

Building an Ex Ante Simulation Model  
for Estimating the Capacity Impact, Benefit  
Incidence, and Cost Effectiveness  
of Child Care Subsidies

An Application Using Provider-Level Data from Turkey

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## Abstract

Public financing of child care can allow for more equitable access to these services in places where public provision and capacity are low. However, the mechanisms of subsidy delivery will affect who benefits, and the overall cost effectiveness of such subsidies. This paper sets out an ex ante simulation model for estimating the benefit incidence of expanded capacity and enrollments resulting from different child care subsidy mechanisms. It uses a supply-side provider level and a demand-side household model, and combines the two models. The paper considers investment grants to providers, operational monthly grants to child care providers, combinations of the investment and operational grants, and demand-side vouchers to households. The model is applied to empirical data from child care centers and households

in Turkey. The results reveal that the choice of the subsidy delivery model has a strong bearing on the benefit incidence and cost effectiveness of the subsidy. In the case of Turkey, where significant supply-side constraints exist in the market, a demand-side voucher system is shown to be the least cost-effective subsidy delivery model. A targeted demand-side voucher does not necessarily deliver the most “pro-poor results,” and combinations show different benefits and costs. The proposed simulation model can be applied in other country contexts, with the only data requirements being micro data on the costs and pricing structure of child care providers, as well as household data with variables on household welfare and child care utilization.

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# Building an Ex Ante Simulation Model for Estimating the Capacity Impact, Benefit Incidence, and Cost Effectiveness of Child Care Subsidies:

## An Application Using Provider-Level Data from Turkey<sup>1</sup>

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## 1. Motivation

Public financing and partial subsidization of child care can allow for more equitable access to child care in places where public provision and capacity are low. Countries have used a number of supply- and demand-side subsidies in order to expand access to child care services. Various mechanisms have been experimented with in various countries, including and not limited to: (i) per child operational grants to supply-side service providers; (ii) tax subsidies to working parents and (iii) vouchers or direct cash transfers provided to households.

In Mexico, in 2007 a supply-side grant program to expand child care services was created with the goal of increasing labor force participation of poor mothers (Mateo Diaz and Chamussy, 2013). Child care centers were provided with one-time initial investment subsidies to open up new centers or to improve their existing facilities. Additionally, monthly grants were provided to day-care centers on a per capita (per child) basis (Calderon, 2014). The operational costs of these centers are covered by the public subsidy plus a fee collected from the parents (Staab and Gerhard, 2010). Similarly, in the Republic of Korea, in 2009 the municipal government of Seoul started providing financial support to private child care centers in meeting their labor costs. In return, regulations of public child care centers are applied in these centers, making them semi-public. Nearly half of the city's child care centers are now part of this scheme (OECD, 2012).

Demand-side grants and tax subsidies are also commonly applied in a number of countries. The Netherlands, the United States, and Australia are examples to countries providing vouchers to families for increasing access to child care services (Warner and Grauds, 2011). In the Netherlands and Australia, the government's aim has been to promote female labor force participation while in the United States vouchers were intended for helping low-income mothers leave welfare and start working. In the United Kingdom, the child care voucher scheme targets working parents – and allows a tax break on income partly subsidized by the employer, and partly subsidized by the state. In all four of these developed countries, vouchers or tax subsidies for child care are provided to the household or working parents through workplace benefits. In the United States and Australia, the vouchers are primarily targeted to poor working mothers, while in the United Kingdom, Netherlands and Austria, the vouchers are provided universally with non-poor working parents also receiving a subsidy albeit smaller.

While countries have experimented with different models and mechanisms for expanding access and utilization, little research has been carried out looking at the impact of the choice of supply- or demand-side mechanisms in targeting these transfers. Where countries have supply-side constraints in the child care market, and rationing takes place for limited child care spaces – the choice of a supply- or demand-side transfer might matter significantly in determining who benefits from public subsidies. This paper sets out a practical methodology for modeling the behavior of service providers (through a supply-side model) and the behavior of households (through a demand-side model) to consider the impact of supply-side investment and/or operational grants given to child care providers and demand-side vouchers provided to households as subsidies for child care. The paper considers the distributional impact of these transfers on increases in capacity and utilization of services, while also considering cost-effectiveness per U.S. dollar spent to bring about new enrollments.

