ATTENDANCE IN EARLY CHILDHOOD EDUCATION AND CARE PROGRAMMES AND ACADEMIC PROFICIENCIES AT AGE 15

LESSONS FROM PISA

23-24 March 2017

This document reflects the 2015 PISA results on the impact of ECEC on student’s performance.

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INTRODUCTION

The Organisation for Economic Co-operation and Development (OECD) launched the Programme for International Student Assessment (PISA) in 1997. PISA assesses the extent to which 15-year-old students, near the end of their compulsory education, have acquired key knowledge and skills that are essential for full participation in modern societies.

The triennial assessment focuses on the core school subjects of science, reading and mathematics. In each round of PISA, one of the core domains is tested in detail, taking up nearly two-thirds of the total testing time. The major domain in 2015 was science, as it was in 2006. Reading was the major domain in 2000 and 2009, and mathematics was the major domain in 2003 and 2012.

Through questionnaires distributed to students, parents, school principals and teachers, PISA also gathers information about students’ home background, their approaches to learning and their learning environments.

Policy makers around the world use PISA findings to gauge the knowledge and skills of students in their own country/economy in comparison with those in other participating countries/economies, establish benchmarks for improvements in the education provided and/or in learning outcomes, and understand the relative strengths and weaknesses of their own education systems.

Among the multitude of factors that could be responsible for differences in students’ proficiency scores both within and across countries is students’ previous participation in one of early childhood education and care (ECEC) programmes (see Box 1 for some explanations regarding ECEC terminology used in this paper). When children enter primary school, they already differ in their language, early literacy and numeracy skills, as well as their social and emotional skills, and those differences are often maintained or amplified later in life (Berlinski, Galiani and Gertler, 2009; Entwisle, Alexander and Olson, 1997; Mistry et al., 2010). ECEC programmes are thus seen as one avenue to promote early development and raise achievement levels of all children, and especially of those from disadvantaged backgrounds. Investing in early education programmes has been seen as an effective policy investment with a myriad of long-term benefits (Heckman, 2006). The importance of ECEC participation and pre-school quality has been analysed in a number of OECD reports as well (OECD, 2011, 2013, 2014, 2015).

In order to examine possible effects of this early learning provision on later academic outcomes of these children, PISA included questions about attendance in ECEC, starting from the second round of PISA in 2003. In particular, in PISA 2003, 2009, and 2012, students were asked whether they attended ECEC at all, and if yes, was it for less or more than one year. In PISA 2015 a much broader set of questions about ECEC provisions was asked not only of students but also of parents. Students were asked about the starting year of their ECEC attendance (rather than directly about ECEC duration) and starting year of their primary school. Based on this information it was then possible to deduct the duration of their ECEC attendance. In addition, students’ parents were also asked a wide set of questions on attendance in different types of ECEC settings, reasons for attending, types of ECEC centres, etc. (full list of these questions is presented in the annex of this paper).

In this paper we will present findings in relation to these questions, i.e. we will examine the existence and strength of the relationship between ECEC attendance and students’ academic competences at age 15. In doing so, we will also try to depict some of the contextual factors that influence this relationship.

No questions about ECEC attendance was asked in PISA 2006.
According to UNESCO (2006), early childhood education and care (ECEC) is defined as “programmes that, in addition to providing children with care, offer a structured and purposeful set of learning activities either in formal institutions (pre-primary) or as part of a non-formal child development programme”.

The focus of the internationally comparable statistics, International Standard Classification of Education Level 0 (ISCED 0), is much narrower. Currently, at least four strands of research support the relevance of applying a broader definition of ECCE than focusing on ISCED 0 alone: brain research, studies on domain-specific development and support, evaluation studies of model programmes, and longitudinal large-scale studies all rely on the broader definition of ECCE. Thus, conclusions about the importance of early child care should be drawn with ECCE and not with ISCED 0 in mind.

In this paper we use the term ECEC to refer ISCED 0 levels. However, we urge readers to notice the wider framework of programmes and settings that ECEC includes and that are not covered in the operational definitions of early childhood education and care used in PISA.

1. Results of previous PISA surveys

In previous rounds of PISA, only one question was asked of students in relation to their ECEC experience. In particular, they were asked whether they attended ECEC: for less than a year, for more than a year or did not attend it. The relationship between students’ attendance and their proficiencies, before and after accounting for students’ socio-economic background is presented in Figure 1. In almost all OECD countries students who attended ECEC for more than one year substantially outperformed those that did not. This is true even after accounting for socio-economic status. On average across OECD countries, the advantage of students who went to ECEC for more than one year in comparison to those that did not attend ECEC programmes is around 50 score points before accounting for socio-economic status and around 30 score points after accounting for it. This reduction in the difference between two groups suggests that ECEC attendance is related to students’ socio-economic characteristics. This may be expected since students from advantaged backgrounds are on the one side more likely to attend ECEC programmes and possibly attend programmes of better quality, and that they are exposed to better learning environments outside of these programmes that benefits their performance in PISA.

