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Economic Implications of Investing in Early Childhood Care and Education in Jordan

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Abstract

This study combines a wide range of demographic and socio-economic data to identify the individual and societal benefits of investing in Early Childhood Care and Education (ECCE) in Jordan. Combining several different local data sets, we estimate that providing children with continuous ECCE access between ages 3 and 5 will increase average educational attainment by 0.7 years, increase life-time earnings by US$ 23,113 and increase average life expectancy by approximately one year. Under very conservative assumptions, these total societal benefits exceed the estimated cost of providing these services by a factor of 9:1 or higher, with additional consumption tax revenues of US$ 1.7 for every dollar invested in ECCE, and an additional 30,000 mostly female jobs created in the ECCE sector.

Acknowledgments

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Disclaimer

The views expressed in this report are solely those of the authors and do not represent the views of the Queen Rania Foundation for Education and Development or its affiliations.

1. Background: Early Childhood Care and Education

Despite a growing body of scientific evidence demonstrating that investment in early childhood care and education (ECCE) creates substantial improvements in children's physical and mental health (Walker, Chang, Powell, & Grantham-McGregor, 2005; Grantham-McGregor et al., 2007) as well as earnings over their lifetime (Gertler et al., 2014; Fink et al., 2016), investment in ECCE remains low in the Middle East and North Africa (MENA) region. According to the latest UNICEF estimates, the MENA region has one of the lowest rates of ECCE enrolment globally, with on average only 27% of children in the region accessing any ECCE services (El-Kogali & Krafft, 2015) as well as the highest rates of violent child discipline for children aged 2-14 (El-Kogali & Krafft; United Nations Children's Fund, 2013).

In a regional comparison conducted by the World Bank (El-Kogali & Kraft, 2015), the Hashemite Kingdom of Jordan emerged as one of the leading MENA countries on multiple indicators for early childhood health and development. These indicators include infant mortality, prenatal care, child immunisation rates, trained nursing or delivery attendants, as well as three to four year olds' involvement in development activities. However, despite these positive indicators, progress in Jordan in the area of ECCE has been slow. According to the latest estimates, enrolment in Kindergarten 2 (KG2) increased from 47% in 2000 (International Bureau of Education, 2007) to 60% in 2015 (National Committee for Human Resource Development, 2016)[1], while enrolment in Kindergarten 1 (KG1) and nurseries remained low at 18% and 3%, respectively[2] (Queen Rania Foundation, 2015; Ministry of Planning and International Cooperation, 2016).

Interestingly, unlike in most countries in the region where urban children are at a significant advantage, children in Jordan from urban and rural residences appear to have equally poor access to ECCE with 19% of rural and 22% of urban children attending ECCE (El-Kogali & Kraft, 2015). The 2012 Population and Family Health Survey[3] suggests that 22% of three- and four-year-olds in Jordan currently attend ECCE, with no gender differences (Department of Statistics Jordan & ICF International, 2013). Substantial ECCE gradients do however exist across the socioeconomic spectrum, with 39% children from the wealthiest quintile in Jordan accessing ECCE compared to only 11% of children from the poorest households (El-Kogali & Kraft, 2015). However, at the same time, two of the poorest governorates, Ma'an and Tafileh, had the highest enrollment in nurseries and KG1[4] in 2015 (Queen Rania Foundation, 2015).

Education in Jordan consists of two years of (pre-primary) kindergarten (KG1 and KG2), ten years of compulsory basic education, and two years of secondary or vocational education that culminate in a secondary "leaving examination" (USAID, 2012). According to the last census, 91.4% of children ages 5-16 are enrolled in primary school in Jordan (Department of Statistics Jordan, 2016) with an estimated 99% literacy rate among youth aged 15-24 (UNICEF, 2015)[5]. From an administrative perspective, KG1 and KG2 fall under the responsibility of the Ministry of Education (MoE), while nurseries are handled by the Ministry of Social Development. Neither nurseries nor kindergarten are mandatory; however, Jordan is aiming for universal KG2 access by 2025 (National Committee for Human Resource Development, 2016).

Traditionally, the private sector has been the main provider of ECCE in Jordan (USAID, 2012), primarily catering to urban and higher-income families. In 2003, the Government of Jordan launched the Education Reform for the Knowledge Economy (ERfKE) program, which was later continued and renewed (ERfKE-II); one of the explicit objectives of these programs was to increase access to and quality of ECCE services (USAID, 2012).

1 *The 60% enrollment rate in 2015 was the rate for Jordanian students only; the total enrollment rate including Syrian refugees is likely to be lower.*
2 *The early educational years in Jordan are segmented into three categories: Kindergarten 2 (KG2) for ages 5-6, Kindergarten (KG1) for ages 4-5, and nursery for ages 0-4.*
3 *The 2012 Population and Family Health Survey is part of the international Demographic and Health Survey (DHS) program.*
4 *As reported by a representative sample of mothers*
5 *Recent estimates on both enrollment and literacy vary substantially based on the inclusion/exclusion of the relatively large refugee population.*

In support of this multi-year national reform, various actors—including USAID, UNICEF and the World Bank—have been partnering over the last 15 years with the Jordanian MoE to address the various deficits in Jordan's ECCE policy in four main areas. These include (1) the establishment of additional public kindergartens, primarily KG2, or renovation of existing ones; (2) providing capacity-building opportunities for existing and potential ECCE teachers; (3) formalizing parent and community involvement; and (4) creating a quality assurance system for public KG and training Ministry and other project staff on monitoring and evaluation.

As part of these efforts, the MoE developed an Early Childhood Development (ECD) policy framework and staff capacity-building assessment plan in April, 2011 (Jordan Ministry of Education, 2012). All KG2 teacher training programs were assessed in order to identify gaps and redundancies, and a National Comprehensive In-Service Training Program was implemented for public KG2 teachers (Jordan Ministry of Education, 2012).

In terms of ECCE infrastructure, ERfKE included the refurbishment of over 400 KG2s. They also developed the national KG2 curriculum, standards for licensing private KG2s, and a quality assurance system for public KG2s. Through ERfKE, public KG2 teachers and supervisors were trained on the new national curriculum, Working with Young Children, and other programs. The total number of public KG2s in Jordan increased from just 15 in 2000 (Creative Associates, 2014) to over 1,200 in 2015 (Jordan Ministry of Education, 2015; Queen Rania Foundation, 2015).

Quality of ECCE Services

Research from around the world suggests that simply granting access to ECCE is insufficient for improving children's developmental outcomes. Instead, ECCE programs must reach sufficiently high levels of quality in order to generate meaningful changes in children's early learning and development (Britto, Yoshikawa, & Boller, 2011). A number of different dimensions of quality exist in the ECCE literature. Structural quality (e.g., low student-teacher ratios, high levels of teacher training and pay) is thought to be fundamental for improving ECCE programs' levels of process quality (e.g., the warmth, responsiveness, and instructional rigor provided by the teacher in the classroom context) (Cryer, Tietze, Burchinal, Leal, & Palacios, 1999). In turn, it is these process dimensions that are thought to have the most meaningful impacts on children's outcomes (Howes et al., 2008).

Consistent with the general lack of research on ECCE in the MENA region (El-Kogali & Krafft, 2015), research on the quality of ECCE interventions in Jordan is limited. A recent report by the World Bank Group (2015) highlights the need for more involvement of both parents and external stakeholders into ECCE. The National Strategy for Human Resource Development (2016) makes this need more explicit by aiming for access to quality early childhood learning and development experiences for all children by 2025.

