IS GENDER BIAS IN EDUCATION MEDIATED BY SIBLING CONFIGURATION? : EVIDENCE FROM EGYPT

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Abstract

In this paper, the Resource Dilution model of parental investments in children is tested using nationally representative survey data on Egyptian adolescents. I investigate the statistical associations between adolescent educational attainment and three characteristics of the sibling group (size, ordinal position, and gender composition), and their interactions with the respondent's gender. Findings show that sibship size has a net negative association with school enrolment, continuation, and completed years of education. Contrary to Resource Dilution evidence from Western settings, first-born children in Egypt are disadvantaged relative to their later-born peers. The presence of older sisters in one's sibling group has a particularly strong positive effect on schooling, indicating that girls may be withheld from school to free up or generate resources for their younger siblings' education. While gender remains among the strongest determinants of education, sibling configuration plays a large role in mediating its impact. Revisions to the Resource Dilution mechanisms linking family structure to adolescents' gendered outcomes are offered in conclusion.

Introduction

Despite precipitous decline in fertility rates and the attendant family changes in Egypt, there has been little exploration of the interplay between household characteristics and individual welfare. Today, the mean household size is 5.2 persons, and a greater proportion of households are nuclear than ever before. (El-Zanaty and Way 2001) (Nawar et al 1995) At the same time, Egypt has seen a sustained school-building campaign whose objective is to improve access to education. Although the gender gap in education has narrowed considerably, disparities persist in most geographic areas and population sub-groups. I demonstrate here that family structure plays an important role in shaping gender inequalities during adolescence.

This paper explores the impact of family structure - in particular the composition of the sibling group and the position of the individual within it - on educational attainment through the conceptual lens of the Resource Dilution model. Based on the premise that individual outcomes are determined primarily by the allocation of finite parental resources to their children, the model posits that there is a trade-off between the quantity and quality of children. Furthermore, the model states that resource flows directed towards or away from a given child will depend on the configuration of the siblings competing for the same resources. I use national survey data on Egyptian adolescents collected in 1997 to test the model's applicability to the Egyptian setting. Paying special attention to interactions with gender, I examine the association between educational attainment and 1- *number of siblings*; 2- *ordinal position in the sibling group*; and 3- *gender composition of the sibling group*.

Review of the Resource Dilution Literature

The Resource Dilution hypothesis evolved from Neoclassical economic theories of the household in order to explain a widely observed inverse relationship between the size of the sibling group and individual welfare. The Resource Dilution hypothesis, one of whose earliest proponents is Judith Blake (1981, 1985), has appropriated the basic Neoclassical economic premise that child quality competes with child quantity. This perspective emphasizes resource constraints, conceiving of parental resources available for investment in children as finite, and in most iterations of the hypothesis, largely fixed. As such, the value of resources allocated to each child shrinks with the birth of each new addition to the sibling group, thus explaining the finding that child welfare declines as the number of children increases.[1] In contrast to Neoclassical theory, Resource Dilution acknowledges that there may be differentials in parents' resource transfers among children that are made not on the basis of both calculations of future productivity, but are dictated by the expedience of family resource constraints. The Resource Dilution perspective's attention to sibling configuration as an analytic tool facilitates exploration of these differentials. Sibling configuration encompasses the size of a child's sibship, the ordinal position of a child within the sibship, the gender composition of the sibship, and the spacing of children within the sibship – all of which influence the value and timing of parental investments. (Steelman et al 2002)

The first prediction this perspective makes regarding the linkages between sibling configuration and child welfare is that as the number of siblings increases educational and cognitive performance diminishes. A great deal of evidence has consistently lent credence to this prediction in Western societies. An inverse relationship between sibship size and educational outcomes, net of various controls, has also been demonstrated in Taiwan (Parish and Willis 1993), Malaysia, the Philippines, Vietnam (Buchmann 2000), Thailand (Knodel, Havanon and Sittitrai 1990), Brazil, and Columbia (Desai 1995). However, an almost equal volume of research indicates that this pattern does not hold in other developing societies, where the link between sibship size and education is neutral or positive. This includes 7 sub-Saharan African countries (Lloyd and Blanc 1996), Kenya (Gomes 1984; Buchmann 2000), and Botswana (Chernichovsky 1985).