Yet the remaining difference is still substantial and shows the possibility that ECEC attendance can influence students’ academic proficiencies independently of socio-economic background factors. This is especially encouraging since a number of studies have indicated that although pre-primary attendance can raise students’ cognitive test scores and build a base for further development, the gains are not long-lived mostly due to the fact that students return to their original environment after their preschool programmes (Barnett, 1995; Lee, 1995). Although many other factors apart from those taken into account here influence students’ performance in school, it is encouraging to see that on average ECEC attendance has considerable positive effects on students even after a substantial period of time. It should be noted though that although in almost all of OECD countries the relationship between ECEC attendance and proficiencies is positive, it does varies considerably indicating possible differences in the quality of provision across countries. We will examine issues of quality in more detail in section 3.
Figure 1. Differences in proficiency scores, by attendance at pre-primary school
Between students who attended pre-primary school for more than one year and those who had not attended


2. PISA 2015 findings: ECEC attendance and students’ academic proficiencies

PISA 2015 has collected much more information about the ECEC experience of students, due to the fact that the parent questionnaire contained an entire section of questions on this topic. The intention was to obtain more information about the early education experiences of students, including specific aspects of programme type, duration and quality. However, it is assumed to be more than unlikely to retrieve this information retrospectively from students. Thus, while keeping a short question on ISCED 0 attendance in the Student Questionnaire, PISA 2015 included a series of questions on ECEC experience in the Parent Questionnaire, expecting parents to be a more reliable source of information. One drawback, however, is the fact that the parent questionnaire was optional for countries and is in the end administered in only 18 PISA countries. It should also be noted that the question for students on their ECEC attendance was changed from that used in previous PISA rounds – they are now asked about the starting year of their ECEC attendance rather than directly on the length of their attendance. Thus results from previous PISA rounds are not comparable to those from this round.

2.1 Overall attendance rates

Overall ECEC attendance rates in OECD countries are rather high with 92% of children attending some ECEC programme for at least one year (Figure 2). However, around half of children attend ECEC programmes for less than three years, and quarter of them attend it for less than two years, indicating that although participation in ECEC programmes is nearly universal in majority of countries, duration of participation may be relatively limited for substantial number of children.
1. Note by Turkey: The information in this document with reference to « Cyprus » relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the “Cyprus issue”.

2. Note by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

2.2 Impact of ECEC attendance

Given these relatively high ECEC attendance rates across countries, it would be interesting to see if and how this attendance is related to the students’ academic proficiencies measured in PISA. Findings presented in Figure 3 indicate that across OECD countries, attendance on its own, irrespective of its duration, does matter and that the impact of pre-primary school attendance is similar to that found in previous PISA waves. However, in PISA 2015, ECEC programmes are divided into three separate categories of ECEC settings – Pre-primary education (ISCED 0-02); Early childhood educational development (ISCED 0-01); and Supervision and care (more details on the characteristics of programmes are given in Box 2). It turns out that the impact of attendance on PISA scores differs quite substantially depending on which type of ECEC setting students attended.

Box 2: Three ECEC settings parents were asked about in PISA 2015

<table>
<thead>
<tr>
<th>Supervision and care (not in ISCED):</th>
<th>Formal and informal programmes that do not necessarily have a holistic or educational component, are not necessarily organized in an institution and with trained staff and have children's supervision and care as basic function.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early childhood educational development (ISCED 0-01):</td>
<td>Education designed to support early development in preparation for participation in school and society. Programmes designed for children below the age of 3.</td>
</tr>
<tr>
<td>Pre-primary education (ISCED 0/02):</td>
<td>Education designed to support early development in preparation for participation in school and society. Programmes designed for children from age 3 to the start of primary education.</td>
</tr>
</tbody>
</table>