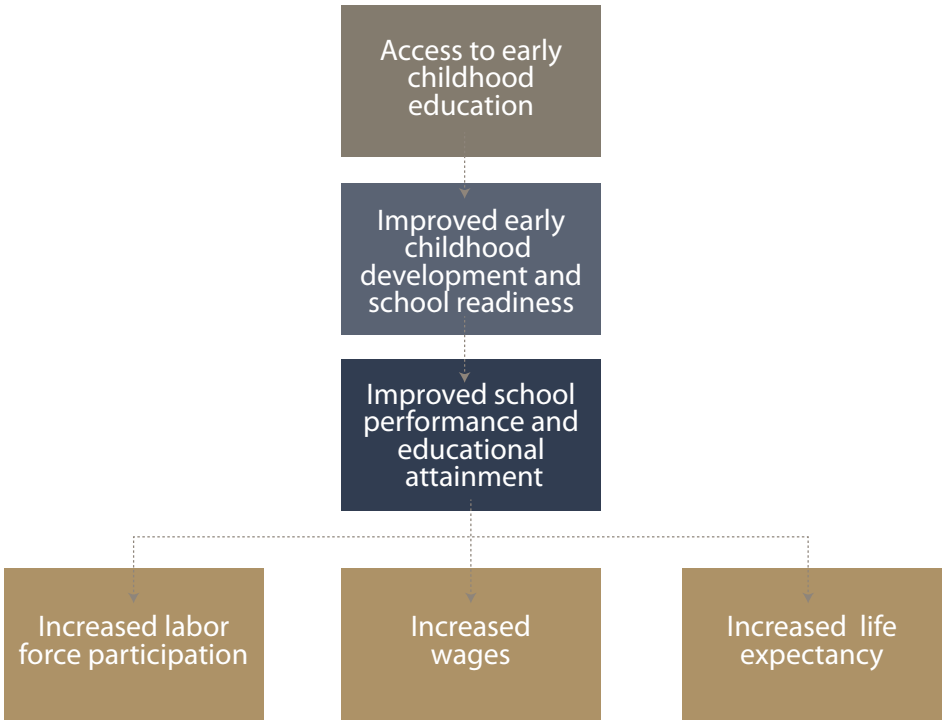
2. Quantifying the Economic Implications of Investing in Early Childhood Care and Education in Jordan

2.1 Objective

The main objective of the present study was to quantify the economic benefits achievable by investing in ECCE in Jordan. The main logic of the model and theory of change underlying the model are illustrated in Figure 1. First, access to ECCE increases children's development in early childhood. Second, improved cognitive development and school readiness translate into better performance in the school system, with higher grades and, ultimately, higher educational attainment achieved. Third, education creates multiple benefits for children in the future: (1) increased labor force participation; (2) increased wages earned; and (3) increased life expectancy. In addition, we computed the total additional consumption tax revenue created for the government due to increased wage earnings[6], as well as the labor market implications of expanding current ECCE coverage to all children age three and older.

Despite the complexity of the model presented, the final model selected abstracts from several other potential benefits ECCE programs may have, such as reduced crime rates, lower reliance on government support, or potentially faster economic growth through a more educated labor force. All of these factors would increase the estimated return on investment for ECCE programs. Given this, the numbers presented below should be interpreted as lower bound (smallest likely) estimates of the true returns to such investment.

Figure 1: Conceptual Framework



6 *While Jordan has an income tax, income taxes are only paid for incomes above JOD 12,000, which affects only a minority of the population.*

Several parameters are necessary to estimate the average benefits per child of attending ECCE as outlined in Figure 1. To provide the most accurate estimates possible, we estimated all parameters using the most recent data available from Jordan. Given that each data source covered a different population and time period, we analyzed each dataset separately in the following subsections. In section 2.2, we show the estimated impact of ECCE attendance on school test performance using test score data from both the 2012 Programme for International Student Assessment (PISA) and the 2012 Jordan Early Grade Reading Assessment (EGRA) and Early Grade Math Assessment (EGMA). To estimate the educational attainment increases achievable through improved school performance, we projected relative percentile shifts into subsequent educational attainment outcomes using data from the Jordan Population and Family Health Survey in section 2.3 (Department of Statistics Jordan & ICF International, 2013).

To quantify the labor market changes attributable to improvements in schooling, we used data from the Jordan Labor Market Panel Survey in 2010 in section 2.4. Last, to quantify the impact of increased education on life expectancy, we used Census data from 2004 and 2015 in section 2.5. We present the main combined estimates in section 2.6.

2.2 ECCE and Academic Test Performance

A total of 6,601 Jordan students were assessed as part of the 2012 PISA study. Table 1 provides descriptive statistics for these students. The 2012 PISA round targeted students who were 15-16 years old at the time of the assessment. Forty nine percent of students indicated that they had attended one year or less of ECCE, while 25% of students indicated that they had participated in more than one year of ECCE. All of the sampled students were born in 1996, and thus attended ECCE programs in the pre- ERfKE reform era. Most of these ECCE programs were likely private, with very limited information on the quality of services received available.

Fifty one percent of students assessed were female. Parents of students in this sample were relatively highly educated on average, with 41% of mothers and 45% of fathers having attended tertiary education.

Table 1: Characteristics of Students Participating in PISA 2012 Jordan Assessment

	N	Mean	SD	Min	Max
Month of birth	6,601	6.67	3.41	1	12
Year of birth	6,601	1996	0	1996	1996
Student is female (proportion)	6,601	0.51	0.50	0	1
One year of ECCE or less[a]	6,601	0.49	0.50	0	1
More than one year of ECCE[a]	6,601	0.25	0.44	0	1
Math score	6,601	387.95	68.87	112	671
Reading score	6,601	403.93	80.97	6	641
Science score	6,601	410.60	74.40	113	668
Immigrant family[b]	6,601	0.16	0.37	0	1
Family wealth score[c]	6,580	-0.92	1.09	-5	3
Mother primary schooling	6,601	0.04	0.20	0	1
Mother secondary schooling	6,601	0.48	0.50	0	1
Mother tertiary schooling	6,601	0.41	0.49	0	1
Father primary schooling	6,601	0.05	0.22	0	1
Father secondary schooling	6,601	0.45	0.50	0	1
Father tertiary schooling	6,601	0.45	0.50	0	1
Mother works part-time	6,601	0.03	0.18	0	1

	N	Mean	SD	Min	Max
Mother works full-time	6,601	0.12	0.33	0	1
Father works part-time	6,601	0.12	0.32	0	1
Father works full-time	6,601	0.57	0.50	0	1
Private school	6,601	0.12	0.32	0	1
Quality of school infrastructure[d]	6,601	-0.66	1.17	-2.8	1.3
Quality of teaching materials[d]	6,601	-0.50	1.00	-3.6	2.0
Teacher morale[d]	6,601	-0.23	1.06	-3.4	1.4

Notes: a) PISA surveys ask students if they ever attended kindergarten or preschool (ISCED 0 programs). Option choices are "No", "Yes, for one year or less", or "Yes, for more than one year". b) Immigrant status reported by student (not born in country). c) PISA index of family wealth is a normalized score based on students reporting to have: a room of their own, a link to the Internet, selected household items, as well as number of cellular phones, televisions, computers, cars, and rooms with a bath or shower. d) Composite school quality scores computed by PISA.

In order to quantify the associations between ECCE attendance and school performance, we use multivariable linear regression models. The dependent variables in our first set of models are domain-specific scores. We analyze both raw scores and percentile ranks for the three domains assessed in PISA: mathematics, reading, and science. The main independent variable of interest is ECCE attendance; we control for the full list of covariates shown in Table 1 to minimize the risk of confounding bias.

The fully adjusted estimates in Table 2 suggest that one year of ECCE is associated with a 12.0 (science) to 17.3 (reading) point increase in test scores, while more than one year of ECCE is associated with an increase in test scores between 12.5 (science) and 18.4 (math) points. In terms of the relative position of students within their respective cohort, this translates to a percentile shift of about five points for one year of ECCE, and a percentile shift of 4.3-7.2 points for more than one year of ECCE. Table 2 also highlights important gender differences as well as the critical importance of parental background and school quality on test scores. On average, girls perform substantially better on the test in all domains, and the same is true for children with highly educated parents: compared to children with mothers who never attended schooling, children with college educated mothers rank on average eight to nine percentile scores higher; children with college educated fathers rank 11-14 percentiles higher on average than children with fathers who never attended school. School type and quality is also highly predictive of test performance: on average, attending private high schools is associated with a 15-16 point increase in the percentile rank of students compared to students attending public schools.

Table 2: Multivariable Associations between ECCE Attendance and PISA Test Performance

