EARLY LEARNING FOR ALL IN CHINA: AN ATTAINABLE GOAL

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Introduction

This paper is based on a presentation with the same title, delivered at the conference "Roadmap for Implementing Early Childhood Development". The conference took place in Beijing on 27-28 October, 2016 and was organized by the Chinese Development Research Foundation (CDRF).

China has identified the expansion and improvement of early childhood development services as a core strategy to reduce and eventually eradicate poverty. This was the rationale for the CDRF conference. The leading question for this paper is: how can China universalize *early learning* opportunities by 2020?

In this paper, early learning is understood as:

- preschool education for children from age three until entry in primary school (3-6) and
- parenting programs for the younger children (0-3): programs to strengthen parenting skills in order to enhance the development of children prior to preschool enrolment.

Strictly speaking, kindergartens in China and many other countries are open to children from birth (or soon after birth) onwards. However, it is not realistic to assume that one day all children from 0-6 are in kindergarten; in fact, this may not even be desirable since young children are best cared for in the home, on the condition that there is a sound home learning environment. It is therefore that in this paper we draw a line at age three: before that age it is recommended to invest in the skills of parents and in the home learning environment (with a focus on marginalized groups and territories), and beyond the age of three the goal is universal access to kindergarten or an alternative preschool institution.

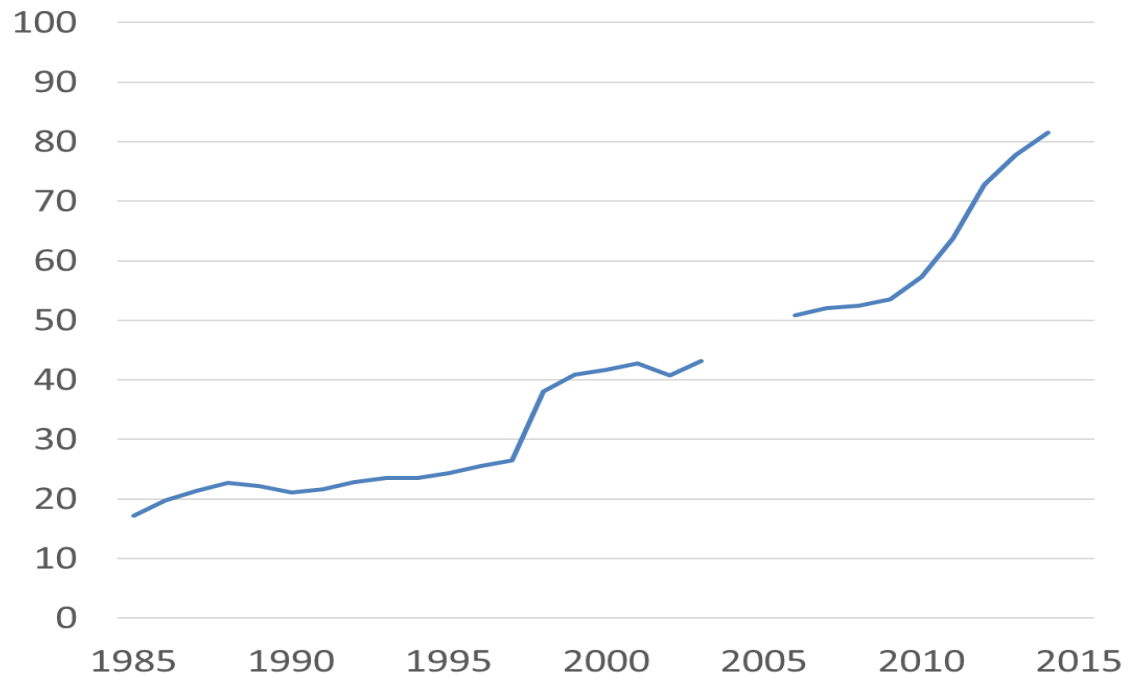
Section 1 (page 2) examines access to preschool historically and internationally, followed by a look at the demographic and fiscal context in section 2 (p 5). Section 3 (p 7) proposes a possible strategy to universalize preschool including a rough estimation of costs, while section 4 (p 9) suggests an approach to develop affordable parenting programs. Conclusions are drawn in section 5 on (p 11).

It should be noted, finally, that this paper is written from a policy maker's perspective, based on experience with ECD policy development in about 30 countries. Given the limited time available, this paper offers a *general* analysis of the feasibility of early learning for all.

1. Access to preschool in China in historical and geographical perspective

The only internationally comparable indicator to monitor access to preschool education (kindergarten and alternative modalities) which has been consistently applied over time is the Pre-primary Gross Enrolment Ratio (GER) for ages 3-6. Figure 1 presents the development of this indicator for China over the last 30 years.