It could be expected that pre-school programmes are most influential since they have the strongest educational component, are most structured and are of longest duration. Also, the fact that supervision and care arrangements do not have substantial effects on later academic proficiencies of students does not come as a surprise, given that these arrangements usually lack an educational component, are unstructured, and informal, and are often staffed by untrained caregivers. However, it is somewhat surprising to see that early childhood educational development programmes for children below age 3 do not have much effect on students’ performance, although they do have educational component and are usually provided by trained staff. These results may be due to the fact that these programmes are done at very early stage and are less structured and intensive than pre-school programmes. On the other hand, taking into account plasticity of children’s’ brains at this early age and their sensitivity to rich environmental stimulation, questions may be asked about the quality and usefulness of these programmes. One should also take into account that students in PISA 2015 were in these programmes in the beginning of the 2000’s, so it could be expected that the provision and quality of these programmes has improved in the meantime.
2.3 Starting age and duration of ECEC attendance

Attendance in ECEC programmes is not the only important parameter of children’s ECEC experience. The duration of their attendance and its quality are two other critical determinants of the impact ECEC programmes will have on a child. Earlier entry into ECEC programmes and a longer ECEC experience may reduce inequalities in education, provided that the participation in pre-primary programmes is of good quality (Chetty et al., 2011; OECD, 2016).

Across OECD countries the majority of students started attending ECEC programmes at ages 3 (about one third of them) and age 4 (about one quarter of them). Only around one in six students was participating in ECEC programmes at an earlier age, where they were participating in supervision and care or early childhood educational development programmes (Figure 4).
As could be expected, starting age is related to later students’ academic proficiency (Figure 5). Across OECD countries, students who started their ECEC at age 3 score on average more than 60 points higher in all three proficiencies in comparison to those that started at the later age. However, the figure shows that the relationship is not linear, i.e. that a very early start at age 0-1 does not bring increased benefits, but is rather less optimal than a start at age of 2 or 3. This may be due to a number of factors, but it could be related to the findings presented in Figure 3, where it is shown that ECEC programmes at an early age (supervision and care and early childhood educational development) are not as beneficial for children as later pre-school programmes.
Once the starting age in ECEC programmes is compared to the starting age in primary school, the average duration of participation in the ECEC programmes can be calculated. Across OECD countries, the average time spent in early childhood education is three years. The relationship between the average time spent in ECEC settings and later students’ proficiency is shown in Figure 6. Here again we can see that this relationship is not linear, but rather curvilinear. In particular, it shows a roughly linear increase in proficiencies with longer duration until an average duration of 4 years. Further increase in duration is followed by actual reversal effects and a slight decrease in proficiencies. These findings should be related to those presented in Figure 4. In other words, they indicate that children who are starting at ECEC participation at a very early age will not necessarily benefit from this early participation. On the other hand, the results again confirm that children starting around age 3 have much higher proficiencies than those starting later, at ages 5 or 6.

Figure 6. Relationship between duration of ECEC attendance and proficiencies at age 15

The positive effects of a longer period spent in ECEC programmes is not only visible at the level of individual students. When results are aggregated to a country level, the relationship between the average duration of students’ ECEC experiences and their science proficiency remains positive (Figure 7). Of course, this relationship is probably influenced by a number of economic and cultural characteristics that may influence both variables in the same direction, so these findings should not be interpreted as a proof of the causal relationship between these two variables. Findings that do take into account some of these background variables are presented in the following sections.
2.4 Intensity of ECEC programmes

Apart from the duration of ECEC attendance, it could be expected that the daily and weekly intensity of these programmes may also play a role. A certain degree of intensity may be necessary for programmes to have beneficial effects, especially relatively long-term effects such as those measured in PISA (Logan et al., 2011; Sylva et al., 2011b). Across OECD countries, the relationship between the intensity of weekly attendance and later students’ proficiency is again curvilinear, indicating an optimal range of attendance spanning between 20-40 hours per week. Slightly more or less intense programmes (i.e. those in range of 40-50 hours and 10-20 hours per week) are somewhat less beneficial. However, the real difference is present in the case of a very short (less than 10 hours) and very long (more than 50 hours) programmes, with students who attended these programmes having substantially lower proficiency scores than students who attended greater or fewer hours respectively. Different reasons may be behind the differences in two extremes. On the one hand, students with few hours of weekly provision are probably not having enough exposure for the programme to have positive effects. On the other hand, those students with more than 50 hours of weekly attendance may have too little contact with family and their ECEC environment may have less of educational and more of a day-care character. These results open up questions on the reasons
parents have for sending their children to particular ECEC programmes. We will examine these in one of the following sections.