Resource Dilution also predicts that performance should decline with each successive child, since first-born children enjoy the exclusive attention and outlays of their parents until the arrival of the next child, whose share of parental resources will be smaller, and so forth. (Blake 1981) It appears that educational investments are indeed distributed in favor of early-born children in many Western countries (Steelman et al 2002) and in Kenya (Gomes 1985). However, being later-born is advantageous to educational outcomes in Taiwan (Parish and Willis 1993), Ghana (Lloyd and Gage-Brandon 1994), and Botswana (Chernichovsky 1985).

The final prediction of the Resource Dilution Perspective posits that the presence of boys in the sibship impedes the opportunities of their sisters, since parents favor those children who are likely to optimize their investments. Steelman and colleagues report that findings on the sex composition front in the West have been contradictory and difficult to reconcile, and generally have a weak impact on individual outcomes. (Steelman et al 2002) Several developing-country studies present interesting results pertaining to gender and the arrangement of siblings. Anecdotal evidence from rural Egypt (Langsten et al 2002) points to parallels with two examples, those of Taiwan and Ghana. In each of these settings, older sisters tend to carry the burden of high fertility by staying out of school themselves, taking on productive roles in the home or

[1] This had been nuanced by recent extensions to the Resource Dilution hypothesis made by Robert Downey (1995), who argues that a distinction must be made between the various types of parental resources invested in children's education, such as interpersonal resources and economic resources.

marketplace, or marrying out of the household at an early age in order to free up resources for younger siblings. (Parish and Willis 1993) (Lloyd and Gage-Brandon 1994)

Perhaps the greatest challenge to the Resource Dilution school of thought emanates from claims that the relationship between sibling configuration - particularly sibship size - and various outcomes is spurious. (Kelley 1996) For example, in nearly all societies individuals of low socio-economic standing tend to have large families. This problem may be remedied by controlling for socio-economic background variables, and most studies still detect a net inverse relationship between sibship size and individual performance. (Downey 1995) If these initial circumstances of couples determine both family size and child outcomes, a mechanism of self-selection rather than the dilution of resources could be at work. (Knodel et al 1990) Alternatively, parents who have high expectations for their children's 'quality,' or who value parental interventions which enhance children's opportunities, may restrict fertility in order to achieve those goals - in other words, fertility and child education decisions may be made jointly.

The sibling configuration literature from the developing world has also leveled several important critiques which offer refinements to the Resource Dilution model. In many societies in sub-Saharan Africa the practice of child fostering offsets the negative association between sibship size and child welfare. (Lloyd and Blanc 1996) In this context, an implicit assumptions of the Resource Dilution hypothesis is overturned – namely, that parents are the primary source of educational resources for their children. (Desai 1995) Government subsidies and interventions which serve to ease the burden borne by parents may have the same effect. A third factor which undermines the relationship between parental resources and child welfare is the tendency for children to become economically productive at relatively early ages in the developing world[2]. Not only may children work to cover all or part of their own schooling-related expenses, but they may also work in order to finance that of their siblings, thus reducing the entire sibship's reliance on parental resources. (Knodel et al 1990)

These exceptions to the underlying assumptions of the Resource Dilution model have limited applicability to the Egyptian case. Child fostering is uncommon in Egypt. Furthermore, although public education in Egypt is nominally free, the state began introducing modest fees in the 1980's. One study estimates that in 1995, households' average annual expenditure on education was approximately $74, or 17% of GNP per capita. (Fergany 2000) Thus a substantial portion of the income of large low-income families is likely to be devoted to the school expenses of children, if they choose to enroll them in school. Child labor has been a widely documented in Egypt, even though it is difficult to quantify due to disputes over measurement.

The gender dimension of the Resource Dilution model may be particularly salient in the developing world. In many developing counties there is ample evidence that intra-household resource flows favor boys to the detriment of girls. In Egypt, boys are more likely to enter school than are girls, though once enrolled, girls' school retention rates exceed those of boys. (Suliman and El-Kogali 2002) This paper seeks to qualify these general patterns of female disadvantage by demonstrating that they are mediated by the sibling configuration of the girls in question. Kelley (1996) has argued that the influence of gender on educational opportunities varies systematically by sibship size, and it is not implausible that other characteristics of the sibling group also determine girls' educational outcomes.