The paper is organized as follows: Section 2 provides an overview and literature review of existing ex ante simulation models of child care. In section 3, we present a background on the child care system in Turkey. In Section 4, we present the model for supply- and demand-side subsidies for the child care market looking at various policy scenarios through investment and/or operational grants to child care providers and through targeted household voucher schemes. In Section 5 we present the data used for the simulations and we discuss the step-by-step methodology for the supply- and demand-side simulation models. In Section 6, we present the main results when the methodology is applied to the Turkish data and in Section 7 we conclude with possible practical implications.

## 2. Literature Review

The literature on ex-ante evaluations of child care policies uses micro simulations mainly to assess the impact of policy changes on maternal labor force participation and child care utilization. Some other outcome

variables investigated include demand for child care, hours spent in household production and the distributional effect of the policies. The policies that the authors investigate range from capacity expansions to fee reductions and the provision of subsidies. Most of these papers focus on using household level data, sometimes with community level variables on supply-side availability.

Del Boca and Vuri (2007) merging data from two micro-level surveys, simulate the impact of a partial or a full subsidy for child care costs on female employment in Italy. They use a discrete choice model where child care and labor force decisions of mothers are jointly made. The authors find that in places where capacity constraints and rationing of child care services are more prevalent the impact of subsidies is smaller. Similar to Del Boca and Vuri (2007), Apps et al (2016) use a discrete choice model to investigate the changes in mothers' labor supply to policies effecting child care prices, taxes and subsidies. In their model, they use three choice variables; mother's labor supply, her time allocated to household production and hours of child care bought. They find that mothers' decision to work is highly sensitive to earnings and child care costs. Both of these papers use household level data and model the labor supply behavior of mothers with changes in child care prices and availability faced by the household.

Vanleenhove (2013) investigates in an ex-ante simulation model impact of a *capacity expansion* in the Flemish child care market on the parents' choice of maternal labor supply and child care usage using data from Flemish Families and Care Survey of 2005. According to a new decree by the government issued in 2012, the child care coverage rate will rise to 50 percent by 2016 and by 2020 all child care demand is planned to be met. By changing the opportunity set of the households through increases in formal care, the author simulates the response of households to the capacity expansion. Once again, the model is entirely built using the demand-side household survey data and providing a shock to the availability of child care to the household.

Looking at the distributional impact of various child care policies, Kornstad and Toresen (2006) consider the case of child care in Norway and look at the impact of four different reforms on child care choices of families, maternal labor supply as well as the policies' distributional impact and their costs to public budget. The reforms that are investigated are (i) increasing child care capacity, (ii) reductions in fees, (iii) rescinding home care allowance (the allowance for families who do not use center-based care) and lastly (iv) introducing a working parents tax credit scheme that provides a certain amount of credit to the mother working more than 17 hours per week and a higher amount if she works more than 24 hours a week. Authors use a discrete choice joint labor supply and child care choice model and estimate the impact of these policies using Home Care Allowance Survey of 1998 of Norway. According to the results, all four reforms increase the demand for center-based care and labor supply of mothers while fee reduction reform is the most successful one in terms of increased demand and the new tax credit scheme is the most successful in terms of increased maternal labor supply. Yet, the fee reduction reform has a slightly negative effect on the distribution of income. In other words it benefits the households that are well-off slightly more than poorer households -since the well-off are already using child care and reducing child care fees will benefit them directly - while the tax credit policy has a strong positive and pro-poor redistribution effect. In the paper, rescinding home care allowance has a slight positive distributional effect and the capacity increase scenario does not have *any* effect on distribution.

In Turkey, Ilkkaracan et al (2015) evaluated ex-ante a policy intervention that would increase child care capacity. They simulate the effects of an increase in public investment in child care services on the jobs created and the distribution of these jobs by gender and income status of households. They investigate the impact of a 20.7 billion TL worth of public investment -estimated annual expenditure for unenrolled preschool aged children in Turkey to catch up with the average OECD preschool enrollment rate- on preschools and child care market versus the same level of investment in the construction sector. They find that an investment of this amount will result in 719,000 new jobs created in total when it is spent on the child care sector while it will only create 290,000 new jobs when it is spent on the construction sector.

