WORKING PAPERS

N° TSE-549

January 2015

"Does Improved Local Supply of Schooling Enhance Intergenerational Mobility in Education? Evidence from Jordan"

Ragui Assaad and Mohamed Saleh

Toulouse School of Economics

Does Improved Local Supply of Schooling Enhance Intergenerational Mobility in Education? Evidence from Jordan

By
Ragui Assaad
University of Minnesota
assaad@umn.edu

And
Mohamed Saleh
Toulouse School of Economics
& Institute for Advanced Study in Toulouse
mohamed.saleh@tse-fr.eu

Abstract

This paper examines the effect of increased local supply of schooling on intergenerational mobility in education in Jordan. We use a unique data set that links individual data on own schooling and parents' schooling for adults, from a household survey, with the annual supply of schools in the sub-district of birth, from a school census. We identify the effect by exploiting the variation in the supply of basic and secondary public schools across cohorts and sub-districts of birth in Jordan, controlling for both cohort and sub-district of birth fixed effects. School availability is determined based on the number of sex-appropriate public schools in the individual's sub-district of birth at the time the individual was ready to start that schooling stage. Our findings show that the local availability of basic public schools does in fact increase intergenerational mobility in education. For instance, an increase in the supply of basic public schools of one school per 1,000 people reduces the father-son and mother-son associations of schooling by 10 percent and the father-daughter and mother-daughter associations by nearly 30 percent. However, an increase in the local supply of secondary public schools does not seem to have a similar effect on intergenerational mobility in education.

JEL Classification: I24, I28
Keywords: Supply of schooling, education, intergenerational mobility, inequality of opportunity, Middle East

I. Introduction

Raising intergenerational mobility of educational attainment, or achieving greater equality of opportunity in the acquisition of human capital, is a major objective of public policy. It should therefore be of great interest to policymakers whether policies aimed at improving access to education by increasing the local supply of public schools actually increase intergenerational mobility in education. This result would only hold if the intergenerational persistence of educational attainment was perpetuated because of supply-side factors (e.g. limited local supply of schools or high tuition fees). If, on the other hand, a child's acquisition of education was constrained by parental attitudes toward education, high opportunity costs, or other demand side factors, increasing the local supply of public schools would not necessarily improve the average educational attainment, let alone that of the children of the poorest and most marginalized parents.

This paper employs new and unique data sources from Jordan, one of the so far understudied Middle Eastern countries, in order to examine the question of whether an increase in the local supply of public schools reduces the intergenerational persistence of educational attainment. The question is of major interest in the Middle East and other developing regions in the world, where many countries carried out state-led programs in the post-independence period in order to expand the supply of public schooling with the often-stated goal of raising equality of opportunity. It is particularly important to evaluate the effectiveness of these programs in reducing the intergenerational persistence of educational attainment and hence promoting equality of opportunity.

We employ a standard difference-in-differences approach to disentangle the impact of the expansion of public schooling on the correlation between a child's educational

attainment and that of his/her parents. In particular, we exploit the variation in the supply of public schools across cohorts and sub-districts of birth, and allow the effect of this variable to vary by parent's schooling. Our empirical strategy is a direct extension of that used in Duflo (2001) who looked at the impact of increased school supply on educational attainment. We add parents' schooling as an additional regressor and interact it with the local supply of public schools to obtain the effect of public school supply on the coefficient of intergenerational persistence of educational attainment.[1]

We employ the 2010 Jordanian Labor Market Panel Survey (JLMPS), which includes information on parents' schooling for every adult in the sample, along with the 2010 School Census produced by the Jordanian Ministry of Education (Hashemite Kingdom of Jordan 2010). The school census provides the sub-district, type, and date of establishment of every school in Jordan. The exposure of an individual to the supply of public schooling is determined by the number of sex-appropriate basic (or secondary) public schools (per 1,000 individuals) that were available to them in their sub-district of birth at the time they were of age to enroll in that school level (basic or secondary). The richness of the data set makes it the first in the Middle East to allow such a study.

The paper is linked to the vast literature on intergenerational mobility of educational attainment (Behrman et al. 1999; Salehi-Isfahani 2001; Dahan and Gaviria 2001; Checchi, Fiorio, and Leonardi 2008; Daouli, Demoussis, and Giannakopoulos 2010). One line of this literature focused on examining the impact of specific policies on educational mobility. For example, Behrman and Wolfe (1987) examined the relative impact of parental schooling versus school supply on child's educational attainment. Checchi,

[1] Potential endogeneity of parent's schooling is not a concern here because we are not interested in identifying the causal impact of parent's schooling on child's schooling but rather the effect of the expansion of public schooling on the correlation between parent's and child's schooling.

Ichino, and Rustichini (1999) and Davies, Zhang, and Zeng (2005) studied the effect of public versus private educational systems on mobility. Checchi and Flabbi (2007) studied the effect of secondary schooling tracks systems on mobility. Schütz, Ursprung, and Wößmann (2008) explored the impact of a number of educational policies on an index of equality of educational opportunity across countries. The paper makes two contributions to this literature: (a) it extends the analysis in Behrman and Wolfe (1987) by examining the impact of the expansion of the local supply of public schools on educational mobility. As far we know, this question has not been studied before. This policy is of primary relevance to the experiences of developing countries where public schooling was the only realistic means to eradicate illiteracy among the masses. (b) While previous mobility studies in the developing world examined outcomes for children who are co-resident with their parents, in order to be able to make use of standard surveys that lack longitudinal or retrospective data on parental characteristics, the JLPMS allows us to improve on these studies by including information on parental characteristics of all adults in the sample.

Our findings indicate that the supply of public basic schools does significantly increase the intergenerational mobility of education among adults in Jordan, but the supply of secondary schools does not have the expected effect. Increasing the supply of basic schooling by one school per thousand people (roughly equivalent to half a standard deviation of the basic school supply for sons and four fifths a standard deviation for daughters) reduces the father-son and mother-son intergenerational persistence coefficients by 10 percent, and reduces the father-daughter and mother-daughter coefficients by 34 percent and 26 percent, respectively. The reduction in intergenerational persistence of schooling appears to be stronger for the older cohort (born between 1940

and 1965) than the younger cohort (born between 1975 and 1985). This is consistent with the cohorts of Jordanians that experienced the most rapid increases in education in the post-independence period. In contrast, an increase in the supply of secondary schooling has no significant effect on the intergenerational persistence coefficients of sons, and is even associated with an increase in the coefficient of intergenerational persistence for daughters.

The rest of the paper is organized as follows: Section II provides a background on the evolution of educational attainment and the expansion of public schooling in Jordan. Section III includes a description of the data. Section IV describes our identification strategy. Section V characterizes the trend across cohorts of intergenerational persistence in Jordan. Section VI presents our findings with regard to effect of increasing the local supply of public schools on intergenerational persistence. Finally, section VII concludes.