3. Quality of ECEC programmes matters

The results presented so far, as well as the body of research on ECEC effectiveness indicate that attendance on its own is not enough to ensure positive child outcomes. In other words, once a child is present in an ECEC setting a number of characteristics of the setting and its provisions determine whether or not the child will benefit from the experience, what kind of benefits will occur, and how long they will persist (OECD, 2016). For example, the British Effective Provision of Pre-School Education (EPPE) Study found short-term effects indicating that pre-school attendance was beneficial for both cognitive and socio-emotional development, especially for children from disadvantaged backgrounds. However, the long-term benefits persisted only for those children that attended high-quality pre-school centres (e.g. Sammons et al., 2008; Sylva et al., 2011a; see also Valenti and Tracey, 2009).

One illustration of the importance of providing high quality ECEC programmes is clearly shown in Figure 11. We can see there that the same duration of ECEC attendance, after accounting for students’ and schools’ socio-economic status, had very different effects across countries. For example, with increased duration of attendance, ECEC programmes have substantial positive effects in Hong Kong (China), Belgium, United Kingdom and Singapore. On the other hand, students that were attending ECEC programmes in Estonia, Latvia and, to a lesser degree, the United States, have actually lower scores in
comparison to their compatriots who did not attend these programmes. Such a difference in the effectiveness of these programmes across countries is quite striking and indicates how critical it is to ensure quality of ECEC provision. The question is then which kind of characteristics influence or determines quality of ECEC provision?

![Figure 9. Relationship between ECEC attendance and science proficiency across countries](image)

**Different impact of ECEC attendance across countries**

Note: * - Differences in comparison with students that did not attend ECEC.


### 3.1 Staff-to-child ratio

The number of children per staff is often used as one indicator of the quality of an educational programme. Large groups of children may limit the time and amount of attention a teacher or ECEC staff member can dedicate to an individual child. In such settings, staff could also be more subjected to disturbances from disruptive and noisy children. As a result, staff may scale down educational activities and change pedagogical styles in order to adjust to this situation, which in turn could affect learning.
Figure 12 shows the relationship between country-level averages in the ratio of children per pre-school staff and the science proficiency of students. Across countries participating in PISA 2015, a moderately strong negative correlation is present, with countries that have higher number of children per staff also tending to have lower science proficiency amongst students. Of course, this finding does not necessarily indicate direct causal relationship between the two variables as many other factors that are not taken into account here, could affect this relationship.

**Figure 10. Relationship between staff-children ratio and science proficiency across countries**

![Graph showing the relationship between number of children per pre-school staff and science proficiency at age 15. The correlation coefficient is -0.37.]


### 3.2 Staff Training

The qualifications and training of ECEC staff is another often used indicator of the quality of educational provision. There is a more direct measure of this indicator in PISA 2015, where parents are asked if the supervision of their children in “supervision and care” programmes was staffed by trained supervisors. Differences in proficiency scores depending whether or not supervision was conducted by a trained person are shown in Figure 13. Results show that across OECD countries, students supervised by trained staff scored between 15-20 points higher than those supervised by untrained staff. These differences could also reflect the fact that ECEC centres with trained staff were offering better quality programmes and having better facilities than those with untrained staff.
3.3 Management and funding type

Type of funding and management could affect the quality of programmes as well (Belfield, 2006). There are two sources of funding for ECEC programmes: public and private. In most countries ECEC programmes are more commonly provided by public than by private institutions, especially in the case of kindergartens or preschools (OECD, 2012). Public institutions often charge lower fees than private institutions and are therefore of special importance for low income families who could not afford to make large private contributions. However, private institutions can also receive public funding and be mostly run by public financing, in which case they provide private management of public funds.

Differences in students’ science proficiency depending on the funding and management type of their pre-school institutions are presented in Figure 14. We can see that across OECD countries, students coming from privately managed pre-schools have substantially higher scores than those coming from publicly run institutions. The funding source does not seem to have much influence as long as the institution is managed by a private provider. These results may reflect the fact that private management may allow for a more flexible and efficient ECEC system. On the other hand, poorer results of students from publicly run systems may be due to their more uniform quality of provision since these programmes are more highly regulated and may be less responsive to differing demands of their users. However, these results may also reflect differences in the socio-economic background of students who attend publicly and privately run providers.
4. Influence of student and school background on the effects of ECEC attendance

So far we have seen that ECEC attendance and the duration of ECEC experience do have positive impacts on students’ later academic proficiencies. However, the question is to what degree these are the product of the common influence of background factors. For example, students from privileged backgrounds may have better home learning environments and at the same time be more likely to attend (better) ECEC programmes. This situation would lead to the correlation between ECEC attendances with later student PISA performance, even in situation where ECEC attendance in reality does not bring any relevant benefits. This is why it is necessary to control or account for as many of these socio-economical background variables as possible before making inferences about the possible effects of ECEC experience on students’ proficiencies at age 15.
Figure 13 shows differences in science proficiency between students that attended ECEC programmes for varying length of time and those that did not. More importantly, the figure also shows how these differences change once student and school’s socio-economic backgrounds are taken into account.