Our paper contributes to the ex-ante simulations literature on child care in two different ways: (i) firstly it uses supply-side provider level data to capture the behavioral investment model of service providers in the face of investment and operational grants provided to the sector – hence the ex-ante model not only looks at the demand side with household data but combines the investment behavior of the service provider in calculating the capacity expansion; and (ii) secondly, it uses data on the child care sector of a developing

country – Turkey - with significant capacity constraints in the child care sector and hence contributes to the literature which has so far focused in terms of ex-ante evaluations in the child care sectors in developed countries such as Norway, Italy and Belgium. Similar to some of the aforementioned papers, this paper looks at the capacity increases and changes in utilization – paying particular attention to the distributional impact of different types and combinations of policies including an investment grant to service providers, an ongoing per capita based monthly operational grant to service providers, and a household targeted voucher scheme. Hence same levels of grants are distributed to households or centers and the impact of each in terms of number of children enrolled and number of children enrolled from the lower income households is investigated, considering the cost-effectiveness of each scenario (in terms of per new child enrolled in the system) as well as the benefit incidence of “new” child care service capacity created. This approach is in similar vein with Kornstad and Toresen (2006) where different types of reforms are investigated at the same time in order to understand which one is more beneficial to the public and cost effective in terms of the budget. Our findings however will significantly differ from their findings – given the initial conditions and capacity constraints in the child care market we analyze in Turkey.

### 3. Background on the Child Care System in Turkey

The gross enrollment ratio in pre-primary education remains low in Turkey, with significant capacity constraints in the child care sector, particularly for the younger age groups. The pre-primary gross enrollment rate was 38.6 percent in Turkey in 2015 as opposed to 82.5 percent in OECD and 93.9 percent in the EU countries in 2013.<sup>i</sup> Currently about 2.7 million children aged 3-5 are not benefitting from center based child care services as opposed to only 1.0 million children enrolled.<sup>ii</sup> Hence, a large number of children do not benefit from center-based child care and preschool services in Turkey. In order to serve these children who are currently not enrolled in center based child care or preschool services, a recent World Bank study estimates that a total of 58,380 facilities need to be built.<sup>iii</sup> For the younger age group 0-3, child care capacity is close to zero, with no public provision of child care for this age group.

Children from disadvantaged backgrounds are even less likely to benefit from center based child care services. Only 16.8 percent of the children aged 3-5 living in households in the poorest per capita income decile benefit from center-based child care services as opposed to 60.0 percent of the children in the same age group living in households in the richest per capita income decile.<sup>iv</sup> A recent paper looking at regulations in the private child care market in Turkey finds that the infrastructure related standards may be too binding making the model expensive and unaffordable for poorer households in urban areas (Aran et.al, (forthcoming)).

Private provision of center-based child care services is very low. As of 2011, 11.6 percent of the children enrolled in pre-primary education in Turkey were enrolled in private institutions, while this rate was 30.5 percent for the world, 37.0 percent for the OECD and 29.9 percent for the EU member countries.<sup>v</sup> Compared to the world or the EU countries the percentage of children enrolled in private institutions remains low in Turkey, pointing to the fact that an alternative way to increase capacity in Turkey could be through interventions increasing private provision of the services.

Limited access to affordable child care is a significant impediment to female labor force participation in the country. In Turkey female labor force participation is already low with 30.3 percent in 2014 compared to the OECD and EU averages which are 51.4 percent and 51.5 percent respectively.<sup>vi</sup> It is common for women to drop out of the labor force due to child care responsibilities. According to a household survey collected in 5 provinces of Turkey, 46 percent of the currently non-employed women in the sample previously worked but decided to leave the labor force and the majority of these women (71 percent) reported leaving the labor force “due to child care responsibilities” (World Bank (2015)).