[2] A 1998 estimate using an extended definition of the labor market states that 6.3% of children under 14 work. (Zibani 2002) The economic roles of Egyptian children are also gendered such that working girls tend to assist in household production and childcare, whereas working boys are employed as wage-earners in the marketplace.

Data and Methodology

I draw on data collected by the Adolescents and Social Change in Egypt (ASCE) survey, fielded in 1997. Multistage, stratified, probability and cluster sampling techniques were utilized in the ASCE survey to arrive at a nationally representative sample of 9,128 10 to 19 year-olds. Each adolescent respondent completed an interview covering topics related to education, economic roles, time use, and peers. (El Tawila et al 2000) I make use of data from the core adolescent questionnaire and the household roster, with records matched according to a unique household identifier. The core sample contained a number of sibling pairs, from which one adolescent was randomly selected to avoid over-sampling those from large families. In addition, all adolescents residing in extended family households[3] were filtered out of the sample, as well as a number of ever-married adolescent girls.

I make use of two measures of educational attainment in this analysis. The first is school attendance status, and indicator consisting of three dummy variables: *currently enrolled*, *enrolled in the past*, and *never enrolled*. The second is an index measuring *years of education* completed, representing the proportion of the years of education the reference adolescent has actually completed to the total possible years of education for that age.

The first explanatory variable employed in the present analysis is the *number of siblings*[4] a reference adolescent has. The second predictor is the reference adolescent's ordinal position in the age hierarchy of the sibling group, using three dummy variables: *first-born*, *middle-born*, or *last-born* child. Neither of these includes those who are only children, who were assigned a separate dummy variable. The third set of predictors combines two characteristics of the sibling group, its gender composition and the ordinal position of the reference adolescent: the *number of older sisters*, the *number of older brothers*, the *number of younger sisters*, and the *number of younger brothers*. Background characteristics including socioeconomic status, father's and mother's education, rural or urban residence, as well as age and gender were controlled for.

I use multinomial logistic regression and multiple linear regression to test the association between educational attainment and various characteristics of the sibling group. Interactions of the sibling configuration variables with gender are introduced in each of the models. Indeed, it is difficult to interpret the intra-household allocation of resources predicted by the Resource Dilution model according to sibling configuration if the gender of the reference individual is not accounted for, even if its proponents have been largely silent on the matter.

Results

Is the Number of Siblings Negatively Associated with Education?

The first prediction which arises from the Resource Dilution model is that, due to the finite nature of parental resources, the quantity and quality of children in the family will be inversely related. To test this hypothesis I model the educational outcomes

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[3] There are a number of problems with this group of adolescents, which comprise 25% of the original sample. First, it is not clear what resources matter for these adolescents (those of the nuclear family or those of the entire household) and with whom they compete for human resource investments. Second, there appears to have been a great deal of misreporting or miscoding of kin relations for this group in the data.

[4] I define "siblings" to be all those who share at least one parent with the reference adolescent and currently reside in the same household. Although age and sex of siblings of reference adolescents was recorded in the household roster, data was gathered on those who usually reside in the household, and excludes siblings who have left the home, or siblings who have died. This is a key limitation of the data in that competition with older siblings in childhood may have affected early schooling trajectories. At the same time, since interest is in resources, those present in the household reflect actual competition for resources.

school attendance status and years of education as a function of the reference adolescent's sibship size.

The reference adolescent's *school attendance status* is estimated using multinomial logistic regression. The odds-ratios for the categories currently enrolled and previously enrolled are calculated relative to the base category never enrolled in school, and are displayed in Table 1. The sibship size coefficient is highly significant in all of the models tested, and its relationship with having ever enrolled in school is consistently negative. Model 1 adjusts for the respondent's characteristics age and gender, while a block of social background variables are added in Model 2, which yields the better fit. Since the gender-sibship size interaction tested in Model 3 is not significant, the estimates in what follows derive from the main effects in Model 2.

When all else is held constant, an increase of one child to the sibling group reduces the reference adolescent's odds of being currently enrolled in school by 24% compared to having never enrolled. As expected, the likelihood of school dropout increases with each year of age. Although the sibship size coefficient is only slightly reduced once social background variables are introduced in Model 2, it is clear that the magnitude of these factors far surpasses that of family size. Residing in an urban area, as well as each additional qualification carried by the adolescent's parent(s) more than doubles the odds of being currently enrolled in school; and the latter set of controls have a marginally smaller influence on having been enrolled in the past. Another highly significant predictor, gender, clearly plays the greatest role in shaping the schooling status of Egyptian adolescents. If the reference adolescent is female rather than male, her odds of being currently enrolled decline by 80%, and her odds of having been enrolled in the past decline by 77%.