Figure 1. Pre-primary GER in China, 1985-2015



Source: copied from "data.worldbank.org" using data from UNESCO Institute for Statistics

Figure 1 shows a dynamic trend in which periods of stagnation and rapid growth alternate. From the mid-1980s to the late 1990s access remained limited to 20-25% of the children in China aged 3-6. After a sudden increase to around 40%, there was another period of slow growth in the first decade of the millennium at 40-50%. Very rapid growth can be observed from the global recession of 2008-2009 onwards.

The cause of the latter increase is probably the economic recovery after that same recession, because public spending on preschool does not seem to have increased in these years. In 2008, the government of China spent 0.1% of GDP on preschool education[1], whereas in 2012 the spending level was still the same (or 0.09% of GDP, to be precise)[2]. Programmatic innovation may have played a role in the post-recession expansion, in the sense that the One Year Program – a school readiness program of one year prior to entry in primary school – was promoted successfully especially in rural areas. However, since this program enrolls mainly the five year olds, it is unlikely to significantly influence the pre-primary GER (which covers not only the five year olds but also the children aged three and four).

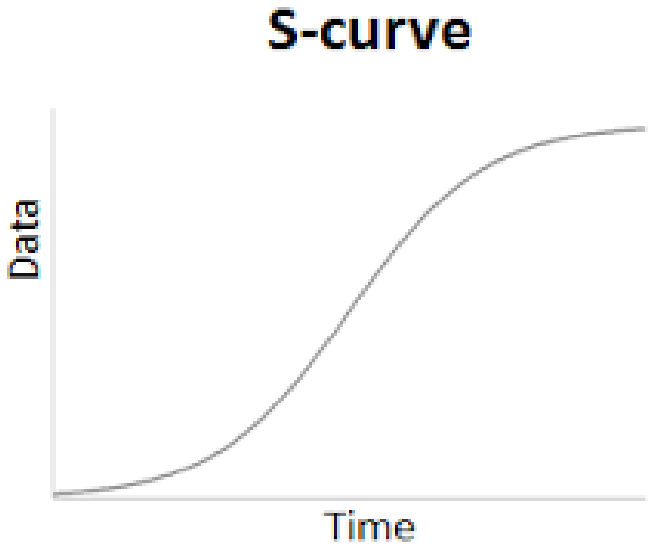
[1] Kin Bing Wu, Mary Eming Young, and Juanhua Cai, 2013. Early Child Development in China: Braking the Cycle of Poverty and Improving Future Competitiveness

[2] Xiaonyan Liang, Yu Fu, and Yinan Zhang, 2013. Challenges and Opportunities: Early Childhood Education in Yunnan

If the recent expansion of preschool education in China is indeed driven by market forces to a large extent, this would reflect a global trend[3]. Even low income countries see high levels of enrolment especially in large cities, where working parents (including working single mothers) not only seek care for their children while they work, but also enroll their children to improve their changes to be successful in education and throughout life.

However, figure 1 also suggests that the increase might level off: the last part of the blue line (2006-2014) reminds us of the so-called S-curve as depicted in figure 2. This shows a pattern that resembles the western letter "S" whereby the expansion process of a certain public service is initially slow reaching only a small and possibly privileged proportion of the population; then picks up momentum as middle groups are being included; and finally slows down again since the last 20% of the population are either too poor to obtain access if there is a fee to be paid, or too marginalized and segregated to be included even if the service is available for free.

Figure 2. Example of an expansion process that follows an S-curve



Thus, the challenge for China is to avoid that the trend level off and to keep the momentum in the expansion process. Looking again at figure 1, we conclude that 100% enrolment should be feasible by 2020 if only the growth rate of 2009-2014 would be maintained.

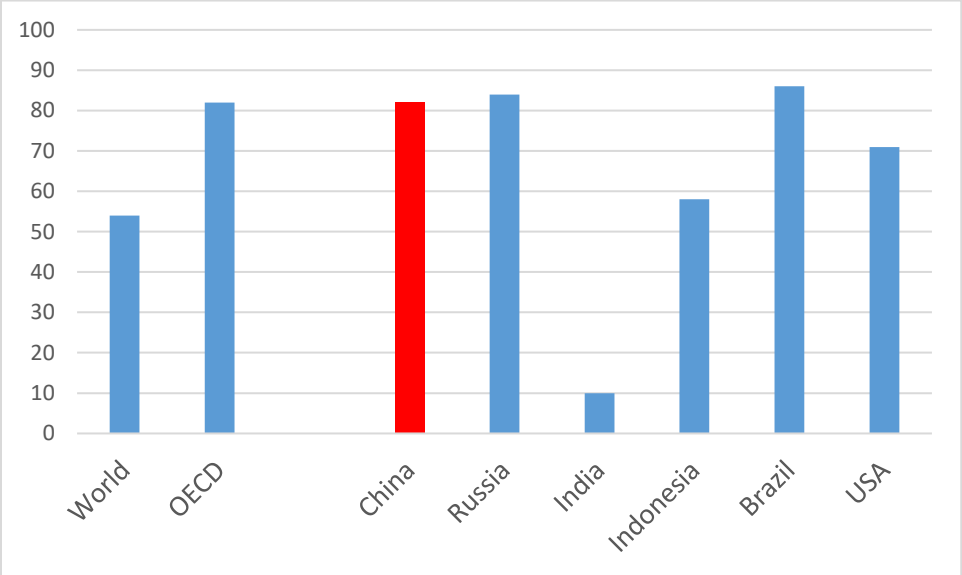
Not only would this do justice to the rights of these children, it would also have a significant impact on the benefit-to-cost ratio. While many scholars - Professor James Heckman most famously - have demonstrated and emphasized that investing early in children yields high returns, this claim must be nuanced. In the highest SES quintile[4] we find mainly children who, had they not been in kindergarten, would have been in a rich home learning environment with books, toys and well-educated parents and perhaps nannies. At the same time, the cost price of daycare services frequented by the upper 20% are quite high, meaning that the *ratio* of benefits to costs is not spectacularly high for this group. In contrast, if China would close the enrolment