In 2015, the Turkish government, and in particular the Ministry of Family and Social Policies was interested in developing policies for supporting the expansion of child care in Turkey. The Ministry was considering options for subsidizing these services by the municipality through investment grants, operational grants to service providers or both. Targeted demand-side vouchers to households were also considered as a policy option. More specifically, the policy scenarios considered included: (i) an investment grant only (Scenario 1), (ii) an operational grant (with or without a price cap (Scenarios 2 A and 2B), (iii) through a voucher scheme

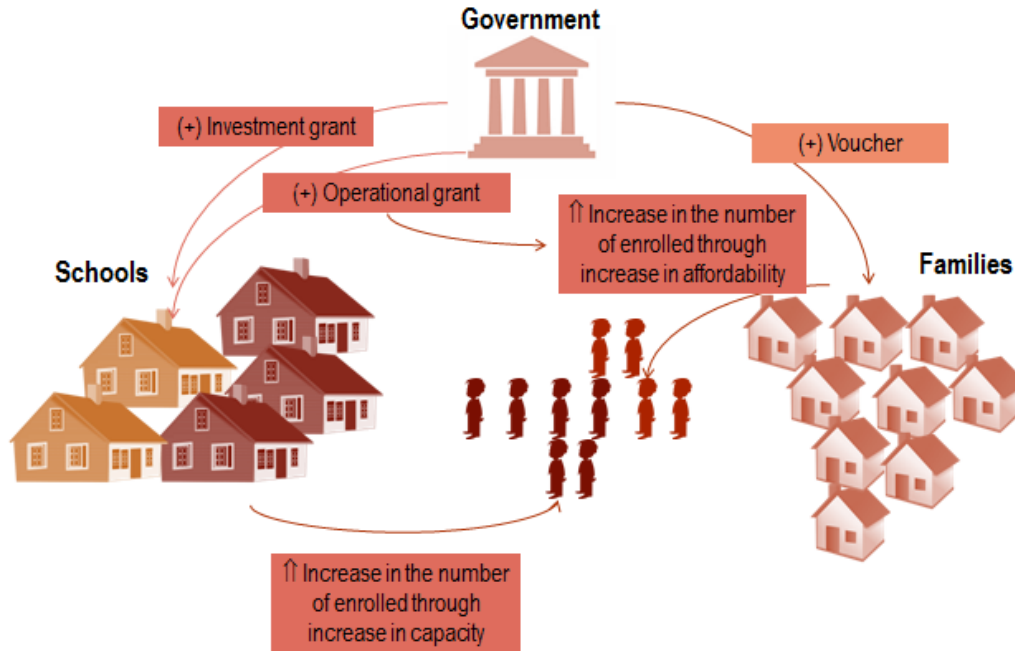
(Scenario 3), and (iv) through the interaction of an investment grant with an operational grant or a voucher scheme (Scenarios 4A, 4B and 5 in Table 1). The purpose of the policy measures was three-fold: (i) to increase the capacity of these services, (ii) to increase accessibility and affordability of services for children from disadvantaged backgrounds and (iii) to increase female labor force participation by increasing employment rates of mothers who will utilize services as well as creating new employment at these child care centers for care-taker women. This model was initially prepared in response to such demand from the Turkish Ministry of Family and Social Policies.

#### 4. The Model: Supply- and Demand-Side Subsidies for Child Care

We build a model that allows for three basic types of subsidies for child care through (i) investment grants to the service provider, (ii) operational grants to the service provider and (iii) vouchers provided to the household. Investment grants are one-time grants that are provided to newly opening child care centers, in order to support their investment and increase overall capacity. Operational grants are provided on a monthly and per child basis and transferred to the service providers. The operational grant helps subsidize the services provided by private providers<sup>vii</sup>. They cover part of the costs of provision – and help reducing partly the prices charged by the providers. The vouchers are also provided on a per child per month basis, however the main difference between the voucher and the operational grant is that the vouchers are provided to households and operational grants are given directly to the service provider. Because the voucher is given to the household, this allows for additional "targeting" of the voucher to eligible households. In other words, it becomes possible to "select" poorer households and/or households where women work etc. as voucher beneficiaries, while with the operational grant the grant benefits whoever enrolls in the child care center - without any purposive targeting. Figure 1 provides a descriptive overview of the model.