II. Background: Educational Attainment and the Expansion of Public Schooling in Twentieth Century Jordan

Educational attainment in Jordan witnessed dramatic growth in the second half of the twentieth century. According to the Barro and Lee's educational attainment dataset, Jordan ranks ninth among 146 countries by the absolute increase in the mean years of schooling from 1970 to 2010 for the population 25 and older, with 6.4 years of additional schooling on average in that period. It ranks eighth in the increase of mean years of schooling among females 25 and older, with 7.2 additional years of schooling in that period (Barro and Lee forthcoming). Figure 1 depicts the evolution of the average years

of schooling of males and females by age based on data from JLMPS 2010.[2] The figure clearly depicts the rapid increase in educational attainment across cohorts for both males and females. For males, the increase occurred earlier, with their mean years of schooling rising from under six years for 65-year-olds (in 2010) to ten years for 55-year-olds. It then stagnated at about 11 years for cohorts ranging from age 50 to age 35, only to start rising again for younger cohorts. The increase in female mean years of schooling occurred later and was more sustained. The mean years of schooling starts as low as two years for 65-year-olds, rises rapidly to about 10 years for 45-year-olds. Although the rate of increase of female schooling slows after that, the mean years of schooling for Jordanian women exceeds that of their male counterparts for those 35 and younger.

To investigate whether this dramatic increase in educational attainment corresponds to the expansion of public schooling in the country, we depict in figures 2a and 2b the national supply of basic and secondary public schools per 1,000 people in the population from 1938 to 2010. This data is obtained from a school census carried out in 2010 by the Jordanian Ministry of Education.[3] We focus on public schools because they enroll the vast majority of students in Jordan.[4] One can clearly see from figure 2a that the growth in the supply of public basic schools started to take off around 1950 and continued at a rapid pace through the mid-1970s. Initially more boys' schools were being built, corresponding

[2] Mean years of schooling for older cohorts may be biased upward due to selectivity resulting from the likely higher mortality of less educated individuals.

[3] Since these figures are based exclusively on surviving schools in 2010, they ignore school closures and school conversions from one type of school to another. Basic schools currently go from first to tenth grade. Before 1994, they were subdivided into primary schools (going from first to sixth grade) and preparatory schools (going from seventh to ninth grade).

[4] Data from the JLMPS 2010 indicates that 94.1 percent of Jordanians between the ages of 25 and 35 who went to basic schools within Jordan were enrolled in public schools run by the Ministry of Education or some other Ministry of the Jordanian government or by the UN Relief and Works Agency for Palestinian Refugees in the Near East (UNRWA), which provides basic schooling to Palestinian refugees in Jordan. For purposes of our analysis, UNRWA schools are considered public schools. The proportion of secondary school students in 2010 enrolled in public schools is 94.7 percent.

to the early school acquisition of Jordanian males. The supply of girls' and mixed schools was also rising from 1950 onward, but by 1970, there appears to have been a concerted effort to dramatically increase the supply of mixed schools. A school built in 1970 would have been accessible to someone born around 1965. This person would be around age 45 in 2010. This corresponds roughly to the cohort of Jordanian women that have experienced the largest increase in schooling relative to previous cohorts.

Figure 2b depicts the growth in the supply of public secondary schools. Again the growth in the supply of boys' schools was most rapid from the late 1940s to the late 1950s, that of girls' schools was slower but lasted through the mid-1960s, and that of mixed schools continued through the early to mid-1970s. The apparent drop in supply in the late 1960s is mostly due to the sharp increase in Jordan's population that resulted from the large inflow of Palestinian refugees after the June 1967 Arab-Israeli war. The fact that such a decline is not as readily apparent in the supply of basic schools may have to do with the fact that the United Nations Relief and Works Agency for Palestinian Refugees in the Near East (UNRWA) was responsible for providing Palestinian refugees with basic schooling and probably managed to increase the supply of basic schools in line with the inflow of refugees.

III. Data

We employ two new and unique data sources in this analysis. First, the Jordan Labor Market Panel Survey of 2010, carried out by the Economic Research Forum in cooperation with the Jordanian Department of Statistics, is a rich source of information on all aspects of the Jordanian labor market (JLMPS 2010). Most importantly for our purposes is the fact that the survey provides individual-level data on own schooling and

parents' schooling for all adults in the sample. We restrict the sample to individuals born in Jordan who are aged 25 to 70 in 2010 and who have non-missing information on age, sub-district of birth, years of schooling, father's schooling, and mother's schooling.[5] These exclusions result in a sample of 4,139 males and 4,131 females, which we refer to as the sons' and daughters' samples, respectively.

Second, each individual in the JLMPS restricted sample is matched to the 2010 Jordanian Schools Census. The matching process determines for each individual the number of public basic and secondary schools per 1,000 individuals available in the individual's sub-district of birth when the individual was of age to accede to this educational level (6 years of age for the basic level and 15 years of age for the secondary level).[6] A school is considered available for a female if it is a girls' or a mixed school and for a male if it is a boys' or mixed school.[7] We chose to employ the local supply of public schooling at the sub-district of birth, rather than the sub-district of residence, in order to avoid potential endogeneity originating from parents who have a higher taste for

[5] The original sample size of all individuals who are aged 25 to 70 years in 2010 and are born in Jordan is 8,312 observations. The sample restrictions on the missing values result, in practice, in the exclusion of 34 observations (missing age), 1 observation (missing father's schooling), and 7 observations (missing mother's schooling).

[6] Because of the absence of annual estimates of sub-district populations, the population used to normalize the supply of schooling at the sub-district level is the 2004 population of the sub-district. There are 86 sub-districts in Jordan. If sub-district populations are growing at different rates, this could introduce some measurement error of the true supply of schooling available to different cohorts. Conversely, because annual estimates of population are available at the national level, the estimates of the national supply of different kinds of schools shown in Figures 2a and 2b are normalized using year-specific population estimates.

[7] Secondary schools include both general and vocational secondary schools. Public schools include schools under the jurisdiction of: (i) Ministry of Education, (ii) Ministry of Higher Education, (iii) Ministry of Defense, (iv) Ministry of Social Development, (v) Ministry of Religious Endowments (Awqaf), and (vi) UNRWA. We should note here that we consider the presence of a mixed school as being available for both boys and girls when, in fact, a mixed school, especially a mixed secondary school, may be seen as inaccessible or inappropriate for girls in a socially conservative setting. It is beyond the scope of this paper to investigate the relative effects of the availability of single sex vs. mixed schools.

schooling moving to districts where public schooling is more abundant when their children are of school age.