First of all, we can see that students who attended ECEC for less than a year are worse off than students that did not attend, even more so after accounting for background variables. Although there are fewer than 2% of students falling in this category across OECD countries, it raises questions about the value of a very late start in ECEC attendance (see Box 3 for comparison of these results with those obtained in previous PISA rounds). On the other hand, and in line with what we have seen in other results, when background characteristics are not taken into account students with longer ECEC experiences have a substantial advantage in terms of their science proficiency compared to students without ECEC experiences.

**Box 3: The impact of methodology**

In previous rounds of PISA, students were asked if they attended pre-school programmes with three answers to choose from: 1) no; 2) yes, less than a year; and 3) yes, more than a year. However, in PISA 2015 student were asked a different question: How old were they when they started attending pre-school programme. Their answer was then compared with answer to the question on their starting age of primary school to calculate their total duration of ECEC attendance.

Although the two approaches may seem rather similar they actually bring quite different results. In particular, the results from previous rounds of PISA indicate that attending ECEC programmes even for less than a year already brings about very substantial benefits (around 30 points higher science proficiency scores). However, results from PISA 2015 shows that those attending for less than a half a year actually have lower scores in academic proficiency in comparison to those that did not attend (about 15 points lower science proficiency scores). So, the question is which results should be believed and how is this possible.

The answer probably lies in the fact that the question asked in earlier rounds of PISA has led to a certain kind of memory bias in students. In particular, given that it may be hard for a student to remember exact duration of their ECEC experience, those students choosing the answer option “yes, less than a year” may have actually only been indicating that they did attended ECEC programmes but for a relatively short duration of few years. On the other hand, being asked about the exact starting year may present a less of a memory challenge, with a more burdensome calculation of actual duration done by researchers at later stage, thus substantially improving the accuracy of the estimated duration of the ECEC experience.

An indication that this is indeed the case can be seen in the proportion of these answers in different PISA rounds, with around 20% of respondents indicating that they attended ECEC programmes for less than a year in previous PISA rounds, compared to only around 1.5% in 2015 (with additional an 10% attending for 1-2 years and around 17% for 2-3 years). PISA 2015 results are much more in line with actual statistics of students’ attendance and represent a more reliable source of information on actual duration of students’ ECEC experience. This example illustrates how seemingly simple methodological decisions can affect substantive conclusions.

When students’ and schools’ socio-economic characteristics are taken into account, however, this advantage is reduced to between a third and a quarter of the original level. This means that the major part of the initial differences in students’ scores is actually not related to their participation to ECEC but rather to differences in their home and school socio-economic status. These findings indicate that ECEC programmes in which these children participated were not able to bring much additional benefit to these children. But more worriedly, they also indicate that these programmes were not that effective in tackling pre-existing socio-economic inequalities, at least not in this cohort of children. This is somewhat at odds with results of previous PISA rounds, presented in Figure 1, where socio-economic background accounted for less than a half of initial differences between students that attended ECEC programmes and those that did not. This is probably the result of the different ways the questions were asked in the earlier and new PISA rounds (see Box 3).
On the more positive note, significant effects of ECEC attendance do remain even after accounting for background variables. Also, one should have in mind that these are aggregate results across OECD countries and that they hide heterogeneity in the effects of ECEC attendance on students’ performance across individual countries as shown in Figure 9.

**Figure 13. Relationships between ECEC attendance and science proficiency before and after accounting for socio-economic background**

<table>
<thead>
<tr>
<th>Impact on ECEC duration before and after accounting for background characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before</td>
</tr>
<tr>
<td>Less than one year</td>
</tr>
<tr>
<td>Before</td>
</tr>
<tr>
<td>-30</td>
</tr>
</tbody>
</table>

Notes: * - Differences in comparison with students that did not attend ECEC.


**4.1 Differences across students’ background characteristics**

Students’ demographic and socio-economic background characteristics do influence their attendance and ECEC experience, as shown in Figures 1 and 13. In this section we will present further insights in how some of individual characteristics of students’ backgrounds influence the relationship between ECEC attendance and academic proficiencies. In Figure 15 we can see how average science proficiency scores change depending on the age at which students started attending ECEC programmes, and separately for girls and boys. Although the general distribution is rather similar, there are still smaller differences
indicating that an aggregate level, across all OECD countries, girls benefit a bit more than boys from earlier start.