The operational grants and vouchers in the model have the same exact monthly per child values in the scenarios – and they only differ by the mechanism of delivery and hence the targeting of the benefits. In the voucher scheme, the household that receives the voucher brings it to the service provider and gets services equivalent to the amount of the voucher for free, and only pays for the rest of the fees. In other words, the vouchers enable households to get discounted services by the value of the voucher. The service providers then claim the vouchers and receive money from the government equivalent to the total value of the vouchers. Both operational grants and vouchers have monthly per child values though the payments from the government to the service providers can be made on a monthly, semi-annual or annual basis depending on how the program is designed.

Figure 1: A stylized model for supply and demand side child care subsidies



The subsidies have an impact on utilization of services in two ways: (i) through their impact on expanding capacity and availability of services, and (ii) through their impact on affordability of services. In the model, investment grants have an impact on enrollments *only* through their impact on capacity. The “benefit” - in terms of financial gain - of the investment grant is fully realized by the service provider. The vouchers -on the other hand- increase affordability of the services for households and the assumption is that their benefit is fully realized by the household. The impact of the vouchers on enrollment is mainly through their impact on affordability of existing services for households – hence we assume in the short term there will be no capacity impact of the vouchers in the system. The operational grants fall somewhere in between – in terms of its impact on enrollments. While the operational grant is received on a per child basis by the service provider, the model assumes that there is a “pass-through” of the operational grants to the households in the form of a reduction in prices. In other words, in our model operational grants lead to decreases in the prices – but the decrease in price is a portion (in this case assumed at 50%) of the operational grant per child. The benefits from the operational grant are assumed to be “shared” between the households and the service providers, hence the operational grant has an impact on enrollments both through its impact on enhanced capacity (through benefits realized by the service provider) and through its impact on affordability (through benefits realized by the household).

We consider several scenarios where these grants are provided by themselves or in combination with each other. The level of the benefits can be varied once the model is set up, we consider here only a fixed level of benefit (50,000 TL one-time investment grant and 300 TL per child per month operational grant or voucher value), though this parameter can be adjusted to take on different levels under each scenario. The operational grant in the scenarios can be provided with a price cap option and without a price cap option (in Scenario 2A and 2B). The scenarios consider the investment grant and operational grants provided separately and in combination with each other to look at cost effectiveness per new enrollment in each scenario. The full list of 7 scenarios is provided in Table 1.



**Table 1. List of policy scenarios**

	<i>Scenario</i>	<i>Name</i>	<i>Description</i>
<i>Simple Scenarios</i>	<i>Scenario 1</i>	Supply Side Investment Grant only: One-time investment grant to child care centers	Investment Grant: 50,000 TL given to the service provider one time for initial investment.
	<i>Scenario 2A</i>	Supply Side Operational Grant only: Monthly per student operational grant (no price cap)	Operational Grant: 300 TL per child per month given to the service provider for 5 years.
	<i>Scenario 2B</i>	Supply Side Operational Grant only with Price Cap: Monthly per student operational grant (with price cap)	Operational Grant: 300 TL per child per month given to the service provider for 5 years. Price cap: 750 TL (the service provider agrees to limit the maximum price to 750 TL per child per month under this contract for the duration of the subsidy)
	<i>Scenario 3</i>	Demand Side Grant only: Vouchers to households per child enrolled	Voucher to Household: 300 TL per child per month, targeting households in bottom 40% of income percentile.
<i>Combination Scenarios</i>	<i>Scenario 4A</i>	Supply Side Investment and Operational Grant combined: One-time investment grant and monthly per child operational grant combined (no price cap)	Investment Grant: 50,000 TL given to the service provider one time for initial investment. + Operational Grant: 300 TL per child per month given to the service provider for 5 years.
	<i>Scenario 4B</i>	Supply Side Investment and Operational Grant combined with Price Cap: One-time investment grant and monthly per child operational grant combined (with price cap)	Investment Grant: 50,000 TL given to the service provider one time for initial investment. + Operational Grant: 300 TL per child per month given to the service provider for 5 years. Price cap: 750 TL (the service provider agrees to limit the maximum price to 750 TL per child per month under this contract for the duration of the subsidy)
	<i>Scenario 5</i>	Supply Side Investment Grant and Demand Side Grant combined: One-time investment grant and monthly voucher to households combined	Investment Grant: 50,000 TL given to the service provider one time for initial investment. + Voucher to Household: 300 TL per child per month, targeting households in bottom 40% of income percentile.