The detrimental effect of having many siblings, however, does not differ significantly depending on gender, as demonstrated by Model 3. It is interesting to note that if the respondent is female, each additional sibling is associated with an *improvement*, if very slight, in the chances of being currently enrolled or having been enrolled in the past, relative to having never enrolled.

Table 1. Multinomial Logistic Regression of Schooling Status on Number of Siblings

	Model 1		Model 2		Model 3	
Variables	Currently Enrolled Exp (B)	Previously Enrolled Exp (B)	Currently Enrolled Exp (B)	Previously Enrolled Exp (B)	Currently Enrolled Exp (B)	Previously Enrolled Exp (B)
Number of Siblings	.697***	.812***	.755***	.818***	.746***	.794**
Age	.920***	1.368***	.852***	1.333***	.851***	1.333***
Gender (Female)	.255***	.268***	.200***	.231***	.187***	.192***
Socio-Economic Status	-	-	1.664***	1.350***	1.665***	1.351***
Father's Education	-	-	2.330***	1.804***	2.330***	1.805***
Mother's Education	-	-	2.771***	1.767**	2.770***	1.765
Residence (Urban)	-	-	2.330***	2.724***	2.327***	2.719***
Female x No. Of Siblings	-	-	-	-	1.014	1.050
Degrees of Freedom	6		14		16	
-2Log Likelihood	1129.254***		3448.106***		3447.739	

NOTES: Figures represent Odds Ratios for the multinomial logistic regression of schooling status on number of siblings with a reference category of "never enrolled". In the final row, p's represent the significance of the change in the –2Log Likelihood from the previous model. (N=4804)
* p<.05, **p<.01, ***p<.001

SOURCE: Adolescents and Social Change in Egypt, 1997

Next, I examine the statistical effects of sibship size on the *years of education index* using multiple linear regression (see Table 2). Again, the reference adolescent's number of siblings emerges as a highly significant predictor of years of education attained which withstands controlling for age, gender, and background characteristics. As sibship size increases, years of education attained decrease. In Model 2, where main effects with controls are displayed, we see that each additional sibling and each year of age have an approximately equal statistical effect. The coefficients for socio-economic status and father's education, which enhance an adolescent's years of education, are similar in magnitude to sibship size and age. Curiously, as mother's education increases, years of education attained by the reference adolescent declines slightly. All of the abovementioned predictors, however, are dwarfed by gender, and being female remains the greatest risk factor for educational attainment. Urban residence emerges as the second-most important determinant of years of education completed.

Unlike the outcome school attendance status, the interaction between gender and the years of education outcome is highly significant, as demonstrated by Model 3. The number of siblings of the reference adolescent has a more deleterious effect if the adolescent is a girl than if the adolescent is a boy. Clearly, the size of an adolescent's sibship interacts with gender to produce stratified educational outcomes.

Table 2. Multiple Linear Regression of Years of Education Index on Number of Siblings

	Model 1	Model 2	Model 3
Variables	Unstandardized Coefficients (B)	Unstandardized Coefficients (B)	Unstandardized Coefficients (B)
Constant	1.233***	1.150***	1.112***
Number of Siblings	-.038***	-.021***	-.009*
Age	-.016***	-.018***	-.018***
Gender (Female)	-.059***	-.065***	.011
Socio-Economic Status	-	.026***	.025***
Father's Education	-	.024***	.024***
Mother's Education	-	-.010*	-.009*
Residence (Urban)	-	.049***	.050***
Female x No. of Siblings	-	-	-.025***
Adjusted R^2	.085	.189	.194
Degrees of Freedom	3	7	8
F Statistic	114.593***	123.049***	111.232***

NOTES: Figures represent the Unstandardized Coefficients from the regression of an index of years of education completed on number of siblings. In the final row, p's represent the significance of the change in F from the previous model. (N=4804)
* p<.05, **p<.01, ***p<.001

SOURCE: Adolescents and Social Change in Egypt, 1997

What Effect Does Ordinal Position Have on Education?