[3] See: http://www.poverty-action.org/publication/exploring-early-education-programs-peri-urban-settings-africa-final-report
[4] Those 20% of the children who enjoy the highest Socio-Economic Status.

gap by also include the lowest SES quintile, the benefits will be much higher. For these children, enrolment makes a much bigger difference, while costs can be much lower, as section 3 of this paper will show. Thus, the benefit-to-cost ratio, and therefore the "profit" that the Government will make, will be the highest for the last children that we take on board.

As we can see from figure 1, the most recent value for pre-primary enrolment in China from an international data-base stems from 2014, when 82% of the children 3-6 were included. Figure 3 compares this figure with the global and OECD averages as well as a selection of other large countries.

Figure 3. Pre-primary GER in China and other large countries, 2013-2014



Source: copied from "data.worldbank.org" using data from UNESCO Institute for Statistics
Note: data concern 2014 for China, Russia, Indonesia and USA, and 2013 for the other columns

As figure 3 shows, enrolment in China is much higher than the word average and has equaled that of the OECD countries (a group that mostly consists of high income countries). China nearly equals Russia and Brazil, notwithstanding the fact that the governments of the latter two countries spend in the order of 0.7% of GDP on preschool education[5], against only 0.1% for China. On the one hand, one could argue that it is an achievement in and of itself that China has reached such a high level of enrolment despite low government funding. Apparently, the government has succeeded in sensitizing the nation with regards to the importance of preschool education, while leaving society itself directly responsible for funding. This is a paradigm that can also be observed in Indonesia, where preschool education has become a "popular

[5] For Russia: see page 61 of "ECD in China" by Kin Bing Wu, Mary Eming Young, and Juanhua Cai, 2013. The corresponding figure for Brazil could not be found, but in 2011 Brazil spent 6.1% of GDP on education (even more than the OECD average of 5.6%) while spending per student was nearly as high in preschool as it was in primary and secondary school. Combined with the high level of preschool enrolment, this suggest an overall level of preschool spending in the order of 0.7% of GDP, if not more. Source of the data regarding Brazil: https://www.oecd.org/brazil/EAG2014-Country-Note-Brazil.pdf

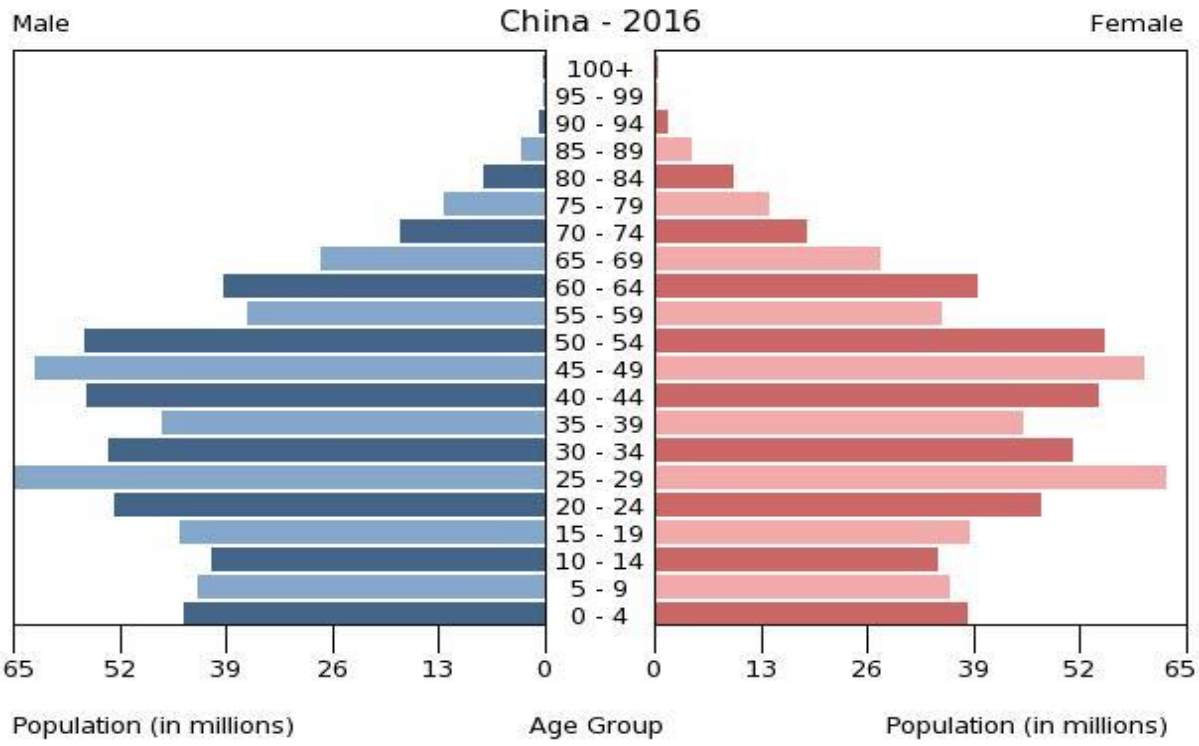
movement"[6], though not yet as successfully as in China when it comes to the scale of participation.