Dependent variable	**Mathematics**		**Reading**		**Science**	
Outcome measure	*Score*	*Percentile*	*Score*	*Percentile*	*Score*	*Percentile*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
One year of ECCE or less	12.91***	5.407***	17.33***	5.719***	11.97***	4.365***
	(2.124)	(0.918)	(2.421)	(0.844)	(2.288)	(0.896)
More than one year of ECCE	18.39***	7.156***	16.74***	5.603***	12.51***	4.344***
	(2.959)	(1.191)	(3.075)	(1.070)	(2.911)	(1.112)
Month of Birth	-0.904***	-0.355***	-1.002***	-0.354***	-0.998***	-0.364***
	(0.219)	(0.0920)	(0.243)	(0.0873)	(0.224)	(0.0860)
Child is female	17.93***	8.274***	68.80***	25.27***	40.50***	16.21***
	(3.985)	(1.679)	(4.153)	(1.462)	(4.111)	(1.581)
Immigrant family	-3.329	-1.443	-5.864*	-0.755	-3.020	-1.067
	(2.651)	(1.110)	(3.255)	(1.047)	(2.927)	(1.092)
Family wealth	3.700***	1.632***	2.392**	0.788**	3.166***	1.259***
	(1.128)	(0.464)	(1.135)	(0.397)	(1.120)	(0.421)
Mother primary education	0.577	-0.632	-2.455	-2.349	-0.871	-1.096
	(4.571)	(2.003)	(5.465)	(1.742)	(5.286)	(2.004)
Mother secondary education	13.58***	5.538***	19.50***	6.121***	14.47***	5.109***
	(4.275)	(1.858)	(4.746)	(1.555)	(4.999)	(1.940)
Mother tertiary education	22.44***	9.011***	27.68***	9.521***	22.00***	8.103***
	(4.597)	(1.952)	(5.271)	(1.695)	(5.379)	(2.041)
Father primary education	12.95**	4.846**	17.87***	5.128**	9.739*	2.497
	(5.290)	(2.302)	(5.896)	(2.048)	(5.729)	(2.216)
Father secondary education	15.63***	6.857***	20.34***	6.606***	15.13***	5.206***
	(4.372)	(1.932)	(5.197)	(1.684)	(5.041)	(1.861)
Father tertiary education	32.33***	13.88***	31.47***	11.06***	33.98***	12.56***
	(4.835)	(2.089)	(5.618)	(1.842)	(5.352)	(1.982)
Mother works part-time	-11.10**	-4.052*	-6.860	-0.914	-19.66***	-5.839***
	(5.031)	(2.071)	(5.643)	(1.898)	(5.348)	(1.998)
Mother works full time	6.304**	2.857***	4.358	2.401**	9.470***	4.099***
	(2.710)	(1.065)	(3.202)	(1.046)	(2.892)	(1.086)
Father works part-time	7.816***	3.093***	9.179***	2.379**	9.993***	3.302***
	(2.700)	(1.139)	(3.043)	(1.042)	(2.733)	(1.024)
Father works full time	9.607***	4.263***	18.32***	5.867***	16.22***	6.130***
	(2.283)	(0.909)	(2.444)	(0.805)	(2.405)	(0.890)
Private school	45.92***	16.40***	43.75***	15.19***	42.30***	15.20***
	(8.936)	(3.027)	(6.644)	(2.171)	(7.609)	(2.650)
Quality of infrastructure	-3.402	-1.040	-2.341	-0.707	-2.883	-0.953
	(2.384)	(0.904)	(2.570)	(0.897)	(2.379)	(0.882)

Dependent variable	Mathematics		Reading		Science	
Outcome measure	*Score*	*Percentile*	*Score*	*Percentile*	*Score*	*Percentile*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Quality of teaching resources	0.714	-0.455	-0.229	-0.0686	0.407	0.0476
	(3.301)	(1.117)	(3.054)	(1.005)	(3.136)	(1.081)
Teacher morale score	6.904***	2.610***	7.392***	2.396***	8.303***	3.007***
	(2.163)	(0.815)	(2.228)	(0.701)	(2.100)	(0.736)
Observations	6,580	6,580	6,580	6,580	6,580	6,580
R-squared	0.195	0.179	0.319	0.319	0.236	0.228

**p<0.05, **p<0.01. ***p<0.001*

Notes: Numbers displayed are coefficients from Ordinary Least Squares (OLS) regression models with standard errors in parentheses. Standard errors are clustered at the school level.

Figure 2 shows the empirical distribution of mathematics scores for students with and without ECCE exposure; ECCE exposure seems to essentially shift the entire density curve to the right, suggesting that the benefits of ECCE on improved math performance are universal across the achievement spectrum.

Figure 2: Distribution of PISA Math Scores for Students without Prior ECCE Exposure and Students with more than One Year of ECCE Exposure

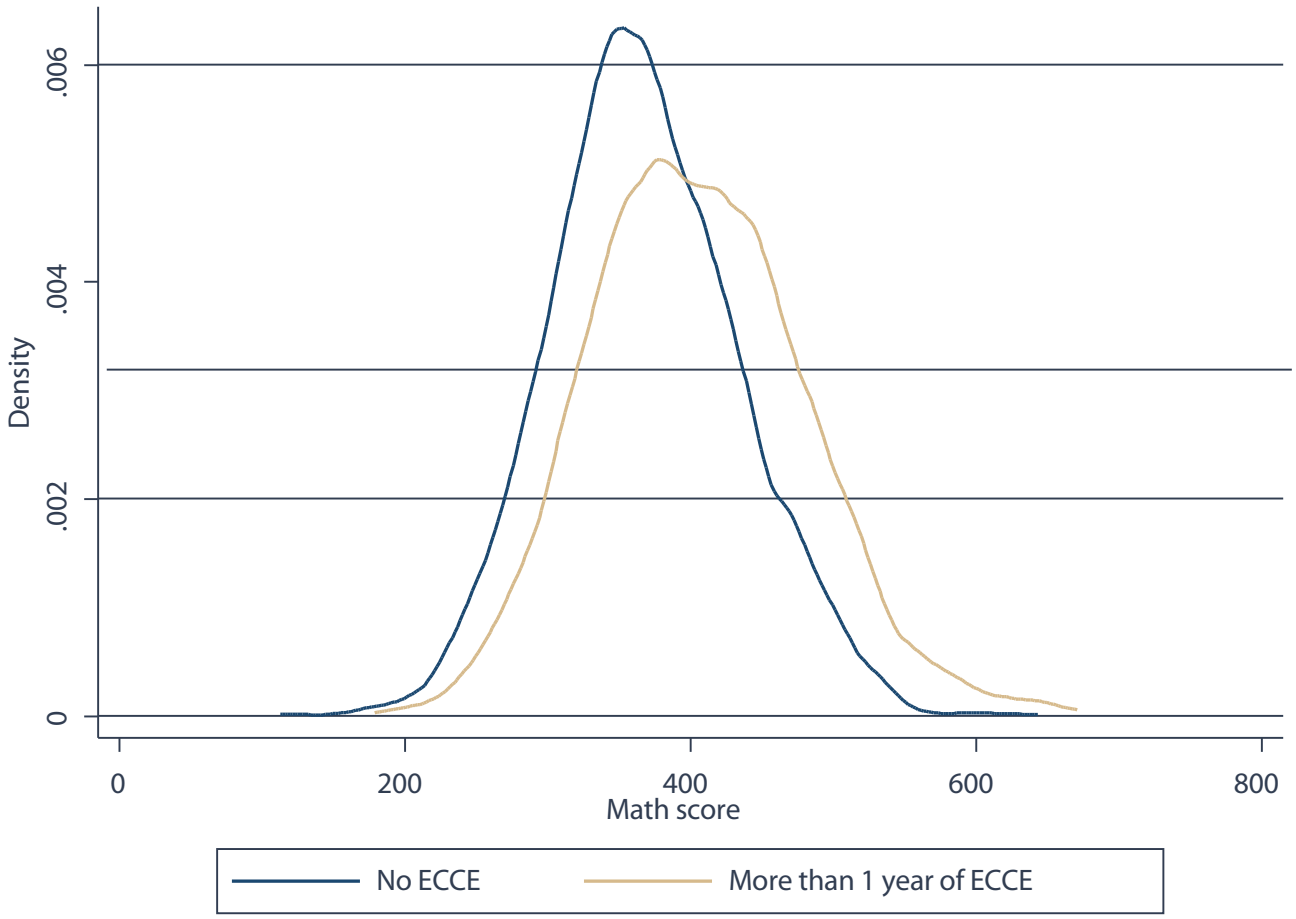


Table 3 shows results stratified by gender and family wealth quintile. To simplify analysis, we created an average percentile rank variable corresponding to the mean rank across the three PISA domains. The overall associations between ECCE attendance and PISA test performance were very similar for male and female students, with an average increase of 6.3 percentile points for one year or less of ECCE, and a slightly smaller (but not statistically different) association for more than one year of ECCE. In terms of socioeconomic background, larger associations between ECCE attendance and test performance were found for households in the third and fourth wealth quintiles. Interestingly, associations appear to be smallest for households from the poorest wealth quintile and are actually not statistically different from zero for children attending more than one year of ECCE. Previous research from the United States has shown that low-income children tend to be exposed to ECCE programming that is of particularly low quality (Pianta et al., 2005). Unfortunately, data on ECCE quality was not collected as part of PISA, making it difficult to directly assess this hypothesis. However, given that the PISA data capture students who attended ECCE prior to 2000 and the implementation of ERfKE, it is clearly possible that quality differentials were particularly large in the 1996 cohort surveyed in the PISA study.