Third, in order to discern the effects of the increased supply of schooling on different cohorts, we examine an "old" cohort born from 1940 to 1965, who would have been 45-70 in 2010, and a "young" cohort born from 1975 to 1985, who would have been 25 to 35 in 2010. Our expectation is that the old cohort is more likely to be affected by the increased supply of schooling since that increase would have occurred when they were ready to enroll in school. We also provide estimates for the full sample of adults aged 25 to 70 born in Jordan.

The summary statistics for the full sample of sons and daughters and for the "young" and "old" subcomponents are shown in table 1. While sons have higher years of schooling on the whole (10.8 vs. 9.8 years), this is reversed among the young cohort where daughters now have slightly higher years of schooling than sons (11.9 vs 11.5 years). We note that the average local supply of schooling has increased substantially from the old to the young cohort, but much more so for basic schools than for secondary schools. For sons, the supply of basic schools increased 4.6 times and that of secondary schools 1.6 times from the old to the young cohort. For daughters, the supply of basic schools increased 5.6 times and that of secondary schools doubled. Despite, the more rapid increase in the supply of schools available to girls, the supply of both basic and secondary schools available to sons in the young cohort continues to be larger than that available to daughters.

IV. Identification Strategy

We use a difference-in-difference methodology that exploits variation across cohorts and sub-districts of birth in the local supply of public basic and secondary schools. Our focus is on the intergenerational persistence coefficient between parent's and child's educational attainment, and the way in which the local supply of schooling affects this coefficient. We include sub-district of birth fixed effects to control for time-invariant characteristics of sub-districts that may be correlated with both the local supply of public schooling and school attainment, and year of birth fixed effects to control for the time trend in school attainment.

The identifying assumption underlying this estimation strategy is that the variation in the local supply of public schools across cohorts and sub-districts of birth is uncorrelated with unobservable time-varying characteristics of the sub-district that may affect both the supply of schooling and school attainment. A possible confounding factor that could violate this assumption is that sub-districts with a rising taste for education over time (perhaps because of economic development) may tend to get differentially more public schools and also have higher educational attainment compared to other sub-districts even in the absence of a causal relationship between the supply of schooling and educational attainment. We argue that this is highly unlikely given the way school construction decisions are made in Jordan. Decision-making about school construction in Jordan is highly centralized in the Ministry of Education and is unlikely to be affected by local shifts in demand for schooling. Similar identifying assumptions are used in Duflo (2001) and the literature on returns to education (Card and Krueger 1992).

V. Characterizing the Trend in the Intergenerational Persistence of Educational Attainment in Jordan

Before getting into the effect of school construction on the intergenerational persistence of educational attainment, we conduct a few regressions to characterize the rate at which the coefficient of persistence has been changing across cohorts for different parent-child combinations. The regressions shown in table 2 relate child's year of schooling to that of the parent for father/son, mother/son, father/daughter and mother/daughter combinations. All regressions include sub-district of birth fixed effects to capture mean differences in schooling across sub-districts. In each case, Model 1 includes the parent's schooling and the age deviation from the mean for the child and its square. Model 2 adds to these variables the interaction between parental schooling and the age deviation and its square. Model 1 shows that the average intergenerational persistence coefficient for all age groups of individuals 25 to 70 in 2010 is higher between mothers and their children than between fathers and their children and it is also slightly higher for daughters than it is for sons, with both parents. It also shows that years of schooling decrease at an increasing rate with age, capturing the rapid increase of educational attainment among increasingly younger cohorts in Jordan (shown in figure 1). Model 2 shows that intergenerational persistence also increases at an increasing rate with age in Jordan, meaning that intergenerational mobility in education has risen rapidly over time in Jordan. The trend in the intergenerational persistence coefficient estimated in Model 2 for the various parent-child combinations is illustrated graphically in figure 3. For instance, the correlation between the educational attainment of a 50 year-old woman in Jordan with that of her mother was 0.7, while that of a 25 year-old woman was only

0.15. As discussed earlier, the coefficient of intergenerational persistence tends to be larger for both sexes of children with their mothers. It also tends to be larger for females with both their parents, but only for those above age 30-35. This implies that the intergenerational persistence coefficient has fallen more sharply across cohorts for women in Jordan, as women began acquiring education in large numbers in recent years.

VI. Estimating the Impact of Local Supply of Public Schools on the Intergenerational Persistence of Educational Attainment

We now come to the main question motivating this paper, namely the effect of the local supply of public schools on the intergenerational persistence in education. As before, we run separate regressions for the four parent-child combinations. For each combination, we estimate four models: (i) Model 1 which includes only the main effects of parent's schooling, public basic and secondary school supply on the full sample (ages 25-70); (ii) Model 2, which adds the interactions of parent's schooling with the basic and secondary school supply variables for the full samples; (iii) Model 3, which is the same as Model 2, but where the sample is limited to the old cohort (ages 45-70); (iv) Model 4, which is the same as Model 2, but limited to the young cohort (ages 25-35). As before, the dependent variable in all models is the child's years of schooling. The school supply variables are defined as number of public schools in the sub-district of birth available to the individual when he or she was of age for that level of schooling per 1,000 individuals. We include in all models sub-district of birth fixed effects to capture the effects on school attainment of any time-invariant sub-district characteristics, and year of birth fixed effects to capture any general time trends in educational attainment that affect all sub-districts in Jordan. Results for sons are shown in table 3 and for daughters in table 4.

We start by discussing the results for the full sample of sons shown in Model 1 in Table 3. We note that an increased supply of public basic schooling has a significant direct impact on school attainment for the full sample. An increase of one basic school per 1,000 people (roughly equivalent to half a standard deviation) is associated with 0.21 to 0.24 additional years of schooling. An increase of one secondary school per 1,000 people is associated with 0.5 additional years of schooling. When the supply of schools is interacted with the parent's schooling in Model 2, the main effect of school supply becomes larger for basic schooling as it now captures the effect of school supply for sons whose parents have no schooling. The interaction term has the expected negative effect for basic schooling, , indicating that the effect of public basic schools is larger for sons whose parents have fewer years of schooling, but is insignificant for secondary schooling. This suggests that the local supply of basic schools reduces the intergenerational persistence of education for boys but the local supply of secondary school does not. The relative size of the effect is summarized in table 5. An increase in basic schooling of one school per 1,000 people results in a relative reduction in the coefficient of intergenerational persistence of 10 percent for both parents in the case of sons. The effect is statistically significant at the 5 percent level for fathers and at the 10 percent level of mothers.

To investigate differences across cohorts, we separate the sample into an old cohort born 1965 or earlier and a young cohort, born 1975 or later. The results for these young and old cohorts, shown in Models 3 and 4, indicate that the baseline impact of increased supply of basic schooling on educational attainment is still positive but becomes statistically insignificant, perhaps because of the smaller sample size in each group. The

interaction of the supply of basic schooling with parent's schooling has the expected negative sign for the old cohort (and is statistically significant for the mother-son regression), but small and statistically insignificant in the young cohort. Finally, we note that the baseline effects and the interaction terms of the supply of secondary schools for the old and young cohort regressions are all statistically insignificant.