On the other hand, expansion of a public service without government funding runs the risk of low quality for the middle groups and exclusion of the poorest. Those with moderate means can only afford suboptimal services while those who cannot spare any money for preschool will not beget access at all. Before examining concrete options to resolve this, we first look at the demographic and economic context of China for a very general assessment of the feasibility of universal preschool.

2. Demographic and fiscal context

The demographic composition of a country's population usually provides some important if broad indications of the feasibility of scaling up and sustaining a service for a certain age group. Figure 4 presents the population profile of China per 2016. Comments follow below the figure.

Figure 5. Population Profile of China, 2016



Source: composed by the author using a tool found at the following website
https://www.census.gov/population/international/data/idb/informationGateway.php

First we look at the development of the size of the relevant age groups for preschool education (3-6) and parenting programs (0-3). In recent years these age groups have been increasing. Currently the number of children aged 0-4 is well above 80 million, whereas a decade ago this number was well below that number as we can deduct from the number of children who are now in the age bracket of 10-14. In fact, if we compare the number of children aged 10-14 with

[6] This expression was adequately used by a high civil servant in Indonesia to characterize the movement to promote community-based ECD centers in his country.

older generations, we can conclude that a decade ago the annual number of newborns was lower than it ever was in the past half century.

Whether or not the annual number of newborns will continue to increase is very difficult to say because two contradictory trends are competing for primacy. On the one hand the number of young families is bound to decrease dramatically. Currently the number of citizens aged 25-29 is larger than in ever was. But the numbers of young people aged 10-19 are much smaller, hence the number of young families will drop steeply in the coming decade. On the other hand – and possibly because of the aforementioned trend – China has abolished the one child policy by January 2016. But whether or not the immanent increase of the average number of children per family will compensate for the decrease of the number of young families, is difficult to foresee. This leaves us with an important uncertainty with regards to the planning of early childhood services.

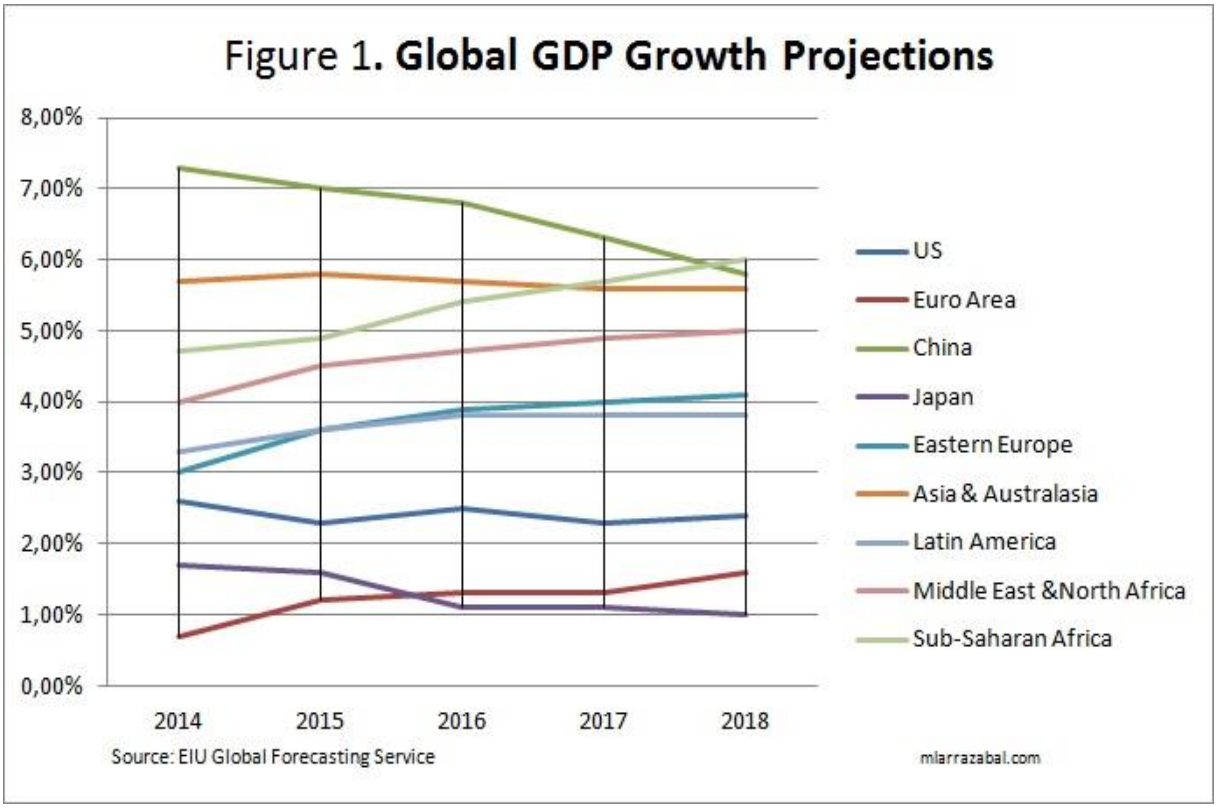
Figure 4 also provides an indication of the future development of the education budget. If we compare the relatively small numbers in age brackets of 5-19 with the much larger numbers in age brackets of 20-34, we conclude that the number of children attending primary and secondary education (both of which are universal in China) must have decreased dramatically. Government spending at these levels of education is likely to have decreased whereas in many primary schools there may be classrooms available that can be equipped for preschool provision. And in as far as there are redundant lower grade teachers in primary schools (or at home jobless) they might become preschool teachers on the condition that they receive thorough retraining.