**Figure 14. Relationship between starting age of ECEC attendance and science proficiency, by gender**

![Graph showing the relationship between starting age of ECEC attendance and science proficiency by gender.](image)


Across OECD countries, the relationship between attendance and science proficiency is fairly similar for different levels of socio-economic status (SES). The main difference seem to be that students with high SES tend to benefit most from an early start (age 2) and benefit the least from a late start (age 6), while other students have highest scores when starting at age 3. These results are somewhat unexpected as it could be assumed that students from disadvantaged backgrounds benefit the most from longer duration. Lack of such evidence could be attributed to lower quality of programmes these students were attending in comparison with students from more privileged backgrounds.
Attendance in ECEC programmes is often considered to be especially important for children with an immigrant background. Indeed, results presented Figure 17 show that across OECD countries, students with an immigrant background have benefited from ECEC attendance substantially more than their native peers in all three proficiencies. These results illustrate how important it is to meet the needs of children and parents from immigrant backgrounds whose circumstances may prevent access to high quality ECEC settings in order to increase their participation and benefit from it. This effort would need to focus on developing positive and informative messages about the content and benefits of ECEC provision, but would also need to adjust pedagogical approaches that would promote socio-cultural diversity among both native and immigrant children.
Figure 16. Differences in proficiency scores among students that started attending ECEC at ages 3 and 5, by immigration status

![Impact of ECEC on science proficiency by immigration status](image)

Note: * - Difference in proficiency scores among students that started attending ECEC programmes at age 3 in comparison with those that started attending at age 5.


4.2 Differences across students’ school characteristics

Another set of students’ background variables concerns the socio-economic characteristics of the schools that students attend. In Figure 18 we present differences in average duration of ECEC attendance across different type of schools in which students are currently enrolled. Across OECD countries, students in socio-economically advantaged schools had attended about four months more pre-primary school than students in disadvantaged schools. Across OECD countries, students in urban schools had spent two months more in pre-primary school than students in rural schools, and students in private schools had also spent two months more in pre-primary education than students in public schools. These results point out that students from advantaged backgrounds are more likely to spend more time in ECEC settings and thus benefit more from their ECEC experience than less advantaged children.
5. Parents’ reasons for enrolling their children in ECEC

The results presented so far have shown the type, duration and intensity of students’ ECEC experiences. However, it would be interesting also to know parents’ reasons for enrolling their children in different types of ECEC programmes. In PISA 2015, parents chose from four reasons for enrolling their children in each of the three types of ECEC settings. Their answers are presented in Figure 10. As could be expected, across OECD countries, students who were attending ECEC programmes only because it was a mandatory obligation for their parents have lowest scores. This may reflect the fact that in these cases parents were not choosing programmes with stronger learning focus or that the quality of programmes where attendance was mandatory was lower. Similarly, sending children to ECEC programmes only because other children attend them as well also implies that parents are not focusing on the educational dimension of ECEC experiences and that the quality of these programmes may not be the best.

Figure 17. Differences in duration of ECEC attendance, by schools’ characteristics

Duration of ECEC participation by school characteristics

<table>
<thead>
<tr>
<th>By school socio-economic profile</th>
<th>By type of school</th>
<th>By school location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottom quarter</td>
<td>Public</td>
<td>Rural area</td>
</tr>
<tr>
<td>Top quarter</td>
<td>Private</td>
<td>Town</td>
</tr>
<tr>
<td></td>
<td></td>
<td>City</td>
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</tbody>
</table>

Additional learning stimulation, as expected, is the most beneficial motivation of parents in pre-school and early childhood education programmes. Likewise, in all three ECEC types, but especially in the supervision and care programmes, ECEC programmes are very beneficial in those situations where parents are not able to provide necessary care themselves all the time (e.g. when both parents are working). This finding illustrates how important ECEC programmes are for providing a stimulating learning environment in situations when this may be lacking. In this way, apart from their educational role, they fulfil their economic and wider social role of allowing both parents to be economically and socially active, thus improving employment rates and reducing gender inequalities.
CONCLUSIONS

PISA results shows that, across OECD countries, students who had attended early childhood education tend to have higher scores in academic proficiencies at age 15 than students who had not attended ECEC programmes. However, in between two to three quarters of this advantage is reduced once the socio-economic background of students and their schools is taken into account. These results may indicate presence of selection effects, i.e. the tendency that students from advantaged background have a higher chance to attend ECEC at all and high quality ECEC in particular. ECEC programmes across OECD countries do not seem to be more beneficial to students coming from disadvantaged socio-economic backgrounds, which is often one of the policy priorities of these programmes. On the other hand, it is encouraging to see that immigrant students have been able to substantially improve their skills, indicating how important it is to ensure their access to high quality ECEC programmes.