## 5. Data and Methodology

The supply- and demand-side simulation model is built using data sets from households and child care providers in Turkey. A unique data set collected from child care providers in 2014 in 5 provinces of Turkey, allows us to have insights into the microeconomics of running a child care center in Turkey, and hence allows us to look at the costs and prices in the market for child care. Turkey has significant supply-side constraints in the child care sector, and these reflect on the results of the simulation model. The initial conditions of the child care market matter significantly in determining the outcomes and benefit incidence of grants distributed for expanding child care utilization. This section first describes the data sets that were used for the simulations and the methodology in detail.

### 5.1 Data Used for the Simulation

In order to understand the impact of different kinds of subsidies we have two main simulation models that interact with one another in producing the results. These models are (i) the supply-side simulation model and (ii) the demand-side simulation model. Using these models and changing the parameters for the subsidy type and the level of the subsidy we estimate possible benefits of each scenario. Below, we describe the data used for the simulations and the details of each model.

### 5.1.1 Supply-Side Simulation Data

For the supply-side model we use the data that were collected by Development Analytics in 2014 for the World Bank study “*Supply and Demand for Child Care Services in Turkey*” (World Bank, 2015) from 603 center-based child care providers in 5 provinces, namely Istanbul, Gaziantep, Denizli, Eskişehir and Samsun. The data set includes a wide range of information on child care centers such as their set-up and operational costs and the prices they charge per child. For the purposes of this analysis, we only make use of a sample composed of the private providers in the data set making up a total of 226 providers. This uniquely designed survey allows us to have information on the costs and prices faced by private providers in the child care market in Turkey, and allows us to model the break-even points and internal rate of return on investments in the child care sector. Combining this information with a model on the investment behavior of private providers, we are able to come up with different levels of investments and capacity increases with different levels of the subsidy (whether through the investment or operational grants to facilities).

### 5.1.2 Demand-Side Data

For the demand-side model we make use of the *Turkey EU-SILC (Survey of Income and Living Conditions)* 2012 data set. The *EU-SILC* data set includes a wide range of information on households including information on children’s enrollment in center-based child care and labor force participation of household members. This data set is used in order to understand the benefit incidence of enrollments as a result of the capacity increase that occurs in the supply-side model, the changes in enrollment as a result of increased affordability. We only make use of the part of the data set collected from households located in urban areas as the proposed capacity expansions are likely to benefit initially - and primarily - the urban areas in the country. The demand-side data are used to model the behavior of the household given increased availability of child care in the neighborhood, and increased affordability of child care given the operational grant (which leads to reduced prices in the market through a pass-through assumption) or through the vouchers.

## 5.2 Methodology: Building the Simulation Model

In the supply- and demand-side simulations, using existing data we aim to model the effects of an outside shock to the system. In our case, this shock could be child care centers receiving investment or operational grants or both or households receiving a voucher. There are multiple options which could be adopted in a subsidy policy framework and we investigate in our simulation models combinations of these policies with different levels of the investment and operational grants and vouchers. The scenarios are as described in Table 1.

### 5.2.1 Supply-Side Simulation

We build the supply-side simulation model, using the supply-side provider level survey collected in 5 provinces where we have detailed information on the setup and operational cost structure and prices faced by child care providers. Before a shock is introduced to the system, each provider faces certain setup (investment) and operational costs and certain prices and enrollments. All of these data come from the empirical data set, but are treated in the model as hypothetical cases (as if investments in these centers have not yet been made). A probability of investment is calculated for each service provider in the baseline. We call them hypothetical cases as they actually exist in reality - but in the model they are treated as probabilistic investments - such that a service provider that faces lower costs and better prices in the market has a higher initial likelihood of investment. An outside shock is introduced to the model that increases the likelihood for investment for the child care centers. With these simulations our aim is to find out the “*expected*” added capacity and how many more centers will be established when there are investment grants or operational grants (of varying sizes) and to see which ones lead to a higher capacity increase.