In higher education there might be scope for expansion. In 2014, enrolment in tertiary education in China was in the order of 40%, against an OECD average of around 70%. However, it is not sure that this gap will be closed soon given the high level of unemployment among Chinese graduates. Furthermore, an increasing share of the financial burden in higher education is borne by students and their parents so that further expansion of higher education may not lead to a proportional increase of higher education spending.

A last thing that strikes the eye when looking at figure 4 is the immanent increase of people who retire. Currently, a large proportion of the Chinese population is in the age brackets of 40-54. Given the fact that retirement age is 60 for men and 50-55 for women, this means that the inactive population will increase dramatically in the coming years, which is likely to have a significant impact on the fiscal situation in China. Even an adjustment of the retirement age (as we observe currently in some OECD countries) is unlikely prevent this entirely. This leads us to the conclusion that while the demographic conditions seem favorable for a policy to universalize preschool, there is a need to hurry up; in five to ten years time the required funding may not be as available as it is now.

In this regard, it is very positive that education spending as a share of GDP has reached the target of 4% in 2012, after many years of stagnation at around 3%. While this still falls short of an OECD average of 5.4%, it does generate additional resources that could be allocated to preschool and parenting programs. And even though GDP growth in China is no longer expressed in double digits as it has been between 1992 and 2012, it still is significantly higher than in OECD countries as figure 5 shows.

Figure 5. GDP growth (projections) in selected countries and groups of countries, 2014-2018



Source: generated with a tool at the website of the EIU Global Foresting Service

So with an education budget of 4% of a still rapidly growing GDP and a relatively favorable demography, chances for universalizing preschool are good. However, it would still be a challenge for the Chinese government to increase the level of preschool funding from the current 0.1% of GDP to the level of around 0.7% that is found in countries such as Russia, some of the Scandinavian countries, and France. Even meeting the emerging benchmark of investing 10% of the education budget in preschool[7] would imply a growth towards 0.4% of GDP, i.e. four times the current preschool budget. How can this be resolved?

3. A possible strategy to universalize preschool

The key policy dilemma that the government of China is facing is the following:

- 82% of the children aged 3-6 are already enrolled in preschool education without a significant level of government funding[8]; enrolment seems primarily driven by market forces.
- The remaining 18% of the children are likely to live in rural poor families, predominantly with limited financial means. Government funding is probably needed to enroll most of these children.

[7] This benchmark does not have an official status; it is not part of any national or international frameworks. Rather it is a practical observation that those countries that have well developed preschool systems tend to invest in the order of 10% of their education budgets in preschool.

[8] The 0.1% of GDP is divided over three levels of governance: central governance (10%); provinces (45%) and counties and townships (45%). This paper does not differentiate between these three levels and speaks merely of "government", but for a more thorough analysis the three levels must of course be distinguished.

- Including just these 18% in programs financed by the government will not be very costly in and of itself.
- But once programs are offered for free (or against a fee that is well below the cost price) for the "last 18%", they cannot be refused to the "first 82%". Families who would otherwise enroll their children in kindergartens who charge a fee, might shift to subsidized programs once available. Eventually, China might have to invest 0.7% of GDP or more in this scenario.