The data shows that although great majority students are now at some point participating in ECEC programmes, many of them have done so for a short duration (i.e. for less than two years) and with low intensity (i.e. with fewer than 10 hours per week). PISA findings provide a clear indication that both longer duration and greater intensity tend to be associated with higher proficiency scores at a later age. However, they also show that there is an optimum level of ECEC experience and that too long a duration (starting before age 2) and too much intensity (more than 50 hours per week) may not provide an optimal balance between exposure to home care and learning environment and additional educational stimulation provided in ECEC programmes.

And although results across OECD countries clearly indicate positive but moderate effect of ECEC attendance, heterogeneity of results across countries and differences across some of the quality indicators clearly illustrate that attendance alone is not enough. The quality of ECEC programmes not only matters, but will ultimately be deciding factor on whether or not they will provide beneficial effects. These PISA findings, thus, can be seen as generally encouraging empirical evidence about the possibility of positive influences of ECEC programmes. But they can also be seen as a warning that in order for these programmes to deliver their potential benefits, a strong emphasis on their high quality and wide outreach need to be a policy priority.

Presented PISA data on students’ ECEC experiences, although valuable, are limited in scope and have important methodological constrains (e.g. see Box 3). As such, they do not allow for a more comprehensive analysis of children’s learning outcomes in relation with their home and ECEC environments. In addition, PISA 2015 results refer to ECEC settings that existed some 10-15 years ago, when these students were attending these programmes (and in case previous PISA rounds even earlier). Clearly, situation may have changed quite substantially in the meantime and these changes could not be reflected in these findings. In this sense, findings from PISA studies could be seen as a call for further studies that would provide answers for questions opened by presented results. The International Early Learning and Child-wellbeing Study is one such research project that would attempt to offer much more timely and comprehensive information on the relationship between children’s learning environments, their individual characteristics, and their learning outcomes. In doing so, it will allow for better examination of factors that foster and hinder learning within ECEC environment and how these factors differ across children from coming from different social and cultural backgrounds. Policy makers could then use this information to set up more effective ECEC programmes, which would be of better value to participating children, especially to those from disadvantaged groups.
REFERENCES


ANNEX: LIST OF QUESTIONS ON ECEC ATTENDANCE IN PISA SURVEYS:

PISA 2003, PISA 2009, & PISA 2012:

Student questionnaire:

Q20 Did you attend ISCED 0?
No 1
Yes, for one year or less 2
Yes, for more than one year 3

Q21 How old were you when you started ISCED 1?
___ Years

PISA 2015:

Student questionnaire:

ST125
How old were you when you started ISCED 0?
“1 year or younger” 1
2 years 2
3 years 3
4 years 4
5 years 5
“6 years or older” 6
“I did not attend ISCED 0” 7
“I do not remember” 8

ST126
How old were you when you started ISCED 1?
“3 years or younger” 1
4 years 2
5 years 3
6 years 4
7 years 5
8 years 6
“9 years or older” 7
Parent questionnaire (was optional for countries, applied in 18 countries):

**Supervision and care arrangements:**

**PA018** Did your child regularly attend an arrangement with one of the following main purposes prior to <grade 1 in ISCED 1>?

(Please tick only one box in each row.)

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervision and care (e.g., national examples)</td>
<td>☐ 1</td>
<td>☐ 2</td>
</tr>
<tr>
<td>Early childhood educational development (e.g., national examples)</td>
<td>☐ 1</td>
<td>☐ 2</td>
</tr>
<tr>
<td>Pre-primary education (e.g., national examples)</td>
<td>☐ 1</td>
<td>☐ 2</td>
</tr>
</tbody>
</table>

If yes, please answer questions 19–22.

If yes, please answer questions 23 and 26.

If yes, please answer questions 27–30.

In case your child did not visit any <early childhood education and care arrangement> prior to <grade 1 in ISCED 1> please proceed to Q32.

**PA019** At what ages did your child attend a <supervision and care arrangement> prior to <grade 1 in ISCED 1>?

(Please tick all that apply.)

<table>
<thead>
<tr>
<th>Age</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to age 1</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>Age 1</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>Age 2</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>Age 3</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>Age 4</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>Age 5</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>Age 6</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>Age 7</td>
<td>☐</td>
<td></td>
</tr>
</tbody>
</table>

**PA020** Who took care of or educated your child in a <supervision and care arrangement>?

(Please tick all that apply.)