In the following section, I explore the association between the reference adolescent's birth order and education, while holding the total number of siblings constant. The Resource Dilution school of thought would predict that first-born children should surpass their later-born counterparts in various indicators of welfare, since they dominate parents' investment of resources until the arrival of the next child. To test this assertion, I regress the educational outcomes on dummy variables for whether the reference adolescent is the first-born, middle-born, or last-born child. Tables 3 and 4 suggest that the role of the control variables utilized in the previous

section remain largely unchanged. It also demonstrates that the ordinal position of the reference adolescent is not a significant predictor of educational attainment.

We see from Model 1 of Table 3 that being the middle-born child has negligible to small statistical effect on the odds of school enrollment and continuation. Being the last-born child, on the other hand, improves the odds that the reference adolescent is currently enrolled in the school system and the odds of having been enrolled at some point in the past, both by more than 50%. However, none of the coefficients for the ordinal position variables have statistically significant associations with this outcome.

In Model 2 I introduce interactions with gender. Although the interactions are not significant, they yield noteworthy patterns - namely, that being female and last-born reverses the direction of this birth order effect when all else is equal. In other words, the educational advantage of being the last-born child does not hold if the reference adolescent is a girl, in which case the odds of ever-enrollment decline because of gender.

Table 3. Multinomial Logistic Regression of Schooling Status on Reference Adolescent's Ordinal Position

	Model 1		Model 2	
Variables	Currently Enrolled Exp (B)	Previously Enrolled Exp (B)	Currently Enrolled Exp (B)	Previously Enrolled Exp (B)
Number of Siblings	.774***	.830**	.774***	.831**
Age	.853***	1.333***	.851***	1.333***
Gender (Female)	.198***	.225***	.163***	.197***
Socio-Economic Status	1.651***	1.339***	1.652***	1.339***
Father's Education	2.391***	1.829***	2.399***	1.841***
Mother's Education	2.776**	1.803*	2.776**	1.797*
Residence (Urban)	2.355***	2.733***	2.356***	2.728***
Middle-born	1.003	1.184	.848	.971
Last-born	1.552	1.596	1.165	1.499
Female x Middle-born	-	-	1.251	1.320
Female x Last-born	-	-	1.532	.947
Degrees of Freedom	20		26	
-2Log Likelihood	3443.321***		34439.022	

NOTES: Figures represent Odds Ratios for the multinomial logistic regression of schooling status on number of siblings with a reference category of "never enrolled". Birth order variables have the reference category "first born." In the final row, p's represent the significance of the change in the –2Log Likelihood from the previous model. (N=4804)
* p<.05, **p<.01, ***p<.001

SOURCE: Adolescents and Social Change in Egypt, 1997

When we turn next to the outcome *years of education*, these results are slightly different. Here, later-born siblings display a weak and statistically insignificant positive relationship with years of education compared to first-borns.

Adding the block of interactions with gender shows that being female reverses the birth order effect only for middle-born girls, an association which is marginally significant. This may point to an important non-linearity where middle-born girls are disadvantaged relative to first-borns as well as last-borns.

Table 4. Multiple Linear Regression of Years of Education Index on Reference Adolescent's Ordinal Position

Variables	Model 1 Unstandardized Coefficients (B)	Model 2 Unstandardized Coefficients (B)
Constant	1.156*	1.155*
Number of Siblings	-.023***	-.023***
Age	-.018***	-.018***
Gender – Female	-.068***	-.061***
Socio-Economic Status	.027***	.027***
Father's Education	.024***	.024***
Mother's Education	-.011**	-.011**
Residence – Urban	.049***	.049***
Middle-born	.006	.021
Last-born	.005	-.015
Female x Middle-born	-	-.029*
Female x Last-born	-	.042
Adjusted R^2	.189	.191
Degrees of Freedom	9	11
F Statistic	86.454***	67.618**

NOTES: Figures represent the Unstandardized Coefficients from the regression of an index of years of education completed on number of siblings. Birth order variables have the reference category "first born." In the final row, p's represent the significance of the change in F from the previous model. (N=4804)
* p<.05, **p<.01, ***p<.001

SOURCE: Adolescents and Social Change in Egypt, 1997

What Effect Does the Gender and Relative Age Composition of the Sibling Group Have on Education?