Table 3: Stratified Associations between ECCE Attendance and PISA Test Performance

Dependent variable	**Average Percentile Rank**						
Sample	*Male*	*Female*	*AQ1*	*AQ2*	*AQ3*	*AQ4*	*AQ5*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
One year of ECCE	6.265***	6.265***	3.397**	4.702***	4.873**	6.988***	4.049**
	(1.265)	(1.265)	(1.383)	(1.564)	(2.004)	(1.798)	(1.882)
Two or more years of ECCE	5.326***	5.326***	1.204	5.469***	5.520**	8.612***	3.602
	(1.617)	(1.617)	(1.955)	(1.876)	(2.128)	(2.189)	(2.228)
Observations	3,076	3,076	1,382	1,571	1,150	1,510	967
R-squared	0.193	0.193	0.192	0.187	0.240	0.290	0.370

**p<0.05, **p<0.01. ***p<0.001*

Notes: Table 3 shows adjusted associations between average PISA percentile rank and ECCE exposure. Numbers displayed are coefficients from multivariable Ordinary Least Squares (OLS) regression models with standard errors in parentheses. Standard errors are clustered at the school level. All models adjust for the full list of covariates shown in Table 1 including student, family and school characteristics.

In 2012, the EGRA and EGMA were conducted in Jordan. A total of 3,079 students between ages seven and ten were assessed; 82% of these students indicated that they had attended preschool or kindergarten. In Table 4, we regress combined overall (combined math and literacy) test scores on ECCE attendance within this sample of students. Similar to the PISA results in Table 3, we find strong and very robust associations between ECCE attendance and test scores; on average, ECCE attendance is associated with a 0.4 standard deviation increase in test scores. These increases are particularly large among girls, and for children from medium wealth households, similar to the PISA results. Different from PISA, we now also find a positive association for children from the lowest asset quartile. These associations are smaller than the effects observed from children in the second and third quartiles, but not statistically different from the effects observed for children from the best-off households (quartile 4). This suggests that the overall difference in ECCE quality across socioeconomic groups may be declining; further research will be needed to better understand the gender gradient as well as the particularly large associations for middle income households.

Table 4: Stratified Associations between ECCE Attendance and EGRA/EGMA Test Performance

Dependent variable	Early Grade Reading & Math Assessment z-score					
	Male	*Female*	*Asset quartile 1*	*Asset quartile 2*	*Asset quartile 3*	*Asset quartile 4*
Ever attended ECCE	0.350***	0.488***	0.295***	0.504***	0.569***	0.357***
	(0.102)	(0.110)	(0.108)	(0.139)	(0.144)	(0.113)

Dependent variable	Early Grade Reading & Math Assessment Percentile					
	Male	*Female*	*Asset quartile 1*	*Asset quartile 2*	*Asset quartile 3*	*Asset quartile 4*
Ever attended ECCE	9.860***	13.41***	7.881**	14.54***	16.63***	9.362***
	(3.035)	(3.311)	(3.236)	(3.987)	(4.347)	(3.357)
Observations	1,371	1,678	876	844	296	1,033
R-squared	0.048	0.085	0.031	0.101	0.067	0.052

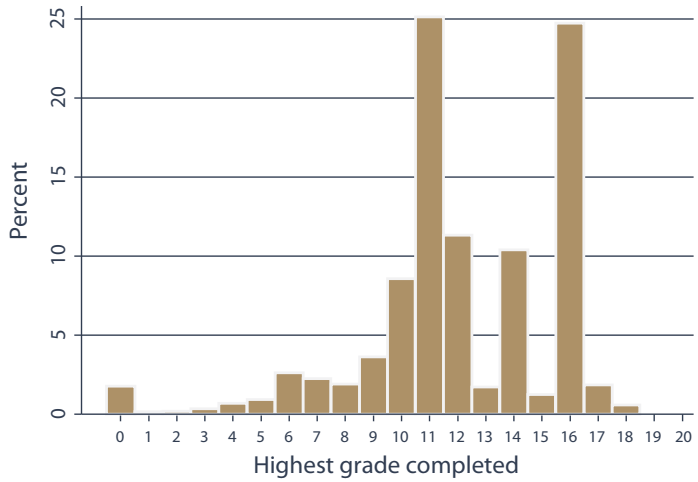
Notes: Table 4 Panel A shows adjusted associations between average EGMA/EGRA z-scores and ECCE exposure. Panel B shows the same regressions with percentile rank as outcome. Numbers displayed are standardized coefficients from multivariable Ordinary Least Squares (OLS) regression models with standard errors in parentheses. Coefficients correspond to standard deviations in test scores. Standard errors are clustered at the school level. All models adjust for age, gender, and parental SES.

2.3 Relative School Performance and Educational Attainment Outcomes

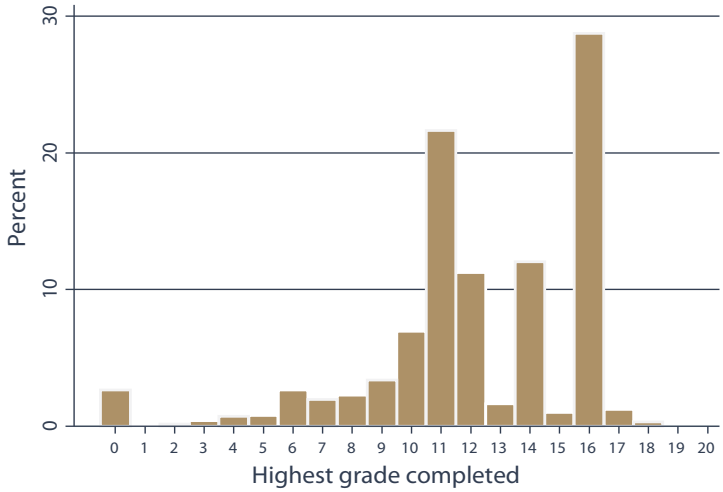
The 2012 Jordan Population and Family Health Survey interviewed a nationally and regionally representative sample of 15,190 households (Department of Statistics Jordan & ICF International, 2013). As part of these interviews, households were asked to list all household members and then to indicate their age and educational attainment. The resulting household (roster) data contain 80,822 individual education records. In order to capture educational attainment among young individuals living in Jordan, we focus on 6,337 individuals between ages 25 and 29, who should have recently completed their education. As Figure 3 shows, educational attainment in this group is rather high: male Jordanians in this age group have an average (mean) of 12 years of schooling; median educational attainment is 11 years (high school). Females are on average slightly more educated, with a mean of 12.2 years of schooling attained, and a median of 12 years of schooling. The educational gender gap in favor of females is particularly pronounced for higher education: 30% of women complete college (16 years of schooling or more) compared to only 24% of men in the 25-29 years age group.

Figure 3: Educational Attainment among Jordanians Aged 25-29

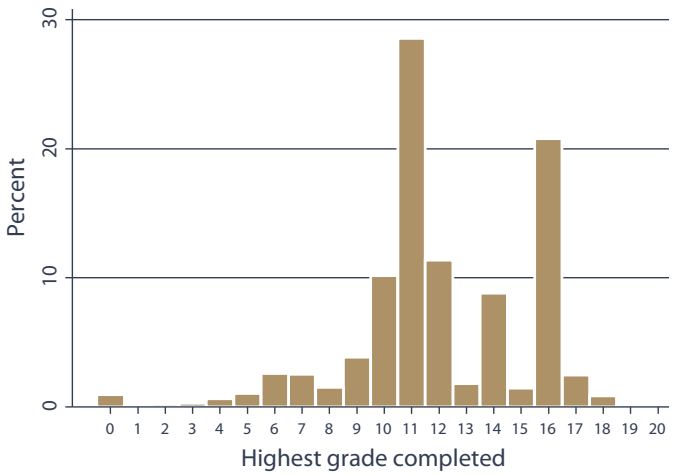
Both Sexes



Females



Males



Source: Jordan 2012 Population and Family Health Survey; author calculations.

Figure 4 shows the estimated shifts in educational attainment under the assumption of universal access to three years of ECCE. The main working assumptions for this model are that,

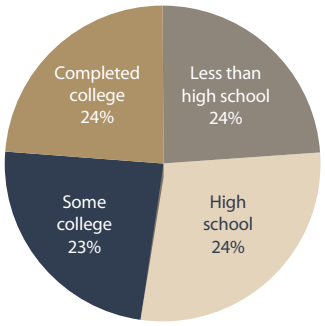
1) Universal access to ECCE from ages three to five would increase average school readiness by 10 percentile points, and
2) These improvements in school readiness will result in matching improvements in educational attainment rank.

The 10 percentile point increase in school readiness was directly derived from Tables 2-4. The PISA study (Tables 2 & 3) suggests that attending more than one year of ECCE is associated with four to seven percentile rank increases; the EGRA/EGMA data (Table 4) suggest percentile increases between ten and 13 percent. Given that these estimates are more recent, we primarily rely on EGRA/EGMA, and choose ten percentile points as our main estimate. It should be highlighted here that these estimates are likely to be on the conservative side because EGRA/EGMA only collects data on "any ECCE exposure", which will in practice capture many children who have one year or less of ECCE, while we assume that all children would receive 3 years of ECCE in our main scenario. Even though it seems reasonable to assume that improvements would be larger with three years of ECCE, we do not have data to directly quantify these additional benefits beyond the limited information collected in PISA, which suggests a relatively flat dose-response relationship, and thus use the average benefits observed in EGRA/EGMA as our main impact estimates.

