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DISSERTATION

Family Factors and Student Outcomes

Nailing Xia

This document was submitted as a dissertation in December 2009 in partial fulfillment of the requirements of the doctoral degree in public policy analysis at the Pardee RAND Graduate School. The faculty committee that supervised and approved the dissertation consisted of Richard Buddin (Chair), Sheila Nataraj Kirby, and Vi-Nhuan Le.



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To my father

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EXECUTIVE SUMMARY

This study distinguishes two types of factor factors—family process variables (i.e., specific things families do) and family status variables (i.e., who families are), and examines their respective effects on student outcomes. Each of the three chapters investigates this central research theme from a different angle. Using a U.S. longitudinal dataset, Chapter 1 looks at the effects on academic achievement while Chapter 2 focuses on nonacademic outcomes. Chapter 3 examines the academic effects of family factors in an international setting. While each chapter stands alone as a complete research paper, this summary pulls the findings together in an attempt to answer the overarching research question.

Chapter 1 Findings

Results from the analysis of U.S. data support the notion that family process factors are important predictors of student achievement. Family process variables explained 21 percent of the between-child variation in reading scores and 18 percent of the between-child variation in mathematics scores. As shown in Table 1, the inclusion of the family process variables in the regression models resulted in smaller coefficients of family status variables (in absolute value), suggesting that family process variables collectively explain a good portion of the achievement gaps by race, SES, and family structure. Moreover, the negative association between the single-parent household and student achievement was no longer significant after controlling for family process variables. This result somewhat mirrors the findings in previous literature that family structure (single-parent versus two-parent families) was statistically insignificant after controlling for other family factors such as income, mother’s characteristics, and family resources (Grissmer et al., 1994). Despite the sharp decrease in magnitude, most of these family status variables were still statistically significant and had larger effect sizes than many family process variables.

Table 1. Chapter 1: Family Status Variables in Baseline and Family Process Models

Family Status Variables	Reading		Mathematics	
	Baseline	Family Process	Baseline	Family Process
Black	-0.410**	-0.358**	-0.915**	-0.780**
Hispanic	-0.173**	-0.147**	-0.337**	-0.265**
Asian	0.443**	0.369**	0.457**	0.429**
Other race	-0.192**	-0.134**	-0.395**	-0.302**
SES	0.526**	0.337**	0.585**	0.404**
Single-parent household	-0.093**	-0.031	-0.070**	-0.013
Other type of household	-0.260**	-0.187**	-0.272**	-0.138

NOTE: Effect Sizes. * indicates significance at .05 level, ** indicates significance at .01 level.

Student achievement was found to be positively associated with a number of family process variables including high parental expectations and beliefs; higher frequency of doing homework, reading books, and using home computers; access to more resources such as books, newspapers, magazines, dictionaries, encyclopedia, pocket calculators, home Internet availability, and child’s own community library card; fewer negative sentiments from parents towards children and child-rearing; and parental involvement in school events, regular communication with parents of child’s peers, and involvement in artistic or cultural activities outside of school. Consistent with previous literature, student achievement was shown to be negatively associated with frequent help with homework (Milne et al., 1986; Shumow and Miller, 2001; Henderson and Mapp, 2002). In addition, achievement was also found to be negatively related with frequent involvement of children in sports-related activities.

Although statistically significant, many of these family process variables had small effect sizes, suggesting a lack of practical importance in their influence over student achievement. However, several variables showed average or above average effect sizes, suggesting both statistical and substantive importance in their relationship with student achievement (see Table 2).

Table 2. Chapter 1: Family Process Variables of Statistical and Substantive Importance

Family Process Variables	Reading		Mathematics	
	Estimate	Effect Size	Estimate	Effect Size
Degree expected	3.643**	0.294**	2.927**	0.311**
Belief in reading performance ¹	13.036**	1.054**	N/A	N/A
Belief in math performance	N/A	N/A	11.634**	1.238**
Home Internet access	2.556**	0.207**	2.479**	0.264**
Parents feeling child harder to care	-4.740**	-0.383**	-3.794**	-0.404**
Frequent help with reading homework	-6.128**	-0.495**	N/A	N/A
Frequent help with math homework	N/A	N/A	-5.722**	-0.609**

NOTE: * indicates significance at .05 level, ** indicates significance at .01 level.

