>(N=1,763) | Hispanic<br>(N=1,793) | White<br>(N=5,835) |
|---|-------------------------------|-----------------------|--------------------|
| Log Odds Coefficients (Exponentiated Odds Ratios) |                               |                       |                    |
| Intercept   | -3.869 (0.021)**              | -3.752 (0.023)***     | -3.940 (0.019)***  |
| Extracurricular Participation                     |                               |                       |                    |
| Total Number of Activities                        | -0.174 (0.840)**              | -0.151 (0.860)**      | -0.197 (0.822)***  |
| Control Variables                                 |                               |                       |                    |
| Gender (Male)                                     | 1.276 (3.581)***              | 0.637 (1.890)***      | -0.110 (0.896)     |
| Socioeconomic Status                              | -0.495 (0.610)*               | 0.293 (1.340)         | -0.589 (0.555)***  |
| Academic Risk Factors (Index)                     | 0.561 (1.753)***              | 0.417 (1.517)***      | 0.590 (1.805)***   |
| Composite Test Score                              | -0.066 (0.936)***             | -0.082 (0.921)***     | -0.066 (0.936)***  |
| Student Employment (Yes)                          | 0.309 (1.362)                 | 0.930 (2.533)***      | 0.382 (1.466)*     |
| Random Effects                                    |                               |                       |                    |
| Total Enrollment (Scale)                          | -0.037 (0.964)                | -0.019 (0.981)        | -0.214 (0.807)     |
| Percent Free Lunch (Scale)                        | -0.410 (0.661)                | -0.037 (0.964)        | 0.032 (1.033)      |
| Percent LEP                                       | 0.065 (1.067)***              | 0.026 (1.027)**       | 0.054 (1.056)**    |

\*\*\* p≤.01, \*\*p≤.05, \* p≤.10

Table 3.5  
 Extracurricular Involvement and High School Dropout (Intensity Models)

|   | African American<br>(N=1,763) | Hispanic<br>(N=1,793) | White<br>(N=5,835) |
|---|-------------------------------|-----------------------|--------------------|
| Log Odds Coefficients (Exponentiated Odds Ratios) |                               |                       |                    |
| Intercept   | -4.860 (0.008)***             | -4.014 (0.018)***     | -4.069 (0.017)***  |
| Extracurricular Participation                     |                               |                       |                    |
| Total Extracurricular Hours                       | -0.051 (0.950)*               | -0.109 (0.897)***     | -0.066 (0.937)**   |
| Control Variables                                 |                               |                       |                    |
| Gender (Male)                                     | 1.324 (3.762)***              | 0.667 (1.948)***      | -0.064 (0.938)     |
| Socioeconomic Status                              | -0.510 (0.601)**              | 0.320 (1.378)         | -0.597 (0.560)**   |
| Academic Risk Factors (Index)                     | 0.556 (1.744)***              | 0.395 (1.484)***      | 0.578 (1.783)***   |
| Composite Test Score                              | -0.060 (0.941)***             | -0.079 (0.924)***     | -0.065 (0.937)***  |
| Student Employment (Yes)                          | 0.250 (1.284)                 | 0.909 (2.482)***      | 0.380 (1.463)*     |
| Random Effects                                    |                               |                       |                    |
| Total Enrollment (Scale)                          | 0.011 (1.011)                 | 0.006 (1.006)         | -0.202 (0.817)     |
| Percent Free Lunch (Scale)                        | -0.298 (0.742)                | 0.014 (1.014)         | 0.021 (1.021)      |
| Percent LEP                                       | 0.062 (1.064)**               | 0.017 (1.017)         | 0.052 (1.054)***   |

\*\*\* p≤.01, \*\*p≤.05, \* p≤.10

high school than among other groups. The breadth and intensity of extracurricular participation have fairly consistent impacts on student dropout across racial/ethnic groups.

### **Discussion**

This study has considered the influence of extracurricular participation on dropout among a nationally representative sample of high school students. Hierarchical logistic models were utilized to account for school level, random effects, which have generally been absent from prior analyses. Social theory and longitudinal data points were employed in order to build a stronger case for causality in the observed relationships. While these components help to mitigate selection biases, limitations still apply to the present study as well as others of its kind. The current findings support the general consensus reached by previous studies, demonstrating a significant relationship between extracurricular participation and reduced likelihood of high school dropout, even after controlling for other known causes/antecedents. The impact of extracurricular athletic activities on student retention was particularly pronounced among African American students, though the results were also statistically significant for Hispanics and Whites. The large effect sizes associated with athletic and academic activity participation in the initial model runs contrary to the small and/or negligible effect sizes found in many previous studies (Shulruf, 2010). This may be due in part to variations in model specification, including the presence of level two, random effects.

These findings have significant public policy implications with regard to recent budgetary trends. As mentioned in the introduction, many school districts have sought to

address fiscal shortfalls by reducing extracurricular budgets, cutting programs and activities, or charging student fees for participation. While the budgetary constraints currently facing policy makers and school administrators are significant, policies that reduce extracurricular involvement should be considered in light of the economic and social costs of high school dropout. Based on current and previous findings, these programs seem to be directly contributing to student socialization and reducing the likelihood of dropout. Cutting these programs for financial reasons may result in unexpected and negative educational outcomes. Social justice concerns also arise, as policies that cut extracurricular programming or assess participation fees are likely to be regressive in nature, leading to the exclusion of low SES and minority students who are already at higher risk of dropping out. As this analysis shows, extracurricular involvement may have profound student retention benefits among traditionally disadvantaged groups.

This study found statistically significant reductions in the odds of dropout associated with both the breadth and intensity of extracurricular involvement. However, the largest extracurricular effect sizes were those associated with the most basic measures of involvement. For educators and administrators, the challenge posed by these data is simply to get students involved. While the social and economic antecedents of dropout are generally outside the control of school administrators, extracurricular programming provides a potential avenue for addressing dropout behavior through school/district level policy. One potential use of extracurricular programming would be for administrators to incentivize participation among academically at-risk students. Furthermore, because student disengagement is now recognized as a long-term process, expanding opportunities and

creating a culture of participation in early grades may help to prevent some of the negative ramifications of disengagement in later grades.

Finally, these and previous findings may also have implications for both the use of social control theory in educational analysis and the ongoing debate over school size. Further research and theoretical development is required in order to better understand the complex relationship between societal bond formation and student outcomes, but this analysis suggests that greater student involvement may lead to a greater likelihood of student retention, and presumably high school completion. Subsequent research should consider the role of extracurricular activities in social bond formation, as well as the impact of societal bonds on additional student outcomes. With regard to school size issues, while economies of scale may favor larger schools, research has shown that extracurricular participation is significantly higher at smaller schools. To the extent that participation is related to increased engagement and reduced incidences of dropout, smaller schools may prove more socially beneficial, particularly for at risk students.

### **Conclusion**

In conclusion, these results do indicate a significant relationship between extracurricular participation and reduced likelihood of high school dropout, even after controlling for known antecedents and school level effects. However, caution should be exercised when interpreting these or other results. While this article helps to address the need for hierarchical analysis in this area, the ability to control for selection bias with secondary data is limited. Significant concerns remain regarding causality and the belief that

academically engaged students are more likely to participate in extracurricular activities.

Addressing these concerns fully would require extensive longitudinal data that spanned the life course of the student in order to capture early manifestations of disengagement. Through the use of sound theory and base-year indicators, this analysis helps to advance this process, but more research is needed. Qualitative/case-study analysis may also help to further our understanding in this area.

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