Moving on to the results for daughters shown in Table 4, Model 1 shows that the baseline effect of the local supply of basic schooling is positive, as expected, and larger in magnitude than that for sons. An increase in the local supply of basic schools of one school per 1,000 population (about 0.8 standard deviations) results in an increase of 0.63-0.65 years of schooling for girls. In contrast, the local supply of secondary schooling has an insignificant effect on attainment. The negative sign on the interaction term of the supply of basic schooling and parental schooling shown in Model 2 indicates that the supply of basic schooling significantly reduces the coefficient of intergenerational persistence for daughters as well. As shown in Table 5, the coefficient falls by 34 percent and 26 percent for an increase of one basic school per 1,000 individuals for fathers and mothers, respectively, with both of these effects significant at the 1 percent level. Unexpectedly, the supply of secondary schools appears to *increase* the coefficient of intergenerational persistence for daughters, an issue we return to below.

When the sample is sub-divided into old and young cohorts, the baseline effect of the supply of basic schools on the schooling of daughters is highly positive and again much larger for the old cohort compared to the young cohort. The interaction terms with parent's schooling are negative as expected and, also, larger in magnitude for the old cohort. However, they lack statistical significance in the mother-daughter regressions.

With regard to the supply of secondary schools, the baseline effects remain insignificant when the sample is subdivided into cohorts, but the unexpected positive and significant coefficient of the interaction term found for the full sample survives only for the father-daughter regression of the young cohort.

Based on the above results, our main finding is that the local supply of public basic schools appears to be a binding constraint on the educational attainment of both sons and daughters and thus loosening this constraint raises attainment levels, on average, and differentially more for individuals whose parents have lower educational levels. As such it increases intergenerational mobility in education. This effect appears to be more pronounced for the old cohort, who was presumably more constrained by the local supply of public basic schools.

The results on the supply of secondary schooling are more complicated. For sons, we find that the local supply of schooling significantly raises attainment levels on average, but not differentially by parents' schooling. This suggests that the supply of secondary schooling is a binding constraint on attainment for sons, but is equally binding regardless of the level of parental education. In the case of daughters, the supply of secondary school does not appear to be a binding constraint since higher local supply does not appear to raise educational attainment. This suggests that demand-side factors may be more important at the secondary level for girls. In other words, enrollment in secondary schools for girls may have been more constrained by parental attitudes towards girls' education in what is a fairly conservative social setting. In fact, the positive interaction between the supply of secondary schools and parental education lends support to this interpretation. More educated parents are likely to have more liberal attitudes

toward girls' education and are thus more likely to take advantage of the increased supply of secondary schools.

In an attempt to understand why, in the case of sons, the effect of the local supply of public schools varies by the level of parental education for basic schools but not for secondary schools, we examined whether parents have an outside option where public schools are absent. In particular, if private schools are available in the vicinity, educated parents are more likely to avail themselves of them, resulting in a less binding public school supply constraint the higher the parental education. However, if private schools are not available, the education of the children of even educated parents will be constrained by the absence of public schools, making the local supply of public schools equally binding regardless of parental education. Accordingly, we examined the supply of private basic and secondary schools at the sub-district level in the 2010 Jordanian school census. We found that private basic schools are relatively spread out across sub-districts whereas private secondary schools are mostly concentrated in a handful of districts. For example, 79 percent of all sub-districts in 2010 had no private secondary schools and therefore no outside option for parents, as compared to only 45 percent of sub-districts not having private basic schools. Thus an increase in the supply of public secondary schools relieves a constraint for everyone, while an increase in the supply of public basic schools provides relatively more relief for less educated parents.

Finally, we conducted two sets of regressions to further examine the robustness of our results. In particular we were concerned about possible collinearity between the local supply of basic and secondary schools, so we ran regressions with one or the other type of school supply. For both sons and daughters, when only the supply of basic schools was

retained there was no appreciable change in the baseline effect or in its interaction with parental schooling. When the supply of secondary schooling was retained, the positive baseline effect for sons was unchanged and the interaction remained small and insignificant. For daughters, the main effect of secondary schools remained insignificant and the interaction remained positive and significant at the 5 percent level for the father-daughter regression, but not for the mother-daughter regression. Thus the results remain essentially unchanged.

VI. Conclusions

This paper investigated the extent to which intergenerational mobility in education in Jordan was enhanced by government policies to increase the supply of public basic and secondary schools. Our identification strategy relied on exploiting the variation in school supply across sub-districts and cohorts of birth to identify the effect of school construction on the coefficient of intergenerational persistence in educational attainment.

By first analyzing intergenerational mobility across cohorts we establish that mobility has increased significantly in Jordan over time, and more so for women than for men. We also find that school attainment is significantly enhanced by the increased supply of schooling, with the effect of increased supply of basic schools being larger for girls than for boys and the opposite being true for the effect of secondary schooling.

With regard to our main research question regarding the effect of school supply on intergenerational mobility in education, we find that an increase in the local supply of basic schools reduces intergenerational persistence in education for women three times more than it does for men. A one school per 1,000 people increase reduces the coefficient of intergenerational persistence by one third for women and by one tenth for

men. The effect is particularly strong for an older cohort of Jordanians born between 1940 and 1965, for whom the supply of basic schooling was clearly a constraint, although younger women also benefited somewhat. The fact that the effect of the local supply of basic school is larger for women on both attainment and intergenerational persistence can be explained that girls in a conservative social setting are more constrained geographically and are often unable to go to school in a jurisdiction different from their own.

We find that while the supply of secondary schooling substantially increases school attainment for boys, it has no differential effect across parental education levels. We interpret this result as indicating that in the absence of public secondary schools educated parents had few outside options given the relative absence of private secondary schools outside the capital Amman. Thus, both educated and uneducated parents were equally constrained by the local supply of public schools. The results for girls suggest that the supply of secondary schooling was not the main constraint to educational attainment but that demand-side factors may have played a more important role until recently in limiting girls' access to secondary school in a socially conservative setting. We find evidence that in this case, increasing the supply of secondary school actually raises intergenerational persistence because more educated parents are more likely to take advantage of the increased school supply.

This research therefore demonstrates that a policy to construct more public basic schools and to equalize the supply of basic schools across jurisdictions does in fact contribute to improved equality of opportunity in education, especially at early stages of education acquisition. It remains to be seen in future research whether it is better in a

socially conservative setting such as Jordan to establish single-sex schools or mixed schools if the objective is to improve the educational attainment of girls.