Proponents of the Resource Dilution perspective have argued that since a disproportionate share of parental resources are directed at early-born children and at male children, individuals with several older brothers are likely to be educationally disadvantaged. Controlling for a host of personal and social background characteristics, in what follows I model educational attainment as a function of the number of older and younger brothers and sisters that the reference adolescent currently resides with.

Tables 5 and 6 display the results of the regressions of *school attendance status* and *years of education* on the number of siblings of the four gender and relative age categories possible. A similar pattern of findings emerges across the two educational attainment indicators. In Model 1 of both tables, the majority of parameter estimates for the four categories of siblings are shown to be significant net of controls for the reference adolescent's age and gender. In Model 2 of Tables 5 and 6, social background controls are added, significantly improving the fit of both regressions and thereby providing the optimal model.

We see here that the most consistent finding is that the greater the number of older sisters, the more favorable are the reference adolescent's educational outcomes. An additional older sister significantly improves the chances of being currently enrolled by 45%, and significantly improves the chances of having had some schooling as opposed to no schooling whatsoever by 33%. As number of sisters increases, so do the years of education completed by the reference adolescent, albeit by a small but still significant margin.

The number of siblings of other gender-relative age categories all have a deleterious effect on educational attainment when all else is held constant. Older brothers, followed by younger brothers, followed by younger sisters (in order of

decreasing strength of the statistical effects) reduce the odds of being currently enrolled. The coefficients for these three predictors on this outcome are highly significant. The strongest relationship, that associated with the number of older brothers, cuts by 44% the odds that the reference adolescent is currently in school. On the other hand, the odds of having enrolled in the past but dropped out are reduced most by the presence of younger brothers (who lessen the chances of having been previously enrolled by 29%), followed by older brothers, followed by younger sisters. Turning next to Table 6, we see that for years of education completed, the number of younger brothers has the most detrimental effect on years of education, followed close behind by the number of older brothers, and finally younger sisters.

Interactions of the four predictors with the reference adolescent's own gender were added to the main effects in the third model tested. Examining school attendance status probabilities in Table 5, we see that if the reference adolescent is female rather than male, the odds of being currently in school are reduced by increasing numbers of younger brothers and younger sisters, though only by a few percentage points. The odds of current enrollment are boosted by a larger margin if the adolescent girl has a greater number of older brothers, and especially if she has a greater number of older sisters (by 11%). On the other hand, if one is female the likelihood of previous enrollment is raised by the number of younger brothers and older sisters, and depressed by the number of older brothers and younger sisters. However, none of these interactions are significant, unlike interactions with gender for the outcome variable years of education completed. Here, the benefit of having older sisters remains, but is not significant or very strong if the reference adolescent is female. The number of older brothers and younger sisters significantly reduces for girls the years spent in the school system to an equal degree. Increasing numbers of younger brothers have the most powerful and significant negative association with years of education if the respondent is female (see Table 6).

Table 5. Multinomial Logistic Regression of Schooling Status on Number of Siblings of each Gender-Relative Age Composition Category

	Model 1		Model 2		Model 3	
Variables	Currently Enrolled Exp (B)	Previously Enrolled Exp (B)	Currently Enrolled Exp (B)	Previously Enrolled Exp (B)	Currently Enrolled Exp (B)	Previously Enrolled Exp (B)
No. of Younger Sisters	.688***	.790***	.706***	.814*	.725*	.854
No. of Younger Brothers	.583***	.710***	.666***	.705***	.663**	.621***
No. of Older Sisters	1.179	1.173	1.453**	1.330*	1.349	1.215
No. of Older Brothers	.655***	.822**	.658***	.771**	.639**	.780
Age	.940*	1.392***	.884***	1.373***	.883***	1.370***
Gender (Female)	.273***	.281***	.208***	.240***	.201***	.204***
Socio-Economic Status	-	-	1.637***	1.328***	1.638***	1.327***
Father's Education	-	-	2.412***	1.867***	2.418***	1.870***
Mother's Education	-	-	2.777***	1.773	2.797***	1.787
Residence (Urban)	-	-	2.162***	2.595***	2.155***	2.601***
Female x No. of Younger Sisters	-	-	-	-	.966	.922
Female x No. of Younger Brothers	-	-	-	-	.985	1.228
Female x No. of Older Sisters	-	-	-	-	1.106	1.123
Female x No. of Older Brothers	-	-	-	-	1.043	.962
Degrees of Freedom	12		20		28	
-2 Log Likelihood	3745.412***		3403.985***		3397.659	