Results of the interaction models revealed that in terms of student achievement in reading and mathematics, black children, compared with their non-black peers, had lower returns to a number of family process factors (such as ownership of home computers, number of books available for child use at home, and involvement in artistic or cultural activities). Only child’s ownership of a community library card appeared to have a higher return for blacks than for

¹ The relationship between parental belief about child’s academic performance and student achievement may indicate reverse causality.

their non-black peers, with an effect size of 0.20 for reading and an effect size of 0.22 for mathematics. Moreover, children with low SES background tended to have higher returns to such factors as doing homework more frequently, home Internet access, and child’s ownership of a community library card. All these effect sizes for the interaction terms with SES were small, with an exception of interaction term between home Internet access and SES, which showed an effect size of -0.201 for reading achievement.

Chapter 2 Findings

Chapter 2 examines the relationship between family factors and nonacademic outcomes, and results indicate that family process factors collectively are important predictors of nonacademic outcomes. As shown in Table 3, controlling for family process factors reduced the magnitude of the effects of SES and family structure although most coefficients were still statistically significant. This reduction in coefficient magnitude suggests that while family status factors are important, better family process explains a good portion of the differences in outcomes by SES and family structure. However, there was not much difference in the effects of race between the baseline and family process models.

Table 3. Chapter 2: Family Status Variables in Baseline and Family Process Models

Nonacademic Outcomes	SES		Single-Parent HH		Other Type HH	
	Baseline	Family Process	Baseline	Family Process	Baseline	Family Process
Approaches to learning	0.182**	0.123**	-0.093**	-0.076**	-0.261**	-0.253**
Self-control	0.129**	0.097**	-0.091**	-0.083**	-0.186*	-0.152
Interpersonal skills	0.145**	0.106**	-0.096**	-0.081**	-0.254**	-0.218*
Externalizing problem behaviors	-0.093**	-0.070**	0.090**	0.084**	0.158*	0.141
Internalizing problem behaviors	-0.124**	-0.083**	0.164**	0.157**	0.261**	0.251**

NOTE: Effect sizes. * indicates significance at .05 level, ** indicates significance at .01 level. HH stands for household.

While many family process factors were statistically insignificant, several variables were found to be significantly associated with multiple dimensions of nonacademic outcomes even after controlling for demographics and school inputs. Higher parental expectations was associated with all five nonacademic outcomes including higher ratings in approaches to learning, self-control, and interpersonal skills, and fewer internalizing and externalizing problem behaviors. Greater parental involvement in school activities was correlated with higher ratings in approaches to learning, self-control, and interpersonal skills, and fewer internalizing problem behaviors. Moreover, less frequent use of spanking was correlated with higher ratings in approaches to learning, self-control, and

interpersonal skills, and fewer externalizing problem behaviors. Although statistically significant, most of these variables showed small effect sizes.

Interaction models showed that only several variables were statistically significant in both the main effects and interaction terms and that most of these significant variables indicated lower returns to nonacademic outcomes for black or low SES children than for their counterparts. One variable, child’s ownership of a community library card, showed a significantly higher return in terms of self-control for low SES children, but the effect size was small.

Chapter 3 Findings

Results from the analysis of a cross-country dataset are consistent with findings based on the U.S. data in Chapter 1. As shown in Table 4, the effects of SES on student achievement reduced by one third after controlling for family process factors, suggesting the importance of family process factors in explaining achievement collectively. However, SES remained statistically significant in the family process models.

Table 4. Chapter 3: Family Status Variables (SES) in Baseline and Family Process Models

Family Status Variables	Mathematics		Science	
	Baseline	Family Process	Baseline	Family Process
SES	0.302**	0.186**	0.290**	0.170**

NOTE: Effect Sizes. * indicates significance at .05 level, ** indicates significance at .01 level.

Several family process variables appeared to be significantly associated with achievement even after controlling for demographics, school inputs, and country fixed effects. Better performance in mathematics and science was associated with ownership of home computers, home Internet access, and number of books at home. Students who reported spending no time on homework or self-study tended to score lower in both subjects than those who reported spending more than zero and less than four hours per week. Performance and time spent on attending out-of-school lessons were inversely related, suggesting the possibility that less able students required more outside help. As shown in Table 5, several family process variables showed average or above average effect sizes.

Table 5. Chapter 3: Family Process Variables of Statistical and Substantive Importance

Family Process Variables	Mathematics		Science	
	Estimate	Effect Size	Estimate	Effect Size
Time on homework/studying: never	-27.720**	-0.307**	-25.248**	-0.259**
Number of books at home: 0-25 books	-20.899**	-0.232**	-26.075**	-0.267**
Number of books at home: 101 or more	21.540**	0.239**	23.091**	0.237**

Time on out-of-school lessons: never	23.609**	0.262**	21.584**	0.221**
Time on out-of-school lessons: frequent	-13.988**	-0.155**	-25.279**	-0.259**

NOTE: * indicates significance at .05 level, ** indicates significance at .01 level.