References

Barro, R., and J-W. Lee. Forthcoming. A new data set of educational attainment in the world, 1950-2010. *Journal of Development Economics*.

Behrman, J. R., A. D. Foster, M. R. Rosenzweig, and P. Vashishtha. 1999. Women's schooling, home teaching, and economic growth. *Journal of Political Economy* 107(4): 682–714.

Behrman, J., and B. Wolfe. 1987. Investing in schooling in two generations in pre-revolutionary Nicaragua. The roles of family background and school supply. *Journal of Development Economics* 27(1-2): 395–419.

Card, D., and A. Krueger. 1992. Does school quality matter? Returns to education and the characteristics of public schools in the United States. *Journal of Political Economy* 100(1): 1–39.

Casto, E.R. and O. W. Dotson. 1938. "Urban Population of Palestine. *Economic Geography* 14(1): 68-72.

Checchi, D., C. V. Fiorio, and M. Leonardi. 2008. Intergenerational persistence in educational attainment in Italy. IZA Discussion Papers no. 3622.

Checchi, D., and L. Flabbi. 2007. Intergenerational mobility and schooling decisions in Germany and Italy: The impact of secondary school tracks. IZA Discussion Papers no. 2876.

Checchi, D., A. Ichino, and A. Rustichini. 1999. More equal but less mobile? Education financing and intergenerational mobility in Italy and in the US. *Journal of Public Economics* 74: 351–93.

Dahan, M., and A. Gaviria. 2001. Sibling correlations and intergenerational mobility in Latin America. *Economic Development and Cultural Change* 49(3): 537–54.

Daouli, J., M. Demoussis, and N. Giannakopoulos. 2010. Mothers, fathers, and daughters: Intergenerational transmission of education in Greece. *Economics of Education Review* 29: 83–93.

Davies, J. B., J. Zhang, and J. Zeng. 2005. Intergenerational mobility under private vs. public education. *Scandinavian Journal of Economics* 107(3): 399–417.

Duflo, E. 2001. Schooling and labor market consequences of school construction in Indonesia: Evidence from an unusual policy experiment. *American Economic Review*

91(4): 795–813.

Hashemite Kingdom of Jordan 2010. Census of Schools 2010. Ministry of Education. Hashemite Kingdom of Jordan.

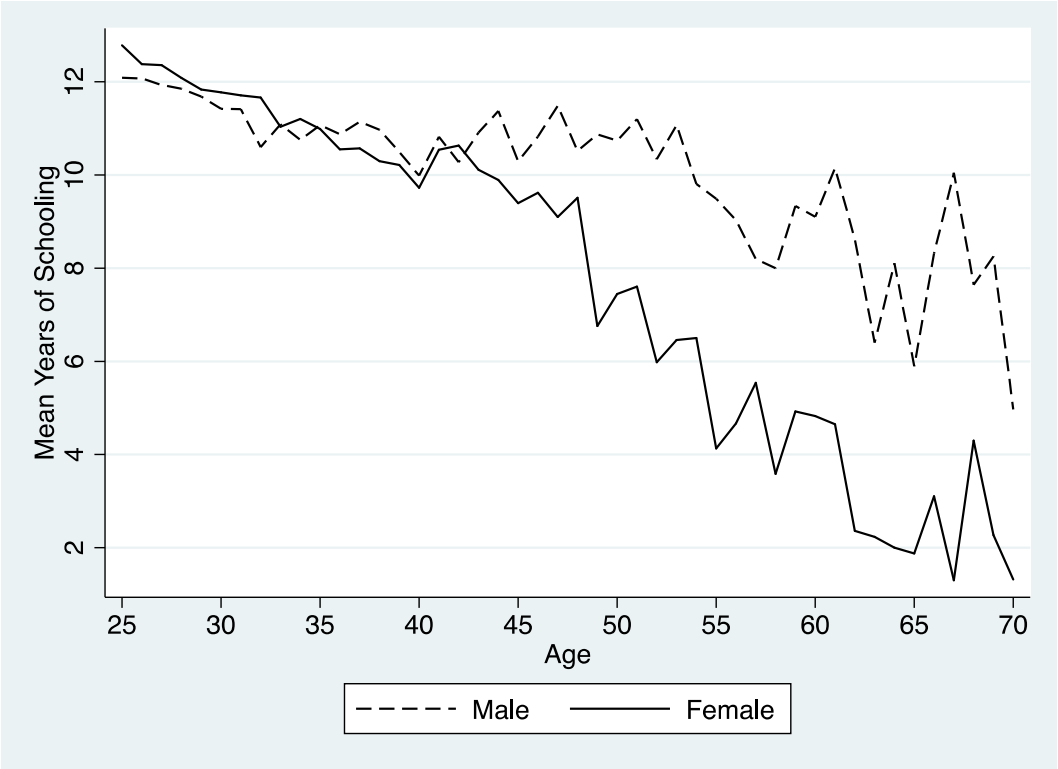
JLMPS 2010. Jordan Labor Market Panel Survey of 2010. Economic Research Forum, Cairo, Egypt. Public use microdata available through www.erfdataportal.com. [Accessed June 22, 2013].

Salehi-Isfahani, D. 2001. The gender gap in education in Iran: Evidence for the role of household characteristics. In *Labor and human capital in the Middle East: Studies of markets and household behavior*, ed. D. Salehi-Isfahani. Reading, U.K.: Ithaca Press.

Schütz, G., H. W. Ursprung, and L. Wößmann. 2008. Education policy and equality of opportunity. *KYKLOS* 61(2): 279–308.