A first step to prevent this undesirable effect is to provide *short* programs in under-served areas. In East Europe and former Soviet Republics, where the traditional full-day kindergartens are too expensive to scale up, there is an emerging standard called the 600 hour program. This program is delivered during 3 hours per day, 5 days per week, and 40 weeks per year, arriving at a total of 3 * 5 * 40 = 600 hours per year. Research suggests that these short programs have the same effect for child development as full-day programs[9], while unit costs are four to five times lower than in the full-day programs.

Since the full-day programs in China tend to cater for working parents who are in need of full daycare for their children, these parents may not shift towards these short programs even if they are free. In other words, these parents would be likely to "opt out". If this does not appear to happen to a sufficient extent, it could be an option to target under-served areas where current enrolment (in full daycare programs) is so low that there are simply not many families to make the unintended shift from fee-based to subsidized programs. Alternatively, the government may consider means-tested fees whereby the fee varies according to family income (with the possibility of waiving for the poorest). This principle can also be applied geographically, in that the government can provide a per capita contribution that varies from 100% in the poorest provinces to 0% in the richest provinces[10]. In the latter provinces, preschool would remain an unfunded mandate or even an unfunded directive, with an obligation for provinces to provide universal preschool even if they need to finance this by themselves[11].

On the assumption that no families will shift from fee-based full daycare to subsided short programs, it is possible to make a rough and preliminary estimation of the annual costs to the government of providing the short program to 18% of the children at ages 3-6. The calculation can be found in Annex 1 to this paper. The outcome is that annual costs will be in the order of magnitude of 0.024% of GDP. This would be an overestimation if mainly new (and predominantly young) teachers will be recruited, and it would be an underestimation in as far as redundant primary school teachers are appointed after intensive retraining. But since the latter teachers are already paid for, the *additional* costs to the government would remain limited. The estimation does not include capital investment, but these costs are limited with the use

[9] In a report on preschool education in Kyrgyzstan, the author of this paper included a review to support the claim that short programs have an impact on child development which equals or surpasses that of full daycare. See the section titled "Making the case for half-day programs" on pages 31-34 of the following report: http://www.globalchilddevelopment.org/sites/default/files/documents/KYRGYZSTAN%20PRESCHOOL%20REPORT%202010.pdf

[10] This principle has already been applied successfully in China. Kin Bing Wu, Mary Eming Young and Juanhua Cai report in their book on ECD in China that in order to compensate for the elimination of fees in compulsory education, central fiscal transfers cover 80% of costs in provinces in the Western region, 60% in central provinces, and 0% in coastal and urban areas.

[11] This combination of a national directive that needs to be implemented with local means is not unusual. In Kenya, for example, preschool is seen as part of basic education, while access to basic education is a constitutional right of children. Since preschool education has been decentralized to the local level, the counties are responsible for making this happen.

empty classrooms in primary schools (in the more densely populated areas), community centers and teachers' homes (in sparsely populated areas). The estimation does include amortization of inventory to ensure sustainability on the long run, but the upfront investment in furniture and such is not covered. Finally, this costing method ignores the fact that in large countries such as China there are regional differences in price/wage levels. The cost of living in rural areas may be lower than in coastal and urban areas. So if the short program would mainly be introduced in poor and rural areas, the costs will be lower than suggested above.

If we accept, however, the estimation of 0.024% of GDP as being roughly correct, then we can say that this annual financial burden is about a quarter of the current preschool budget of 0.1%. And it is but a fraction of the education budget of 4% of GDP.

An option for the future might be that the government provide a voucher which is sufficient for access to the short program but which can also be used for an accredited kindergarten. In the latter case, the voucher will only cover 20-25% of the real costs, so there is an additional fee to be paid by the parents. The philosophy behind this would be that the short learning program is the core public service with important externalities which justify public funding, whereas the *additional* services that a kindergarten offers to provide daycare – meals, dormitory, playground – are essentially private, justifying private contributions. In short, for children in kindergarten the learning part is for free but parents "pay for the extra's". The voucher would only be valid in accredited preschool institutions (kindergarten or short program) in order to make sure that standards (pedagogy, safety, hygiene) are being met, so that the scheme has an impact on quality as well. The scheme would not discriminate between public and private kindergartens; it would level the playing field. Obviously, this would eventually lead to higher costs to the government, but the government would never pay more per child than the unit cost of the short program. The overall preschool budget would be, in this option, about five times the costs of the program for the "last 18%". This would amount to 0.2 to 0.3% of GDP: twice to thrice the current preschool budget and less than 10% of the education budget. The costs can be mitigated by introducing the rule that the voucher cannot be used in kindergartens where the fee exceeds a certain threshold; this rule will exclude luxurious kindergartens and their clientele from the subsidy.