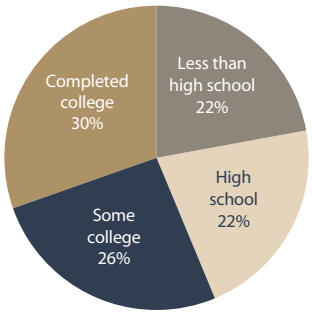
In terms of the predicted educational shifts, our model suggests an average ECCE-associated increase in total years of schooling attained of 0.79 years for males, and an increase of 0.65 years for females. As Figure 4 shows, these average shifts come from different parts of the educational attainment distribution: for males, increases in school readiness are estimated to lead to a major decrease in the proportion with less than high school as well as an increase in tertiary education, with an additional ten percent of the population completing four years of college. For females, the primary increase comes from the lower end of the distribution, with the percentage of women with less than high school dropping from 22% to 15%.

Figure 4: Estimated Shifts in Educational Attainment with Universal ECCE Access

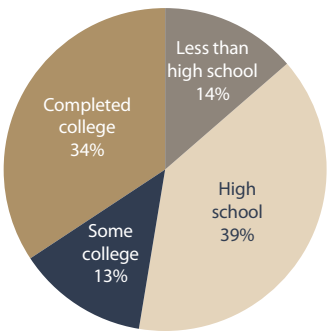
Males Current



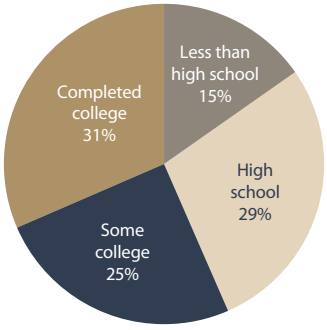
Females Current



Male Projections with Universal ECCE Access



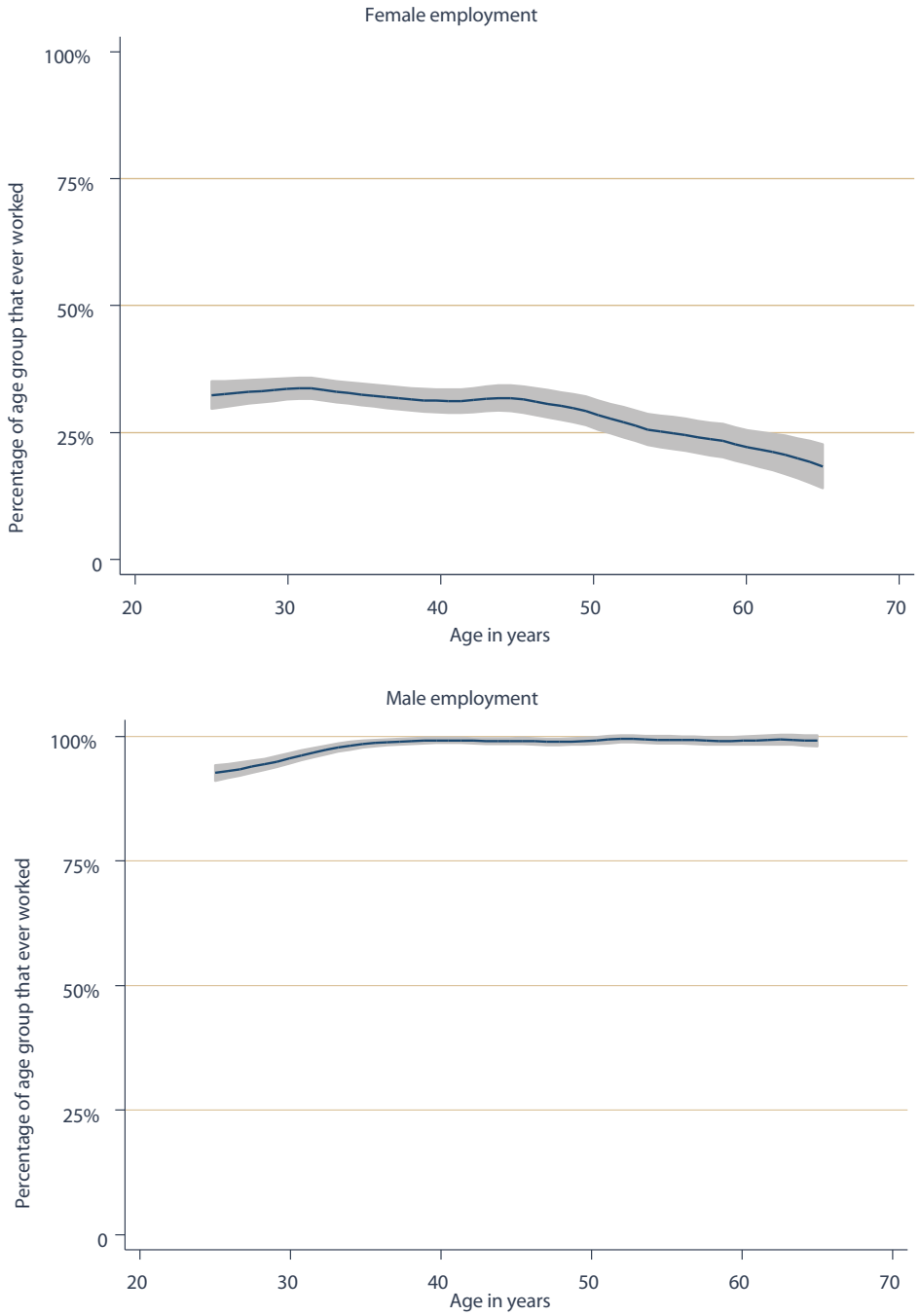
Female Projections with Universal ECCE Access



2.4 Labor Market Returns to Education

The Jordan 2010 Labor Market Panel Survey (LMPS) collected data on 25,969 individuals living across 5,102 households with respect to their labor market activities and current incomes. For the purpose of our analysis we focus on individuals between ages 25 and 64 who are no longer in school, resulting in a sample of 10,141 individuals. Out of this group, only 63% of individuals report to ever have worked. This average masks important gender differences. As shown in Figure 5, only about 30% of women report to ever have worked, while virtually all men over the age of 30 report prior work experience.

Figure 5: Proportion of Respondents Reporting Ever Having Worked



Notes: Shaded areas represent 95% confidence intervals. Estimates represented local polynomial smoothed curves. The outcome variable is subject's report of ever having worked.

At the time of the LMPS, only 4,829 individuals (48%) reported current employment. Out of this subgroup, wage income was reported for 3,944 individuals (82%). Table 5 summarizes the income distribution among individuals reporting income. The mean annual personal income in this study population was US$ 23,169, with a median of US$ 14,471.[7]

Table 5: Distribution of Labor Market Incomes

	Annual wage income in US$		
Income decile	*Mean*	*Min*	*Max*
1	6,073	423	7,616
2	9,506	7,701	10,155
3	11,216	10,240	12,102
4	12,680	12,144	13,159
5	13,813	13,202	14,471
6	15,140	14,556	15,233
7	16,172	15,241	17,619
8	18,838	17,729	20,310
9	23,937	20,353	27,927
10	107,297	28,350	3,960,516

Notes: Based on the LMPS 2010. Local currency incomes were converted to US$ by authors. Since 1995, the Jordanian dinar exchange rate has been fixed at 0.709 dinar per US$, which translates to 1.41 US$ per dinar.

Table 6 shows estimated associations between educational attainment, labor market incomes and labor force participation in the Labor Market Panel Survey. In columns 1-3, we show standard Mincerian regression models. In these models the dependent variable is the natural logarithm of annual wage income; the main independent variable is the highest grade completed. To reduce the risk of confounding or omitted variable biases, we control for residence and parental educational attainment in all specifications. In columns 4-6, we estimate similar models, but analyze labor force participation as the dependent variable. For both dependent variables we first show the results by gender, and then also pooled estimates. As shown in column 1 and column 2 of Table 6, the returns to education are strictly positive, and on average slightly larger for women. On average, each year of educational attainment is associated with a wage increase of 5.4% for males, and an increase of 6.4% for females. Education also increases labor force participation for both sexes: these effects are very small for men due to the almost universal participation at 0.5% per year of schooling; for females, they are more sizeable, with an estimated four percentage point increase in labor force participation per year of schooling.