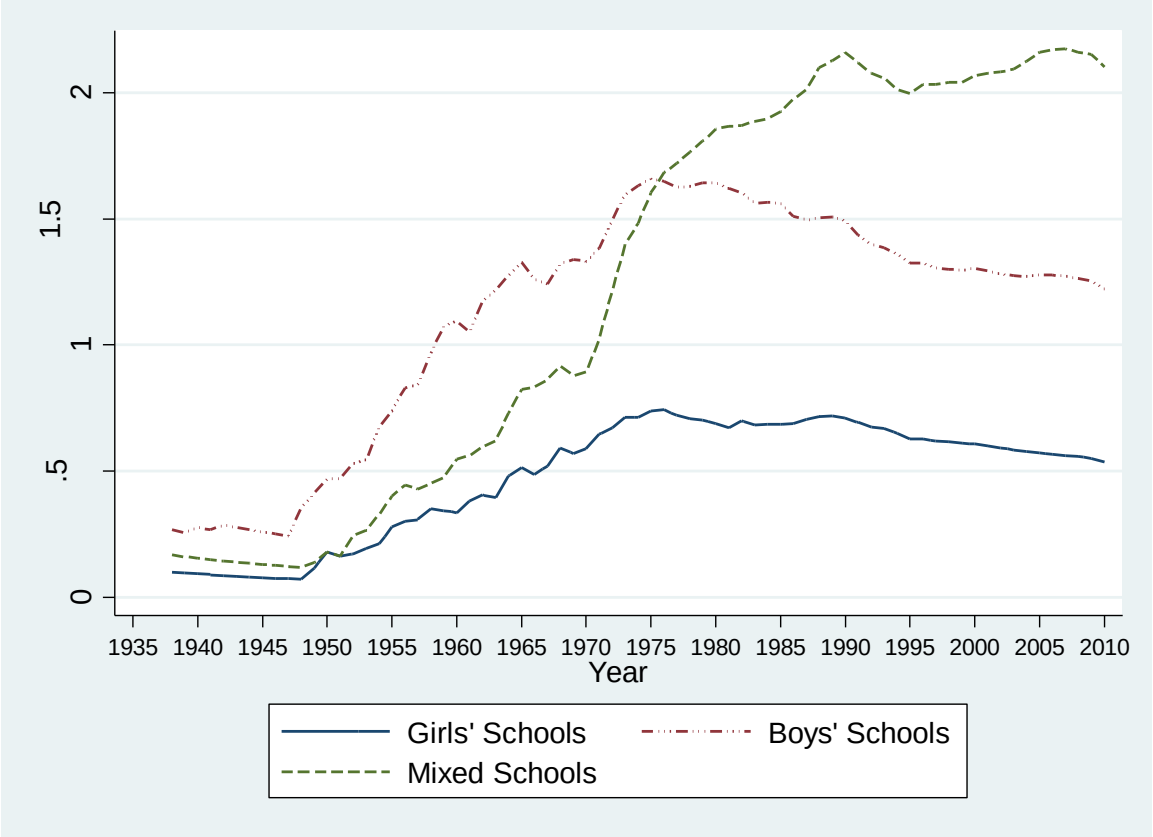
United Nations, Department of Economic and Social Affairs, Population Division (2011) , World Population Prospects: The 2010 Revision, http://esa.un.org/unpd/wpp/index.htm

Fig. 1: Mean Years of Schooling by Age and Sex



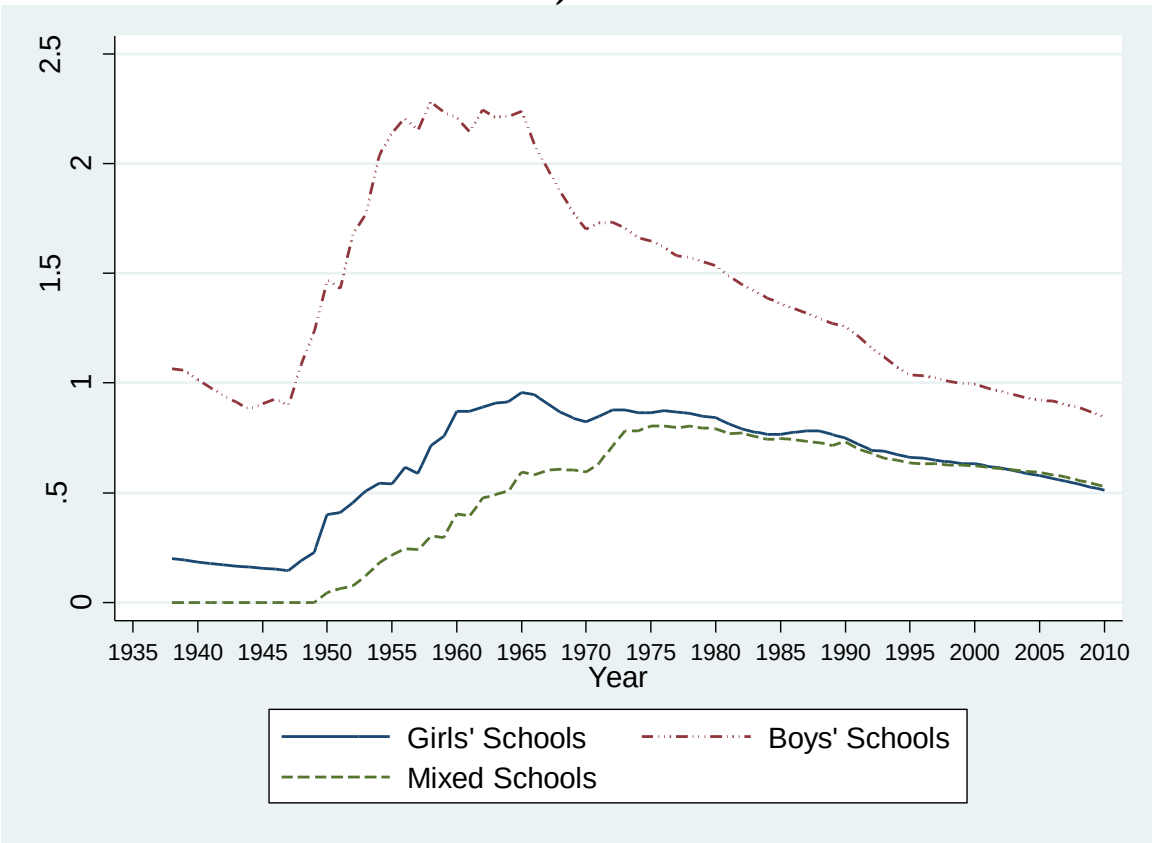
Graph is based on the 2010 Jordanian Labor Market Survey. Sample is restricted to individuals who are aged 25 to 70 years in 2010, are born in Jordan, and with non-missing values for year of birth, sub-district of birth, years of schooling, father's schooling, and mother's schooling.

Fig. 2a: National Supply of Public Basic Schools (Per 1,000 Individuals) in 1938-2010