#### *Calculating the Net Present Value and the Probability to Invest*

First, the net present value for each private child care center in the data is calculated in order to find out their initial probability to invest, given their (i) price per child, (ii) setup cost if they were to open up the center now, (iii) monthly variable costs, and (iv) total number of children enrolled. Net present value of each child care center is calculated for a period of 10 years by also taking into account the value of the center if it were to be sold at the end of this 10-year period.

The equation for the net present value of a child care center is calculated as follows:

$$\begin{aligned} \text{Net Present Value} = & - \text{Setup Cost} \\ & + \sum_{t=1}^{10} \frac{((\text{Price per child} * \text{Enrolment}) - \text{Total monthly variable costs}) * 12 * (1 - \text{tax})}{(1 + r)^t} \\ & + \text{Terminal Value}^{\text{viii}}. \end{aligned} \quad \text{Eq 1}$$

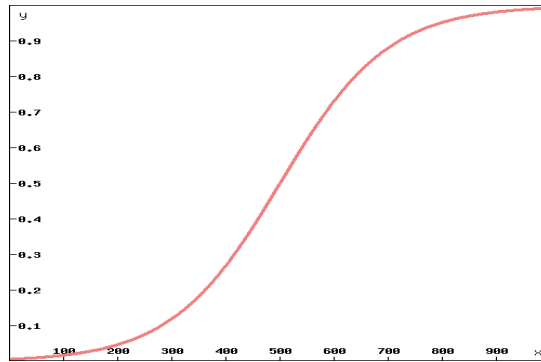
Where:

- Setup cost is the setup cost (e.g. if the center were to be opened up now what the setup cost would be) of the child care center as reported by each respondent in the survey.
- Yearly cash flow is the difference between yearly revenues collected from families minus the variable costs (These are personnel costs, stationary costs, utility costs and travel costs).
- The discount rate  $r$  is assumed to be equal to 40 percent.<sup>ix</sup>
- Cumulative and combined tax rate taken at 32 percent in Turkey<sup>x</sup>.

Secondly, the net present value (NPV) of an investment is mapped onto a probability of investment through a functional form as described below (See Figure 2). This non-linear functional form is used to hypothetically describe the investment behavior of child care centers. With increasing values of NPV, the probability to invest increases and this probability ranges between 0 and 1.

Figure 2. Probability to invest for each child care center given the estimated net present value

$$P(\text{invest}) = \frac{1}{1 + e^{\frac{-(NPV - 500,000)}{100,000}}}$$



This functional form shows that the probability to invest increases with increasing values of the net present value. (For those who have a negative net present value, a probability of 0 is directly assigned without using the functional form).

#### Calculating the Estimated Capacity Increase Impact of the Grants

Impacts of investment and operational grants are estimated by including these grants in the net present value calculations and *recalculating* the net present values of each child care center after the grant shock. The operational grant reduces the operational costs faced by the service provider, and the investment grant reduces the burden of the investment (setup) costs of the service provider which is reflected in the calculation of the net present value -and from there - the probability to invest.

For an investment grant the net present value equation becomes as follows:

$$\begin{aligned} \text{Net Present Value} = & - \text{Setup Cost} + \text{Investment Grant} \\ & + \sum_{t=1}^{10} \frac{((\text{Price per child} * \text{Enrolment}) - \text{Total monthly variable costs}) * 12 * (1 - \text{tax})}{(1 + r)^t} + \text{Terminal Value} \end{aligned} \quad \text{Eq (2)}$$

For an operational grant without a price cap the net present value equation becomes as follows:

$$\begin{aligned} \text{Net Present Value} &= -\text{Setup Cost} + && \text{Eq (3)} \\ &+ \sum_{t=1}^5 \frac{((\text{Price per child} + \text{Operational grant} + \text{Pass through}) * \text{Enrolment}) - \text{Total monthly variable costs} * 12 * (1 - \text{tax})}{(1+r)^t} + \\ &+ \sum_{t=6}^{10} \frac{((\text{Price per child} * \text{Enrolment}) - \text{Total monthly variable costs} * 12 * (1 - \text{tax}))}{(1+r)^t} + \text{Terminal Value} \end{aligned}$$

Operational grants are assumed to be given for a period of five years.