7 *Estimated incomes in the 2010 Jordan Household Income and Expenditure Survey (HEIS) were somewhat lower than these estimates, with a mean household income of US$ 11,485 and a median household income of USD$ 9,515.*

Table 6: Estimated Associations between Educational Attainment, Labor Market Incomes and Labor Force Participation in the Labor Market Panel Survey

Sample	Ln(Annual wage income)			Labor force participation		
	Male	*Female*	*Both*	*Male*	*Female*	*Both*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Highest grade completed	0.0538***	0.0638***	0.0550***	0.00518***	0.0400***	0.0237***
	(0.00332)	(0.00860)	(0.00313)	(0.000971)	(0.00150)	(0.000890)
Observations	3,144	795	3,939	4,988	5,144	10,132
R-squared	0.117	0.223	0.142	0.048	0.163	0.530

Notes: Reported numbers are coefficients from multivariable Ordinary Least Squares model with robust standard errors in parentheses. All models control for age, age squared, urban residence and parental education. Regressions in columns 1-3 are restricted to individuals reporting wage income in the month preceding the LMPS interview.

In terms of the annual benefits, a 5.4% increase in wages for men participating in the labor force implies an annual increase of US$ 820 per year at the median; for females, a 6.4% increase implies an annual wage increase of US$ 874 for working women.[8]

2.5 Health Returns to Education

In order to quantify the health benefits to education, we compare old-age survival data using the 2004 and 2015 population censuses of Jordan. The Department of Statistics provided us with the total population stock by sex and educational attainment for both census rounds. In the absence of migration, census data would allow us to directly compute age and education-specific survival rates. In practice, migration flows are substantial, with pronounced population inflows between the two census rounds. To adjust for these inflows, we use younger age groups (individuals <55 years in 2004) where mortality can be presumed to be small to compute average inflow levels, and then use these inflow levels to adjust population stock for older individuals. We then compare old age survival rates for individuals with high school education (11 years – the largest group) to individuals with college education. Figure 6 shows the resulting mortality estimates. As in virtually all countries, female life expectancy in Jordan is higher than male life expectancy, with latest numbers suggesting a mean life expectancy of 72 years for males, and 76 years for females at birth in 2014 (World Bank, 2016). Our estimates based on census data suggest that college education is associated with a reduction in the relative mortality risk of males in their 60s and 70s of about 50%, and with a reduction in risk of about 65% for females. As a result of these differences in mortality, we estimate that women with college education have a life expectancy of 79 years, and thus can expect to live about 3.8 years longer than women who have completed a high school education. For men with college education, we estimate a life expectancy of 74 years, which corresponds to an additional 2.5 years relative to men who have completed a high school education.

8 *Average benefits are substantially lower for women since only about 30% of women in the sample participated in the labor force.*

Figure 6a: Male Old Age Survival Curves: Individuals with High School vs. Individuals with College Education

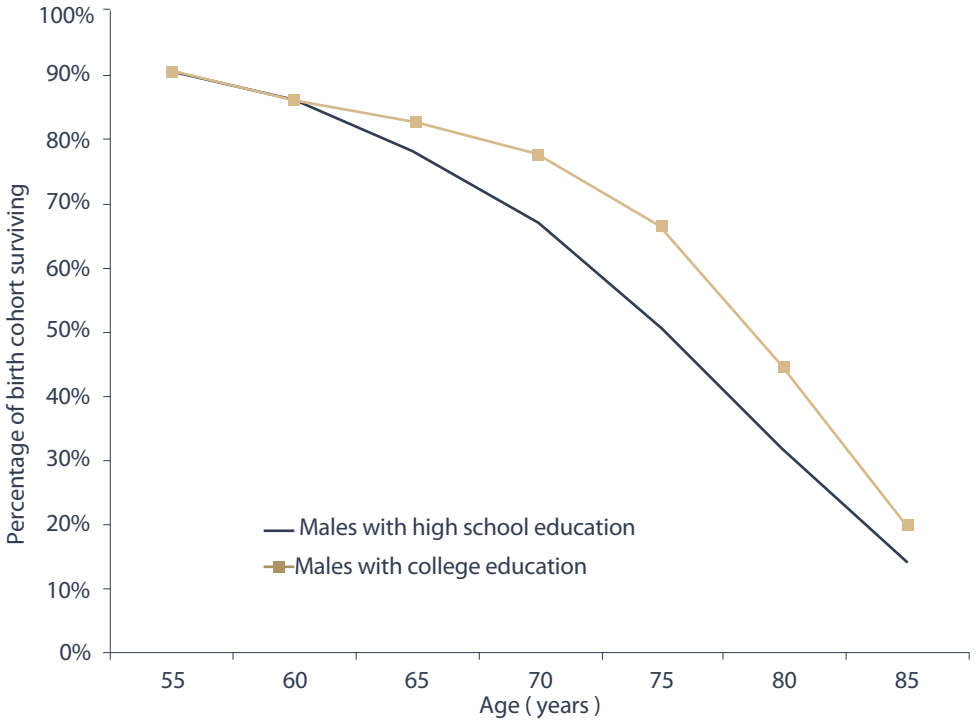
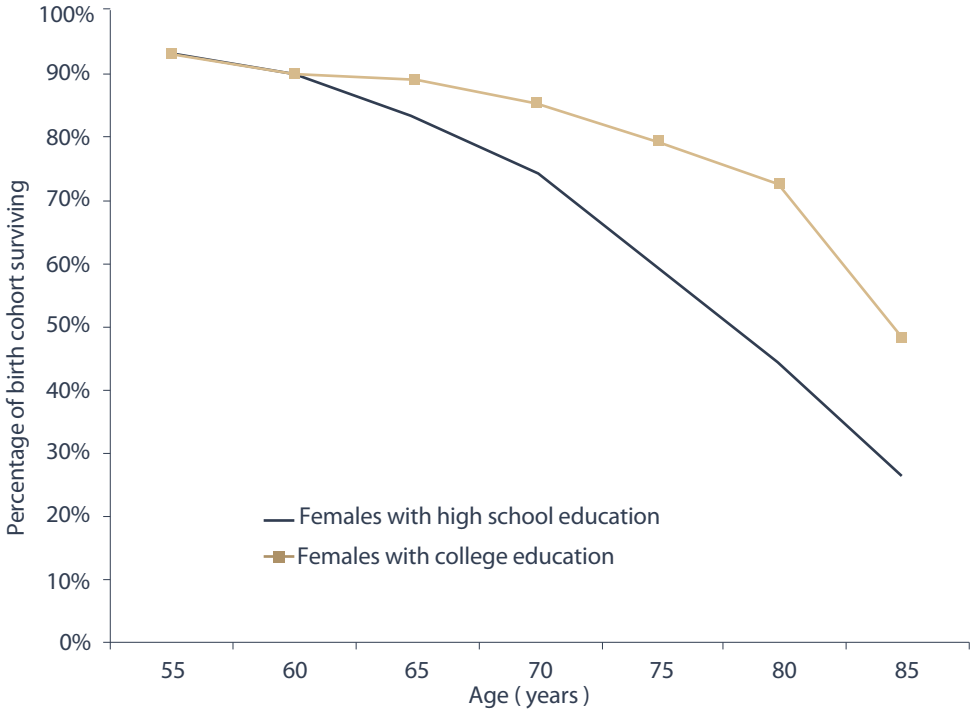


Figure 6b: Female Old Age Survival Curves: Individuals with High School vs. Individuals with College Education



2.6 Quantifying Total Lifetime Benefits

In order to provide policymakers with a clear idea of the potential benefits generated by providing ECCE access to children in Jordan, we compute estimated additional incomes as well as life expectancy benefits for each child based on the parameters below. The main assumptions we make are that children born in 2016 would enter ECCE at age three, complete one year of preschool, and then two years of kindergarten (KG1 and KG2) prior to entering primary school. Between ages six and 24, we assume that individuals would primarily be engaged in educational activities. Our estimates suggest that children benefitting from a comprehensive ECCE package would on average attain 0.7 more years of schooling over this period as outlined in Section 2.3, with slightly larger benefits for male students than for female students. We further assume that children would on average enter the labor market at age 25, and exit the labor market on average at age 64 as suggested by the LMPS data.

During this core working age period (ages 25-64) we use labor force participation rates reported in the labor panel survey as our baseline participation figures, which suggest average labor force participation rates of 73% for men and 16% for women. Both men and women benefitting from ECCE have higher labor force participation rates; as estimated in Section 2.4, these benefits are substantially larger for females than for males.