NOTES: Figures represent Odds Ratios for the multinomial logistic regression of schooling status on number of siblings with a reference category of "never enrolled". In the final row, p's represent the significance of the change in the –2Log Likelihood from the previous model. (N=4804)
* p<.05, **p<.01, ***p<.001

Table 6. Multiple Linear Regression of Years of Education on Number of Siblings of each Gender-Relative Age Composition Category

Variables	Model 1 Unstandardized Coefficients (B)	Model 2 Unstandardized Coefficients (B)	Model 3 Unstandardized Coefficients (B)
Constant	1.210***	1.133***	1.098***
No. of Younger Sisters	-.038***	-.022***	-.011
No. of Younger Brothers	-.055***	-.034***	-.012
No. of Older Sisters	.004	.013*	.011
No. of Older Brothers	-.046***	-.031***	-.020**
Age	-.015***	-.017***	-.017***
Gender (Female)	-.052***	-.059***	.015
Socio-Economic Status	-	.025***	.024***
Father's Education	-	.024***	.023***
Mother's Education	-	-.008*	-.008*
Residence (Urban)	-	.043***	.043***
Female x No. of Younger Sisters	-	-	-.023**
Female x No. of Younger Brothers	-	-	-.040***
Female x No. of Older Sisters	-	-	.007
Female x No. of Older Brothers	-	-	-.023*
Adjusted R	.103	.200	.207
Degrees of Freedom	6	10	14
F Statistic	71.327***	92.727***	69.267***

NOTES: Figures represent the Unstandardized Coefficients from the regression of an index of years of education completed on number of siblings. In the final row, p's represent the significance of the change in F from the previous model. (N=4804)
* p<.05, **p<.01, ***p<.001

SOURCE: Adolescents and Social Change in Egypt, 1997

Discussion and Conclusions

As we might expect from our review of the existing evidence from developing countries, the Resource Dilution hypothesis has limited utility in explaining how intrahousehold resource flows that determine educational attainment may be patterned according to sibling configuration. However, analysis of the ASCE data does provide evidence that household structure affects the gender disparities in education observed at the societal level.

The pivotal argument of the Resource Dilution model, that with increasing sibship size a child's share of parental resources and therefore the child's "quality" deteriorates, finds confirmation in the ASCE data. Sibship size displays a significant inverse association with educational attainment net of controls. The impact of sibship size clearly differs according to gender, although this interaction term acts in opposite directions for each of the educational outcomes tested. If we limit the discussion to statistically significant effects, it appears that larger sibships impede education for girls but not for boys.

Because the influence of gender and most social background variables exceed those of sibship size in the educational outcomes investigated here, the findings in support of Resource Dilution should not be overstated. As in any research based on survey data, there may well be critical determinants of adolescent education which have gone unmeasured. Nonetheless, it would seem that in the case of educational attainment of Egyptian adolescents at least, there is little basis for the contention that it is the initial circumstances of high-fertility couples that determines both the number and performance of their children since the sibship size effect persists after controls for social background are introduced.

Moving on to the second key premise of the Resource Dilution model tested, we see that contrary to the predictions of the Resource Dilution model, the educational attainment of first-born children in Egypt does not surpass that of higher-order siblings. As expected, being female generally reverses any benefits otherwise carried by the reference adolescent's birth order. If we assume that educational outcomes are primarily a product of parental investments, we may argue that resources are concentrated in last-born boys and that this is made possible by denying education to early-born siblings, a hypothesis supported by the fact that the educational achievements of first-born siblings are slightly poorer in comparison. Another interpretation of this finding is that later-born siblings are able to avail themselves of educational resources accumulated by older siblings (school uniforms, textbooks, etc.), as well as tutoring from older siblings. The operational definition of "sibling" I use, in which siblings not present at the time of the survey are not represented in the analysis, probably has the greatest impact on this component of the analysis. It may be that misclassification in the categories of first-born and middle-born has diluted the results of the analysis of ordinal position's statistical effects.