4. Parenting programs

A costing exercise for parenting programs cannot be provided in this paper because of two major uncertainties. First, one could argue that not all families are in need of such a program. Parents with higher education degrees offering a good home learning environment to their children might not be in need of this type of support. But the question is of course: where and how do we draw the line? What we see in practice is that parenting programs in some countries tend to be targeted at marginalized groups and territories, while in other countries they tend to be universal. The latter is the case for the patronage nurse systems in the former Eastern Block as well as the Lady Health Workers in Pakistan. However, some of the richer families opt out and rely on private health care.

The second uncertainty is related to the variation in delivery modes (modalities) that is found between parenting programs. Some parenting programs consist exclusively of group sessions: parents in a village or neighborhood are gathered in a center to learn about various aspects of child rearing. The maximum group size in adult education is about 20. This makes this a very

cost-effective modality. For example, if the frequency of sessions is once a month[12], and assuming that the facilitator can attend two groups of 20 parents per day[13], the total number of parents that one facilitator can reach is:

2 (groups per day) * 20 (parents per group) * 20 (working days per month) = 800

These 800 parents will have a minimum of 800 children and a maximum of 1600 children[14]. This is a significantly larger "case-load" than a preschool teacher who reaches no more than 30 children on an annual basis (two groups of 15 children per day) against almost the same salary.

A limitation of group sessions is that close interaction with parents is not possible or not culturally acceptable. With regards to hygiene, for example, there is a lot of information and that can be effectively transferred in a group, but in most countries it would be inappropriate to randomly ask parents to share their personal habits with the group and to then respond publicly to what parents report. For this reason it is good to combine groups sessions with one-to-one interaction between a counsellor and a parent. In practice, the roles of group facilitator and counsellor can be performed by one and the same professional. These counselling sessions take either place in the same center where the group sessions are provided, or in a place closer to the home in order to limit travel time for the parents and to enable them to bring their children along for practical instruction, e.g. on hygiene or responsive care. A limited number of these counselling sessions need to take place in the home in order to observe the living conditions in the home situation; make recommendations for improvement; or intervene more directly in urgent situations.

Some parenting programs consist exclusively of home-visits. Because of their high intensity, these programs generate strong impacts and therefore this modality is being promoted widely in recent years. The aforementioned Lady Health Workers are an example. However, home-visiting programs are excessively expensive since it is the counsellor, not the parent, who travels. A counsellor who works home-to-home may reach six families per day in densely populated areas, and two or three per day in sparsely populated areas. Assuming again a frequency of one month, and assuming an average of four visits per day, the case-load of one counsellor will be on the order of 80 families, home to 80 to 160 children. This is only one tenth of the case-load of a facilitator of group sessions.

That said, there are circumstances in which high unit costs are unavoidable. In very sparsely populated areas it will be difficult to gather 20 parents in a central place which is situated at an acceptable distance to all of the participants. In practice, the group facilitator will have to travel to small hamlets to attend groups of five to ten parents. This will raise the average cost per child, although it is an advantage that smaller groups allow more interactive teaching methods, reducing the number of individual sessions. At the same time, however, individual sessions will

[12] In practice, the frequency of sessions will vary with the age of the child. For example, a higher frequency is desirable during pregnancy, especially around birth, and also in the first year of the child's life. Lower frequencies can be found in the second and third years of the child, while the program can be phased out if and when the child enters preschool.

[13] The duration of sessions should not exceed two hours, partly because of parents' span of attention, partly because few parents can spare the time. With two session of two hours each per day, the facilitator would have time left for preparation and individual talks with some of the parents before and/or after the group sessions.

[14] We the introduction of the two child policy, many families are likely to have two children. If a parent has attended the program for the first child, there is no point in repeating the program for the second child. This "multiplier effect" makes parenting programs very cost-effective when families have two children.

more often have to take place in the home since mothers cannot always travel to a center. In short, the unit costs of parenting programs will be higher in sparsely populated, as they are for any kind of public service such as education or healthcare. We need to accept this as a fact since children have the same rights regardless where they live. Exactly to what extent sparse population will raise the average unit cost depends on the share of remotely living families. For example, if 90% of all families live in (or close to) towns or larger villages and only 10% require a special arrangement, the impact of the latter families on the average unit cost will be limited.

Once a concrete program has been designed - including a time table that schedules all of the group sessions, center-based counselling and home-based counselling - it is possible to embark upon a costing exercise. But we can say at forehand that if the design is cost-effective – based on the motto "group sessions if possible, individual sessions if needed" – the overall costs per child will be limited and the impact will be high.

5. Summary and conclusions

Preschool enrolment in China has increased rapidly during the recovery from the economic crisis of 2008-2009 to a level of 82% in 2014. This sits well above the world average and equals the OECD average. At 0.1% of GDP, the annual preschool budget is much lower than that of other countries, suggesting that expansion has mainly been driven by the market. The demographic and economic conditions for further expansion are favorable.