The international comparison of student achievement indicates that U.S. students scored significantly below the international average in both mathematics and science, which are consistent with findings from existing literature (Baldi et al., 2007; Juvonen et al., 2004; Lemke et al., 2004; Miller et al., 2009; Provasnik, Gonzales, and Miller, 2009). U.S. students ranked above only one country in mathematics and three other countries in science. After controlling for student, family, and school factors, U.S. students still showed significantly lower average scores than 17 jurisdictions in mathematics and 16 jurisdictions in science.

Several family process variables showed differential effects on student achievement between the U.S. and the other two country groups (Western countries and East Asian economies), with most of these differential effects existing between the U.S. and East Asian economies.

Conclusions and Policy Implications

Taken together, findings of this study suggest that family process factors can have significant impacts on both academic and nonacademic outcomes. When considered collectively, family process variables appeared to be important factors in explaining student outcomes. Once controlling for family process factors, coefficients of the family status variables became smaller in magnitude. For example, the black-white achievement gap reduced by 13 percent for reading and 15 percent for mathematics based on the U.S. data. The international data showed that the achievement gap by SES reduced by approximately one third after controlling for family process variables. Individually, many family process variables were significantly associated with student achievement and some were associated with nonacademic outcomes, although most had small effect sizes.

Although most family status variables remained to be statistically significant and have relatively large effect sizes even after controlling for family process factors, it is imperative to understand that family status factors are *unchangeable* characteristics of families. In contrast, family process factors are *alterable* features that can be influenced through programs designed to increase parental awareness of the importance of education, to improve parenting skills, and to help low-income families gain access to home and community resources for educational purposes, among other things. As this study points out the importance of family process factors in explaining student outcomes and

achievement gaps, policymakers may consider investing in family process factors as one promising alternative for improving educational outcomes.

Despite the promising findings, there are many unanswered questions with respect to the development of effective policy interventions. Here, two issues are raised in terms of the policy design. First, while many family process variables were found to be significantly associated with student outcomes, it is unclear what are the underlying causes that drive the observed relationships. In most cases, the individual family process variable measured in this study in and of itself probably does not cause positive results, and there is more to what each variable implies. For example, child's ownership of a community library card was significantly associated with both academic achievement and nonacademic outcomes, and its interaction terms with race (black versus non-black) and SES were shown to be statistically significant as well. However, giving out community library cards to children is unlikely to have much an effect on improving student outcomes. Instead, the ownership of community library cards can imply multiple parental behaviors such as parental encouragement of library visits, parental involvement in getting a card, going to the library together, and signaling the enjoyment of reading. In fact, previous literature found evidence suggesting that parental involvement contributed to better student outcomes but such involvement appeared to be "a manifestation of parental enthusiasm and positive parenting style" (Zellman and Waterman, 1998, p. 370). Thus, intervention programs might be more effective if they focus on such underlying constructs.

A second issue is to what extent the intervention programs should focus on single factors versus subgroups of factors. For example, the ownership of community library cards and parental involvement in educational activities may be an issue of parents' availability and willingness to get involved. Other family process variables such as ownership of home computers for child's use and home Internet access may concern monetary resources. Yet others, such as parental expectations about child's educational attainment and discipline, may be more about parental attitudes and parenting skills. Each implies a different way of approaching from a policy perspective. Moreover, it is unclear whether investing in one aspect of the factors can lead to spurious effects on other factors. For example, it is possible that an intervention program aiming at promoting positive parenting skills and attitudes towards education might increase parents' willingness to be involved in their children's education. Thus, parents who otherwise would not have time might make adjustments to find time for their

children. As current research findings do not provide clear-cut answers to these issues, further research is needed for effective policymaking in this regard.

Future research should also examine the effects of existing parenting programs on changing parental behaviors and student outcomes, and whether and to which extent the effects on student outcomes are mediated through changes in parental behaviors. Previous research revealed that some intervention programs (such as center-based programs with a parenting component) appeared to be effective in improving parenting skills as well as children's cognitive outcomes, and that some of the program effects on children were mediated through effects on parents (Brooks-Gunn and Markman, 2005; Love et al., 2002; Reynolds, 1994). However, these programs are typically designed for at-risk children in their early years and the development of parenting skills is only one component of the intervention. Recognizing the importance of parental involvement for school-age children, several urban school districts, in recent years, started "parent universities" designed to get parents more involved in their children's education.² As these parent programs are still in their infancy, the effectiveness of such programs are largely unclear and remain as an interesting topic for future research.

² Established in 2005, Miami-Dade's Parent Academy offers more than 100 workshops that have benefited over 120,000 participants. Parent Universities in Philadelphia and Boston were established in 2009 and offer around 30 workshops (Cruz, 2009).