Internal educational differences among children in the same sibling group are highlighted further by considering the entire composition of the sibship, which verifies the Resource Dilution model's prediction regarding the negative impact of older brothers, However, anecdotal evidence from Egypt indicating that higher-order daughters are especially unlikely to attend school in circumstances of poverty, is supported. Educational attainment is positively and significantly associated with the number of older sisters. All other types of sibling significantly and strongly reduce educational attainment, particularly older and younger brothers. Combining this finding with those described above, namely that first-born girls tend to perform poorly educationally, would imply that additional siblings do not merely direct resources away from girls, but that older sisters sacrifice their own education in order to further the education of others. Whether the transfer of resources from older sisters to other siblings operates by their forgoing schooling and thereby freeing parental resources, or by their assumption of productive roles in the home or labor market is a question to be scrutinized in future analyses. Another legitimate interpretation may be that older sisters occupy a 'psuedo-parent' (Blake 1981) or socializing role, tutoring younger siblings if they themselves have received some schooling. (Phillips 1999) While this may explain the benefit accrued to younger siblings, it does not entirely account for the disadvantage of older sisters. Finally, gender interactions for educational attainment yields a mixed picture of findings in which patterns according to the presence of same-sex and older/younger siblings cannot be discerned.

To summarize, we have seen that although the predictions of the Resource Dilution model regarding ordinal position and gender-relative age composition of the sibling group are only partially upheld by the data from Egypt, the model is verified by the finding that child welfare declines as sibship size increases. Policymakers who assume there to be a link between high fertility and poor child outcomes at the level of the household are therefore largely correct. Whether this link is a causal one remains to be tested. Perhaps more important for policy and programming is the finding that other elements of family structure can exacerbate or mitigate the educational disadvantages of being female. (Kelley 1996) If Egypt is to achieve gender parity in basic education, first-born daughters in particular need to be targeted for interventions. Gender bias may be deeply rooted in Egypt, but its influence is differentiated by where girls fall in the configuration of their sibship.

The application of the Resource Dilution perspective to the case of Egypt in this study suggests that this causal model has potential for generalization beyond the Western

societies from which it arose. However, a number of revisions to the framework emerge from my discussion.

First, even in settings where parents exclusively make the resource investments (whether economic outlays or interpersonal care and attention) which determine child welfare, if the necessary infrastructures are absent, parental resources may not matter. A smaller sibling group is of no benefit to a given adolescent if the remote village in which she resides does not contain a school. (Desai 1995)

Second, the Resource Dilution perspective would do well to revive a proposition made by its Neoclassical predecessors, namely that parents optimally allocate children's time between education, leisure, and productive activities. The likelihood that parents will resort to the latter multiplies under conditions of extreme resource constraints, exacerbated by the strain of many children, and labor market demand for child labor. To conceive of children exclusively as consumers and the objects of parental investments is to obscure what are often formidable economic contributions throughout childhood and adolescence which alter the patterns of resource flows within the family.

Third, decision-making power must be recognized as residing in parents as well as others within and outside the household. Norms, as articulated and enforced by the behaviors of neighbors, media messages, and so forth, rather than resource availability per se may dictate the allocation of resources. In the popular quarters of Cairo, the social status of a family is demonstrated publicly by ensuring that its children acquire a primary school certificate. After this stage of schooling, continuation is predicated on financial ability combined with the child's perceived academic potential, and the child's willingness to proceed further[5]. (Hoodfar 1997) Socio-cultural norms and values similarly shape the gender biases which generate the disparities in education documented above, and should not be assumed to derive from considerations of differential labor market opportunities for boys and girls alone.

Finally, although the Resource Dilution perspective has made an important contribution by acknowledging competition among siblings, therefore highlighting conflicting interests within the household, parental benevolence is still assumed. (Yount 2003) Parents clearly do not equalize investments across children, nor do children reap the benefit of any one member's success equally. In a context where particular members are expected to sacrifice personal opportunities for the sake of the collective, coersion rather than the logic of complementarity of tasks may predominate. (Toth 1993) A deeper understanding of sibling dynamics necessitates further scrutiny of the power differentials characterizing the hierarchies which stratify the household.

[5] The agency of children is another dimension which deserves mention. According to Suliman and El-Kogali (2002), 12% of mothers surveyed in the 2000 Demographic and Health survey cited their child's desire to leave school as either the primary or secondary reason for the child's school dropout.

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