Table 7 summarizes the main results from our computations. As it has been traditionally recommended by the World Health Organization, we discount all benefits[9] occurring in the future by an annual rate of 3%; we also show estimates without discounting (discounting rate = 0) and with a discounting rate of 5%. According to our main specification (3% discounting, shaded in grey), access to ECCE will create an average benefit of US$ 23,881 per child, with marginally higher average benefits for males (US$ 24,776) than for females (US$ 22,950) due to the higher labor force participation rates observed for men. As shown in section 2.4, life expectancy benefits are actually substantially larger for women than for men. In order to monetize these gains in life expectancy, we value each life year at current gross domestic product (GDP) per capita.[10]

With 3% discounting the relative contribution of these life expectancy gains that will mostly accrue 70 or more years from today are, however, small. More generally, as it is always the case with long-term projection models, discounting rate assumptions have a major impact of estimated benefits: if future benefits were not discounted at all, average estimated benefits per child would total to US$ 93,920 per child. If a higher discounting rate of 5% is used, the total net present value of future benefits drops from US$ 23,881 (main model) to US$ 10,539.

9 *Discounting is conceptually very similar to the idea of earning interest on investment. A current income of 100 will yield 103 income in one year if the interest rate paid by a bank is 3%. By the same logic, an income of 100 next year corresponds to a benefit of 100/1.03 = 97.1 today.*

10 *This somewhat arbitrary evaluation benchmark is frequently used in the literature based on the idea that GDP per capita captures the average economic production value of each person in a given country.*

Table 7: Estimated Lifetime Benefits per Child

	Discounting rate		
	0%	*3%*	*5%*
Males			
Labor market benefits ages 25-39	$ 27,754.06	$ 10,643.95	$ 5,754.85
Labor market benefits ages 40-64	$ 60,928.81	$ 13,545.90	$ 5,201.99
Survival benefits ages 65 and older	$ 5,381.69	$ 586.02	$ 140.63
Total life time benefits per child	$ 94,064.56	$ 24,775.88	$ 11,097.46
Female			
Labor market benefits ages 25-39	$ 22,935.31	$ 8,834.91	$ 4,790.58
Labor market benefits ages 40-64	$ 61,420.97	$ 13,156.52	$ 4,946.96
Survival benefits ages 65 and older	$ 9,414.34	$ 958.24	$ 220.53
Total life time benefits per child	$ 93,770.62	$ 22,949.67	$ 9,958.07
Both sexes			
Labor market benefits ages 25-39	$ 25,392.87	$ 9,757.52	$ 5,282.36
Labor market benefits ages 40-64	$ 61,169.97	$ 13,355.11	$ 5,077.02
Survival benefits ages 65 and older	$ 7,357.69	$ 768.41	$ 179.78
Total life time benefits per child	$ 93,920.53	$ 23,881.04	$ 10,539.16

Notes: All numbers are in current (2016) US dollars. Each life year is evaluated at current GDP per capita rates

One of the most difficult assumptions for long-term project models is economic as well as real wage growth. The latest government plan foresees an annual economic growth rate between 4.8 and 7.5% per year over the coming decade.[11] Despite slower growth over the past few years, Jordan's average annual economic growth was 5.1% between 2000 and 2015 (World Bank, 2016)[12]. Based on this information, we assume a relatively conservative real wage growth rate of 3.5% per year in our main model. In Table 8, we show alternative results using more conservative (2%) as well as more optimistic (5%) real wage growth assumptions. With a very conservative 2% real wage growth assumption, the total net present value of future benefits shrinks to US$ 13,287 per child; with a more optimistic real wage growth rate of 5% per year, the benefit per child increases to US$ 44,143.

11 *Based on the national vision published in "Jordan 2025" available at* http://inform.gov.jo/Portals/0/Report%20PDFs/0.%20General/jo2025part1.pdf

12 *GDP per capita increased from US$ 1774 to US$ 4940 in 2015, which corresponds to an annual nominal growth rate of 7% in terms of GDP per capita.*

Table 8: Sensitivity Analysis: Future Wage Projections

	Real wage growth		
	2%	*3.5%*	*5%*
Males			
Labor market benefits ages 25-39	$ 6,669.57	$ 10,643.95	$ 16,937.47
Labor market benefits ages 40-64	$ 6,540.99	$ 13,545.90	$ 28,022.33
Survival benefits ages 65 and older	$ 586.02	$ 586.02	$ 586.02
Total life time benefits per child	$ 13,796.58	$ 24,775.88	$ 45,545.82
Female			
Labor market benefits ages 25-39	$ 5,548.17	$ 8,834.91	$ 14,028.47
Labor market benefits ages 40-64	$ 6,250.50	$ 13,156.52	$ 27,695.88
Survival benefits ages 65 and older	$ 958.24	$ 958.24	$ 958.24
Total life time benefits per child	$ 12,756.90	$ 22,949.67	$ 42,682.58
Both sexes			
Labor market benefits ages 25-39	$ 6,120.08	$ 9,757.52	$ 15,512.06
Labor market benefits ages 40-64	$ 6,398.65	$ 13,355.11	$ 27,862.37
Survival benefits ages 65 and older	$ 768.41	$ 768.41	$ 768.41
Total life time benefits per child	$ 13,287.14	$ 23,881.04	$ 44,142.83

Notes: All estimates represent current US$. All future benefits are discounted at an annual rate of 3%.

2.7 Cost of Providing Early Childhood Education and Benefit-Cost Ratios

In order to put the numbers presented into the previous section into perspective, we compute the estimated cost of a comprehensive package of ECCE in Table 9. As before, we assume that children would enter nurseries at age three, and then benefit from ECCE for three years (nursery, KG1 and KG2) as our main assumption. As it is generally the case for ECCE, the primary cost of providing ECCE is teacher salaries. Current nursery and kindergarten salaries vary widely in Jordan, with generally substantially lower salaries reported in the private sector compared to teachers working in public KG2 classrooms (Queen Rania Foundation, 2015). In order to keep our benefit-cost ratio estimates as conservative as possible, we assume that all teachers would be hired at public salary rates of US$ 658 (JOD 467) per month[13] (Jordan Ministry of Education, 2013), and with additional employer social security contributions of 12%.

13 *The government pays teachers with Bachelor's degrees a starting salary of 447 per month (156 for base salary, 135 for a "cost of living raise" and 156 for a "technical raise") , and most teachers also receive a 20 JOD monthly family allowance, for a total of 467 JOD per month (before health insurance and social security deductions).*

Consistent with national guidelines, we assume ten students per class and teacher in nursery, 15 students per teacher in KG1, and 25 students per teacher in KG2.[14] Under these assumptions, the total salary cost per child amounts to US$ 1,660 over the three years of ECCE. In addition to these costs, classroom space will need to be provided. We assume ten students per class for nurseries, 15 students per class for KG1 and 25 students per class for KG2, and that classrooms will on average be usable for 20 years before they need to be renovated. The total estimated annual infrastructure and equipment cost ranges between US$ 373 per child for nurseries and US$ 141 per child in KG2,[15] resulting in a total infrastructure cost of US$ 756 per child over the three-year period. Combining the infrastructure and salary categories results in a total cost of US$ 2,600 per child for three years of ECCE if future costs are not discounted. With the usual 3% discounting rate, the net present value of these costs declines to US$ 2,547 per child.

As Table 8 shows, nurseries account for almost 50% of these total costs due the relatively large number of classrooms and teachers needed for this age range. If the government wanted to only provide KG1 and KG2, the total expected (discounted) cost per child would decline to US$ 1,289. It is worth noting that nursery costs would be substantially lower if nursery provision were to remain predominantly private sector with lower salaries as is currently the case, if there were more children in each classroom, or if there were more children per teacher. However, this model aims to estimate a scenario with a higher quality standard.

Table 9: Estimated Cost of Providing Early Childhood Care

	Discounting rate		
	0%	*3%*	*5%*
Age 3: Nursery			
Salaries & benefits	$ 885.0	$ 885.0	$ 885.0
Classroom cost	$ 323.4	$ 323.4	$ 323.4
Equipment cost	$ 50.0	$ 50.0	$ 50.0
Age 4: KG1			
Salaries & benefits	$ 590.0	$ 572.8	$ 561.9
Classroom cost	$ 215.6	$ 209.3	$ 205.4
Equipment cost	$ 33.3	$ 32.4	$ 31.7
Age 5: KG2			
Salaries & benefits	$ 354.0	$ 333.7	$ 321.1
Classroom cost	$ 129.4	$ 121.9	$ 117.3
Equipment cost	$ 20.0	$ 18.9	$ 18.1
Total estimated cost: Age 3-5	$ 2,600.7	$ 2,547.4	$ 2,514.0
Total estimated cost: KG1 and KG2 only	$ 1,342.3	$ 1,289.0	$ 1,255.6

Notes: Based on 10 students per class in nursery, 15 students per class in KG1, and 25 students per class in KG2. Building costs are amortized over 20 years; classroom equipment is written off over 10 years.