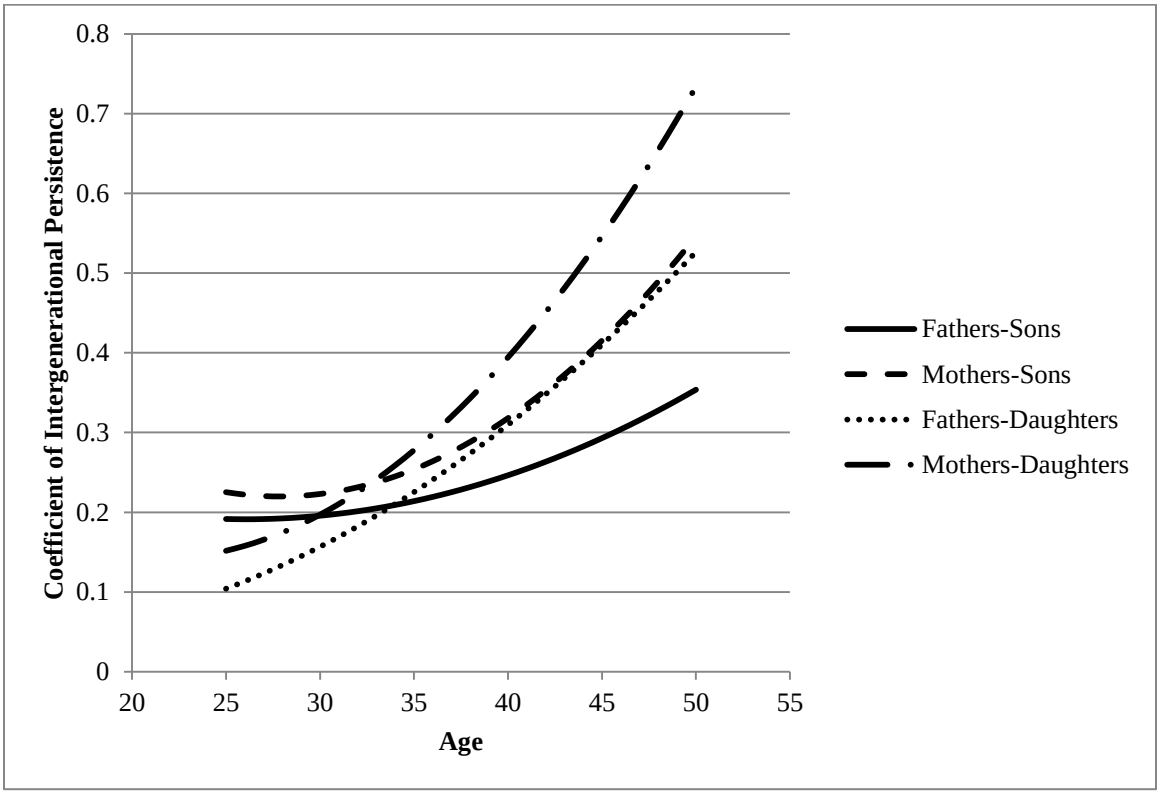
The figure is based on the schools database provided by the Jordanian Ministry of Education. Public basic schools are the basic (*asasi*) schools under the jurisdiction of: (i) Ministry of Education, (ii) Ministry of Higher Education, (iii) Ministry of Defense, (iv) Ministry of Social Development, (v) Ministry of Religious Endowments (*awqaf*), and (vi) UNRWA. The number of schools is weighted by the population size in each year. Population figures are based on: (i) Casto and Dotson (1938) for the year 1938, and (ii) the population estimates from the UN Population Division, which are available every five years from 1950 to 2010 United Nations, Department of Economic and Social Affairs, Population Division (2011). The population figures for the years in between were linearly interpolated.

Fig. 2b: National Supply of Public Secondary Schools (Per 1,000 Individuals) in 1938-2010



The figure is based on the schools database provided by the Jordanian Ministry of Education. Public secondary schools include (i) secondary (*acadimi*) schools, (ii) vocational (*mihani*) schools, and (iii) schools with both secondary and vocational sections (*acadimi* + *mihani*), which lie under the jurisdiction of: (i) Ministry of Education, (ii) Ministry of Higher Education, (iii) Ministry of Defense, (iv) Ministry of Social Development, (v) Ministry of Religious Endowments (*awqaf*), and (vi) UNRWA. The number of schools is weighted by the population size in each year. Population figures are based on: (i) Casto and Dotson (1938) for the year 1938, and (ii) the population estimates from the UN Population Division, which are available every five years from 1950 to 2010 United Nations, Department of Economic and Social Affairs, Population Division (2011) The population figures for the years in between were linearly interpolated.

Fig. 3: Estimated Coefficient of Intergenerational Persistence of Educational Attainment



Graph is based on estimating a regression of child's schooling on parent's schooling, age, age squared, interaction of parent's schooling with age, and interaction of parent's schooling with age squared. Sample is restricted to individuals who are aged 25 to 70 years in 2010, are born in Jordan, and with non-missing values for year of birth, sub-district of birth, years of schooling, father's schooling, and mother's schooling.

Table 1: Summary Statistics- The 2010 Jordanian Labor Market Panel Survey (JLMPS)

Means and Standard Deviations Reported

	Sons			Daughters		
	Young	**Old**	**All**	**Young**	**Old**	**All**
Years of schooling	11.510	9.804	10.789	11.865	6.409	9.831
	(3.565)	(4.670)	(3.972)	(3.692)	(5.458)	(4.945)
Father's schooling	4.536	1.544	3.102	4.870	1.777	3.387
	(4.873)	(2.757)	(4.193)	(5.076)	(2.988)	(4.397)
Mother's schooling	2.624	.431	1.491	2.699	.493	1.593
	(3.989)	(1.417)	(3.132)	(4.155)	(1.662)	(3.275)
Basic public schools per 1,000 people available to individual	2.424	.531	1.621	1.769	.315	1.152
	(2.162)	(0.752)	(1.901)	(1.434)	(.412)	(1.259)
Secondary public schools per 1,000 people available to individual	1.985	1.216	1.653	1.403	.709	1.109
	(2.173)	(1.335)	(1.907)	(1.427)	(.739)	(1.208)
# Observations	1,723	1,242	4,139	1,700	1,218	4,131

Standard deviations are in parentheses. Sample is restricted to individuals born in Jordan, and aged 25 to 70 in 2010, with non-missing year of birth, sub-district of birth, years of schooling, father's schooling, mother's schooling, and local supply of schools. The "young" cohort includes those born in 1975 or later, while the "old" cohort includes those born in 1965 or earlier.

Table 2: Intergenerational Mobility of Education- Basic Regressions

Dependent Variable: Child's Years of Schooling- OLS Regression

	Sons				Daughters			
	Fathers		Mothers		Fathers		Mothers	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Parent's schooling	.232***	.241***	.263***	0.301***	.243***	.297***	.274***	0.368***
	(.015)	(.017)	(.024)	(.027)	(.012)	(.020)	(.021)	(.029)
Age deviation	-.044***	-.062***	-.046***	-.057***	-.174***	-.228***	-.18***	-.205***
	(.011)	(.013)	(.012)	(.013)	(.020)	(.020)	(.022)	(.021)
Age deviation squared/100	-.225***	-.208***	-.246***	-.225***	-.422***	-.305***	-.425***	-.36***
	(.054)	(.061)	(.053)	(.057)	(.06)	(.074)	(.063)	(.074)
Parent's schooling * age deviation		.008***		.015***		.018***		.025***
		(.002)		(.003)		(.002)		(.005)
Parent's schooling * age deviation Sq./100		.027**		.070***		.030*		.077*
		(.012)		(.025)		(.016)		(.039)
Constant	10.346***	10.322***	10.701***	10.663***	9.508***	9.358***	9.900**	9.809***
	(.082)	(.081)	(.081)	(.079)	(0.082)	(.102)	* (.067)	(.083)
Sub-district of birth fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	.173	.179	.158	.163	.419	.440	.407	.422
# Observations	4,139	4,139	4,139	4,139	4,131	4,131	4,131	4,131

Robust standard errors clustered at the sub-district of birth level are in parentheses. * indicates significance at the 10 percent level; ** indicates significance at the 5 percent level; and *** indicates significance at the 1 percent level. Sample is restricted to individuals born in Jordan, and aged 25 to 70 in 2010, with non-missing year of birth, sub-district of birth, education, father's education, mother's education, and local supply of schools.