It is recommended to enroll the remaining 18% of the children aged 3-6 by offering a short program of, for example, 3 hours per day, 5 days per week and 40 weeks per year. It can be expected that working parents who are in need of full daycare will opt out for this short program. Otherwise it can be targeted at under-served areas or families below a certain income threshold. The cost of providing this 600 hour program in group of 15 children are in the order of magnitude of 0.024% of GDP, though a number of caveats needs to be noticed. This mentioned amount is just a fraction of the current education budget of 4% of GDP.

Parenting programs can be scaled up affordably if there is a good combination of group sessions and individual counselling, preferably in centers and in the home if needed.

It must be emphasized that this paper, and indeed its conclusions, are based on a limited amount of analytical work and scarce data. With more time available, and with more and better data, the recommendations regarding preschool education and parenting programs can be strengthened significantly. This might then affect some of the outcomes of this paper.

Annex 1. Calculation of the cost estimation for the short preschool program

This annex explains how the cost estimation for the short program for the "last 18%" has been calculated. It should be emphasized strongly that this is but a rough estimation, using a method that can be applied with the limited amount of data that could be gathered in the short time available for this paper. The main caveats will be mentioned at the end of this annex. A much more precise calculation will be possible when more time and more data are available, and when more concrete plans have been developed.

In essence, the overall annual costs of a program is a multiplication of two factors:

- The number of beneficiaries
- The cost per beneficiary per year, i.e. the unit cost

The number of beneficiaries is, in our case, 18% of all children aged 3-6 in China. So the question is: what is the share of the 3-6 year olds in the total population of China? Very roughly, this is the duration of the program (3 years) divided by the life expectancy in China (75)[15]. Hence the number of beneficiaries for the short program is:

18% * 3 / 75 * population = 0.0072 * population

To estimate the unit cost – the second factor in the multiplication – we depart from the salary of the teachers. The average salary of secondary school teachers in China is 0.88% of per capita GDP[16]. This is comparable to some East-European countries and below the OECD average. On the one hand this is an underestimation of the real income since it does not include social services that are usually provided to Chinese teachers (e.g. housing). On the other hand, preschool teachers usually earn less than secondary school teachers, especially if they are newly recruited (meaning their salary is based on few years of service) which is likely to be the case for a freshly rolled out program. Yet, if experienced but redundant primary school teachers are being retrained and reappointed to teach in preschool, the average salary will be higher than for new teachers, but the *net* costs to the government will be lower since these teachers are already paid for. All things considered, we chose to work with a teacher salary rounded of at 0.8% of GDP, while keeping in mind the caveats just mentioned.

[15] This approach would not be valid in countries with a high fertility rate, where children make up a relatively large share of the total population. But looking at the demographic profile in figure 5, this approach seems acceptable in the case of China.

[16] See page 123 of:
https://books.google.nl/books?id=SzuMbBAYCL4C&pg=PA123&lpg=PA123&dq=china+teacher+salary+gdp+per+capita&source=bl&ots=gwE87Oh652&sig=i9SDdI8CQIWmoPLDK9CJg_4RQV0&hl=nl&sa=X&ved=0ahUKEwi5tNb6tL7QAhWKJ8AKHTtsDhEQ6AEIZTAJ#v=onepage&q=china%20teacher%20salary%20gdp%20per%20capita&f=false

Further assumptions are that:

- Each preschool teacher will teach one class of 15 in the morning and another class of 15 in the afternoon. Teachers who teach just one class per day will receive half the salary.
- Teacher salary is 80% of total costs. The other 20% are for utilities, stationary, and amortization of inventory. We assume that space is available for free in primary schools (in the more densely populated areas) and in community buildings and homes (in sparsely populated areas).

On these assumptions, the unit cost is[17]:

0.8 * pcGDP * 100/80 / 30 = pcGDP / 30 = GDP / population / 30

If we multiply the formula for number of beneficiaries with the formula for unit cost, we see:

{0.0072 * population} * {GDP / population / 30}

Since "population" is in the numerator as well as the denominator we can delete it altogether. This is why this method is irrespective of size of population. The multiplication now becomes:

0.0072 * GDP / 30 = 0.00024 * GDP = **0.024% of GDP**

To following caveats that need to be kept in mind:

- We did not include capital investment. We assume that space is available in primary schools (due to demography, especially in remote areas), community buildings and homes.
- We did not include the upfront investment in inventory. We did include amortization of inventory which secures sustainability on the long run, but in practice this does not buy us the inventory to start the program up.
- There is significant uncertainty with regards to the profile of the teachers:
    - If they are young and inexperienced, having few years of service, we may have overestimated costs.
    - If redundant primary school teachers are retrained, the costs might appear to be higher than what we estimated. But since these teachers are already paid for, the additional costs will be significantly lower. In fact, if redundant primary school teachers can be appointed at scale, the new program might actually require very little additional funding from the government at all.
- We ignored possible variation in price/wage-levels within the country. It may well be that the costs of living in under-served areas are lower than in the coastal areas. In that case the salary of the teacher could be lower than what we assumed in this exercise.

[17] pcGDP stands for per capita GDP: the Gross Domestic Product of a country divided by its population