14 *While these ratios may be higher than in other countries, the assumptions as described would be more realistic given current constraints and would still constitute a major improvement for many KGs and nurseries in Jordan.*

15 *These calculations are based on an estimated unit cost for extension of kindergarten classrooms under ERfKE.*

Comparing the full cost estimates for a three-year package to our main benefit estimate of US$ 23,881 suggests a benefit-cost ratio of approximately 9:1; that is, for any dollar invested, each child will obtain benefits of approximately US$ 9 over his/her lifetime.

It should be highlighted that despite being large this benefit-cost ratio is likely conservative for several reasons. First, as discussed above, we discount future wage benefits at relatively high rates and assume only moderate wage growth. Second, we assume costs which are likely to be substantially higher than the actual cost of providing ECCE, even if the quality of ECCE services is improved. While we assume that all services will be publicly provided at relatively high cost, a substantial fraction of ECCE services will likely be provided by the private sector in practice[16], resulting in substantially lower salary cost. The same holds for the infrastructure cost, which could likely be reduced substantially if existing rooms can be used or shared for teaching, and usability over time can be increased by proper management.

Last, and most importantly, our estimates are very conservative in terms of the expected benefits for three years of ECCE. Our main assumption is that children experiencing three years of ECCE will at least have the benefits experienced by children who have had some (unspecified) quantity of ECCE as reported in the PISA and EGRA/EGMA studies. Given that our benefits are based on relatively little exposure to ECCE (more than one year), it seems likely that these benefits could also be created by a less ambitious (but cheaper) program just covering KG1 and KG2. Under this more optimistic scenario, the cost per child declines to US$ 1226, resulting in a benefit-cost ratio of 19.5, which means that each dollar invested would yield 19.5 dollars in overall benefits.

16 *As of 2014-2015, 23% of students in grades 1-10 were enrolled in private schools; it thus seems likely that a substantial fraction of Jordanian families would prefer private to public ECCE services.*

3. Summary and Discussion

The results presented in this report suggest that providing Jordanian children with access to three years of ECCE will create total benefits of US$ 23,881 per child. These benefits will not accrue immediately, but rather accumulate over time as children complete their education and enter the labor market. In practice, children born in 2016 will not enter ECCE until 2019, and likely not enter the labor market before 2040; the old age survival benefits will come in even later, as many of the children will hopefully reach the next century. To account for the delayed nature of these benefits, we used a relatively large discounting rate of 3% in our analysis; if all future benefits were taken at face value, the estimated benefit per child would total US$ 93,921. The primary mechanisms through which children will benefit from ECCE access are increased educational attainment and increased labor market participation as well as labor market incomes: we estimate that children with full access to ECCE will on average attain 0.7 more years of schooling, and earn additional incomes of approximately US$ 23,000 over their lifetimes[17]. We also estimate that the additional educational attainment and incomes will increase life expectancy of benefitting cohorts by almost one year. Benefits differ somewhat based on gender and socioeconomic status, but are consistently positive for all demographic groups.

From a societal perspective, these estimated benefits exceed the estimated cost of providing ECCE services by a factor of about 9:1; that is, each dollar invested in ECCE creates estimated benefits of approximately US$ 9. Assuming that the same improvements in early childhood development could be achieved by providing a more restricted ECCE package of KG1 and KG2 only, the estimated benefit-cost ratio increases to 19.5.

Approximately 17% of earned incomes in Jordan are currently spent on consumption taxes in Jordan.[18] Applying this rate to future income gains suggests additional tax revenues of US$ 4,251 per child with 3% annual discounting. This means that even if private consumption, income, and life expectancy effects were not taken into account, the expected net fiscal impact of investing into ECCE is positive from a government perspective: for any dollar spent on ECCE today, the government is expected to earn approximately US$ 1.7 in additional future tax revenue.

In addition, expanding ECCE programs would create a substantial number of new jobs in the early education sector. According to the latest United Nations estimates, an estimated 196,000 children will be born on average per year in the 2015-2019 period in Jordan (United Nations 2016), which implies approximately 600,000 children in the three to five years age range. Assuming the teacher/student ratios mentioned above, this implies a total of approximately 40,000 early childhood teachers would be needed to provide ECCE services to all children.[19] According to current enrollment rates and the latest estimates from the Ministry of Education, fewer than 10,000 ECCE teachers are currently working in the country, which means that at least 30,000 new ECCE teacher jobs would need to be created to meet staffing needs. A majority of these jobs would likely be taken up by women, providing Jordan with an opportunity to increase the very low rates of female labor force participation illustrated in Figure 4 of this report.

Even though the analysis presented in this paper is to our knowledge the first comprehensive attempt to quantify the long-run benefits achievable through ECCE access in Jordan, several limitations are worth highlighting. First, and most obviously, there are currently no rigorous studies directly quantifying the long run labor market benefits of ECCE investment. In the absence of such parameters, we estimate additional labor effects based on international student assessments (PISA). Our empirical estimates suggest that access to ECCE on average increased educational attainment by 0.7 years, while each additional year of schooling increases labor market wages by about 6%. These assumptions are relatively conservative compared to consumption and wage differentials observed in long-run trial follow-ups in Guatemala (Hoddinott et al., 2013) and Jamaica (Gertler et al., 2014), and also substantially below the wage assumptions made in previous cost-benefit estimates which directly account for cognitive improvements in addition to increases in highest grade attained (Grantham-McGregor et al., 2007; Hoddinott, Alderman, Behraman, Haddad, & Horton, 2013).

17 *As outlined above, each child will experience additional life expectancy benefits.*
18 *Author calculations based on tax expenditure data.*
19 *Approximately 20,000 nursery teachers, 13,000 KG1 teachers, and 8,000 KG2 teachers.*

All assumptions in the model were intentionally chosen to be conservative in order to provide a lower bound of the true returns to investment in ECCE: as mentioned above, our main model discounts all future benefits at an annual rate of 3%. This results in relatively low weight given to long run benefits, as discussed in a large literature debating the validity of discount rates arising from time preference or opportunity costs (Bazelon & Smetters, 1999; World Health Organization, 2003; Cropper, Freeman, Groom, & Pizer, 2014; Sunstein, 2014). We also restrict working lives to ages 25-64, while some earlier labor market entries and later exits are clearly plausible (United Nations, 2013). We also chose a conservative assumption for real wage growth: an annual rate of 3.5% in our main model is substantially below the 5.9% average growth rates experienced by developing countries in the 2003-2013 period (International Monetary Fund, 2014), as well as the government's targets over the coming ten years.[20] Benefits double when more optimistic growth scenarios are considered; the opposite is of course also true when a more conservative discounting rate of 5% as used in previous nutrition impact studies is applied (Martínez & Fernández, 2006).

Our estimates are also conservative because we fundamentally restrict labor market improvements to be generated by increased educational attainment. A growing literature suggests that improved early life growth can promote increases in adult incomes that go substantially beyond observable improvements in schooling attainment (Hoddinott, Maluccio, Behraman, Flores, & Martorell, 2008; Baird, Hicks, Kremer, & Miguel, 2012; Gertler et al., 2014). Even though the causal mechanisms underlying these improvements are empirically hard to measure (Gertler et al., 2014), higher labor market earnings are also likely to accrue due to ECCE-driven enhancements in adult height (Case & Paxson, 2008), improved self-regulation (Heckman, Pinto, & Savelyev, 2013) and cognitive functioning (Victora et al., 2015), which are only partially accounted for in our model. Evidence from preschool programs in the US (Barnett, 1996; Heckman et al., 2013) as well as home visiting programs in Jamaica (Walker et al., 2005) and Pakistan (Yousafzai, Rasheed, Risvi, Armstrong, & Bhutta, 2014) suggest that early life interventions do not only improve early life cognitive skills, but also impact children's socio-emotional and executive function skills with large subsequent improvements in individual well-being, as well as enhanced labor market incomes and reduced criminal behavior (Heckman, Stixrud & Urzua, 2006; Heckman et al., 2013, Gertler et al., 2014). These benefits are also particularly likely to accrue with improvements in program quality, suggesting that investments to enhance the quality of teacher-child interactions in ECCE classrooms may pay even stronger dividends over time (Britto et al., 2011). In our calculations, we assumed strict adherence to student-teacher ceilings, new classrooms as well as salary rates substantially above current levels, all of which should greatly contribute to the average quality of ECCE delivered.

Despite all of these rather cautious and conservative assumptions, the numbers presented in this report suggest that the expected rate of return on ECCE investment in Jordan is very high, with an estimated return of between US$ 9 and US$ 20 for every dollar invested.

20 *See* http://inform.gov.jo/Portals/0/Report%20PDFs/0.%20General/jo2025part1.pdf *for details.*

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