Table 3: Intergenerational Mobility and Local Supply of Schools- Sons' Sample

Dependent Variable: Child's Schooling- OLS Regression

	Fathers				Mothers			
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 1**	**Model 2**	**Model 3**	**Model 4**
	1-Full Sample	**2-Full Sample**	**3-Old Cohort**	**4-Young Cohort**	**1-Full Sample**	**2-Full Sample**	**3-Old Cohort**	**4-Young Cohort**
Parent's schooling	.236***	.284***	.378***	.238***	.262***	.310***	.721***	.273***
	(.015)	(.017)	(.062)	(.023)	(.027)	(.038)	(.089)	(.041)
Basic public schools per 1,000 people avail. to indiv.	.211***	.318***	.184	.161	.235***	.299***	.105	.219
	(.073)	(.086)	(.364)	(.179)	(.077)	(.084)	(.369)	(.178)
Parent's schooling*Basic public schools		-.027**	-.123	.002		-.032*	-.412*	-.014
		(.012)	(.128)	(.014)		(.019)	(.210)	(.019)
Secondary public schools per 1,000 people avail. to indiv.	.506***	.495***	.481	.689	.498***	.491***	.448	.460
	(.106)	(.111)	(.328)	(.577)	(.109)	(.113)	(.338)	(.573)
Parent's schooling * Secondary public schools		-.0002	.069	-.018		.001	.088	.004
		(.014)	(.055)	(.020)		(.018)	(.163)	(.024)
Constant	6.434***	6.418***	5.962***	8.410***	6.387***	6.388***	5.890**	9.102***
	(1.642)	(1.632)	(1.807)	(1.107)	(1.639)	(1.639)	(1.829)	(1.096)
Sub-district of birth fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	.192	.194	.222	.165	.175	.176	.206	.152
# Observations	4,139	4,139	1,242	1,723	4,139	4,139	1,242	1,723

Robust standard errors clustered at the sub-district of birth level are in parentheses. * indicates significance at the 10 percent level; ** indicates significance at the 5 percent level; and *** indicates significance at the 1 percent level. Sample is restricted to males born in Jordan, and aged 25 to 70 in 2010, with non-missing year of birth, sub-district of birth, education, father's education, mother's education, and local supply of schools. The "young" cohort includes those born in 1975 or later, while the "old" cohort includes those born in 1965 or earlier. The supply of public schools is the number of boys' and mixed schools that were available to the "son" in his sub-district of birth at the time he reached the entrance age for this level of schooling (6 years for basic and 15 years for secondary).

Table 4: Intergenerational Mobility and Local Supply of Schools- Daughters' Sample

Dependent Variable: Child's Years of Schooling- OLS Regressions

	Fathers				Mothers			
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 1**	**Model 2**	**Model 3**	**Model 4**
	1-Full Sample	**2-Full Sample**	**3-Old Cohort**	**4-Young Cohort**	**1-Full Sample**	**2-Full Sample**	**3-Old Cohort**	**4-Young Cohort**
Parent's schooling	.249***	.286***	.675***	.183***	.284***	.348***	.828***	.259***
	(.012)	(.024)	(.075)	(.028)	(.020)	(.036)	(.134)	(.038)
Basic public schools per 1,000 people avail. to indiv.	.630***	.945***	1.511***	.626***	.649***	.823***	1.031**	.563**
	(.154)	(.189)	(.509)	(.216)	(.165)	(.184)	(.480)	(.224)
Parent's schooling * Basic public schools		-.097***	-.425***	-.029*		-.089***	-.264	-.029
		(.022)	(.155)	(.016)		(.027)	(.247)	(.0264)
Secondary public schools per 1,000 people avail. to indiv.	.160	-.065	.043	-.217	.146	.063	.067	-.282
	(.247)	(.237)	(.398)	(1.055)	(.254)	(.250)	(.430)	(.974)
Parent's schooling * Secondary public schools		.095***	.108	.049***		.067***	-.022	.028
		(.019)	(.090)	(.017)		(.023)	(.243)	(.020)
Constant	3.521**	3.813**	2.236	9.475***	3.921**	4.193**	3.625	9.939***
	(1.574)	(1.496)	(1.507)	(1.496)	(1.853)	(1.822)	(2.21)	(1.374)
Sub-district of birth fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year of birth fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	.425	.432	.433	.203	.414	.417	.380	.206
# Observations	4,131	4,131	1,218	1,700	4,131	4,131	1,218	1,700

Robust standard errors clustered at the sub-district of birth level are in parentheses. * indicates significance at the 10 percent level; ** indicates significance at the 5 percent level; and *** indicates significance at the 1 percent level. Sample is restricted to females born in Jordan, and aged 25 to 70 in 2010, with non-missing year of birth, sub-district of birth, education, father's education, mother's education, and local supply of schools. The "young" cohort includes those born in 1975 or later, while the "old" cohort includes those born in 1965 or earlier. The supply of public schools is the number of girls' and mixed schools that were available to the "daughter" in her sub-district of birth at the time she reached the entrance age for this level of schooling (6 years for basic and 15 years for secondary).

Table 5: The Relative Effect of an Increase in the Local Supply of Basic and Secondary Schools by One School per 1,000 People on the Coefficient of Intergenerational Persistence for Different Parent-Child Combinations

	Basic						Secondary					
	Full Sample		Old		Young		Full Sample		Old		Young	
Father-son	-10%	**	-33%		1%		0%		18%		-8%	
Mother-son	-10%	*	-57%	*	-5%		0%		12%		1%	
Father-daughter	-34%	***	-63%	***	-16%	*	33%	***	16%		27%	***
Mother-daughter	-26%	***	-32%		-11%		19%	***	-3%		11%	

The relative size of the effect is obtained by dividing the coefficient of the interaction term between parent schooling and the supply of schools by the parent's schooling coefficient in models 2, 3 and 4 in tables 3 and 4. The significance level of the underlying coefficient of the interaction term is indicated by * at the 10 percent level, ** at the 5 percent level, and *** at the 1 percent level.