<table>
<thead>
<tr>
<th>Care Provider</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>An underage sibling of the child</td>
<td>☐ 1</td>
<td></td>
</tr>
<tr>
<td>An adult relative of the child (e.g., grandparents)</td>
<td>☐ 1</td>
<td></td>
</tr>
<tr>
<td>An adult untrained in child care, not a relative (e.g., baby-sitter, friend, neighbour)</td>
<td>☐ 1</td>
<td></td>
</tr>
<tr>
<td>A trained adult (e.g., teacher, nurse)</td>
<td>☐ 1</td>
<td></td>
</tr>
</tbody>
</table>

**PA021** Where was your child cared for or educated in a <supervision and care arrangement>?

(Please tick all that apply.)

<table>
<thead>
<tr>
<th>Location</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>The child’s own home</td>
<td>☐ 1</td>
<td></td>
</tr>
<tr>
<td>Another person’s private home</td>
<td>☐ 1</td>
<td></td>
</tr>
<tr>
<td>An institutional setting (e.g., national example)</td>
<td>☐ 1</td>
<td></td>
</tr>
<tr>
<td>Another place</td>
<td>☐ 1</td>
<td></td>
</tr>
</tbody>
</table>

**PA022** What was the most important reason why your child attended a <supervision and care arrangement>?

(Please tick only one box.)

<table>
<thead>
<tr>
<th>Reason</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance was mandatory</td>
<td>☐ 1</td>
<td></td>
</tr>
<tr>
<td>We’ll could not care for the child (e.g., work, illness)</td>
<td>☐ 2</td>
<td></td>
</tr>
<tr>
<td>We’ll wanted additional learning stimulation for the child (e.g., social, academic)</td>
<td>☐ 1</td>
<td></td>
</tr>
<tr>
<td>Most other children attended a &lt;supervision and care arrangement&gt;</td>
<td>☐ 1</td>
<td></td>
</tr>
</tbody>
</table>
Early childhood educational development:

At what ages did your child attend an <early childhood educational development arrangement> prior to <grade 1 in ISCED 1>?
(Please tick all that apply.)

| PA023Q01NA | Up to age 1 | 1
| PA023Q02NA | Age 1      | 1
| PA023Q03NA | Age 2      | 1
| PA023Q04NA | Age 3      | 1
| PA023Q05NA | Age 4      | 1
| PA023Q06NA | Age 5      | 1
| PA023Q07NA | Age 6      | 1
| PA023Q08NA | Age 7      | 1

What was the most important reason why your child attended an <early childhood educational development arrangement>?
(Please tick only one box.)

- Attendance was mandatory. 1
- We felt our child needed more stimulation. 2
- We wanted additional learning stimulation for the child (e.g. social, academic). 3
- Most other children attended a <early childhood educational development arrangement>. 4

Pre-primary education arrangement:

At what ages did your child attend a <pre-primary education arrangement> prior to <grade 1 in ISCED 1>?
(Please tick all that apply.)

| PA027Q01NA | Up to age 1 | 1
| PA027Q02NA | Age 1      | 1
| PA027Q03NA | Age 2      | 1
| PA027Q04NA | Age 3      | 1
| PA027Q05NA | Age 4      | 1
| PA027Q06NA | Age 5      | 1
| PA027Q07NA | Age 6      | 1
| PA027Q08NA | Age 7      | 1

Please consider now the last <pre-primary education arrangement> which your child attended prior to <grade 1 in ISCED 1>.

What type of provider offered this <pre-primary education arrangement>?
(Please tick only one box.)

- Public management and mainly public funding (e.g. <national example>). 1
- Private management and mainly public funding (e.g. <national example>). 2
- Private management and mainly private funding (e.g. <national example>). 3

How many hours per week did your child attend a <pre-primary education arrangement> at the age of three years?
(Please tick only one box.)

- 0 hours per week 1
- up to 10 hours per week 2
- 11-20 hours per week 3
- 21-30 hours per week 4
- 31-40 hours per week 5
- 41-50 hours per week 6
- 51 hours per week or more 7
What was the most important reason why your child attended a pre-primary education arrangement?

(Please pick only one box.)

<table>
<thead>
<tr>
<th>Reason</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance was mandatory.</td>
<td></td>
</tr>
<tr>
<td>We'll could not care for the child (e.g. work, illness).</td>
<td></td>
</tr>
<tr>
<td>We'll wanted additional learning stimulation for the child (e.g. social, academic).</td>
<td></td>
</tr>
<tr>
<td>Most other children attended a pre-primary education arrangement.</td>
<td></td>
</tr>
</tbody>
</table>