For an operational grant with a price cap the net present value equation is the same as above, but only some of the schools that have lower initial prices opt in for the program. For those child care providers that initially are able to charge high prices, it may not be favorable to lock themselves into the price cap. We assume therefore that a sub-group of child care centers will opt-in for the grant (those with already high prices will opt out of this program). The new prices are then calculated as follows for all centers:

$$\text{Price}_{\text{new}} = \text{Price}_{\text{old}} \text{ if } \text{Price}_{\text{old}} - \text{operational grant} * \text{pass-through} \geq \text{Price cap} \text{ (Those who opt-out)} \quad \text{Eq (4)}$$

$$\text{Price}_{\text{new}} = \text{Price}_{\text{old}} - \text{operational grant} * \text{pass-through} \text{ if } \text{Price}_{\text{old}} - \text{operational grant} * \text{pass-through} < \text{Price cap} \text{ (Those who opt-in)} \quad \text{Eq (5)}$$

It is assumed that after 5 years, the prices go back to what they were before the price cap was introduced. For both of the operational grant scenarios a pass-through rate is assumed. This lets the model distribute the benefit to the households by leading to a decrease in prices (Pass through rate is assumed to be 0.5).

Following the net present value recalculation, the probability to invest is also recalculated for each center and for each grant scenario. Once the baseline probability to invest and probability to invest under each scenario are all calculated, the expected capacity for each center is then calculated as follows:

$$E(\text{Capacity})_{\text{Baseline}} = \text{Probability to invest in Baseline} * \text{Total capacity of the center} \quad \text{Eq (6)}$$

$$E(\text{Capacity})_{\text{Sc X}} = \text{Probability to invest in Sc. X} * \text{Total capacity of the center} \quad \text{Eq (7)}$$

These expected capacities are then summed up and the percent capacity increase achieved with Sc. X is calculated with the following equation:

$$\% \text{ Increase in total capacity}_{\text{Sc X}} = \frac{(E(\text{Total capacity})_{\text{Sc X}} - E(\text{Total capacity})_{\text{Baseline}})}{E(\text{Total capacity})_{\text{Baseline}}} \quad \text{Eq (8)}$$

### 5.2.2 Demand-Side Simulation

The next step is to tie the capacity increase coming from the supply-side simulation to the demand-side household data in order to see who is impacted by the newly created capacity and enrollments. The capacity increase found in the supply-side simulation is used as the “*exogenous shock*” in the demand-side simulations.

Our aim in each scenario is to find out how much capacity is estimated to expand, how many new children are expected to enroll in each scenario, who benefits from the capacity increases and price reductions and the total estimated impact on mothers’ employment. We also calculate the cost implications in each scenario (net of taxes collected as a result of the intervention) as well as cost-effectiveness per child enrolled and per woman employed into the labor market.

*The impact on children’s preschool enrollment*

In the model, we can expect an increase in children’s enrollment from two different channels: (i) the first channel works through the expansion of capacity and hence enrollments (a new center is opened in the child’s neighborhood and those most likely to enroll become beneficiaries of this newly created capacity; (ii) the second channel works through affordability (the child becomes enrolled because now it is more affordable for the family to send the child to daycare). The scenarios considered may contribute to enrollments through their impact on capacity or through their impact on affordability for households, or both.

The investment grants, where they are applied, are assumed to have an impact on enrollments through capacity increases – and not through increased affordability. Hence, it is assumed in the model, that the full benefit of the investment grant will be captured by the service provider. They have an impact on enrollments only through new capacity created.<sup>xi</sup>

For operational grants, the increase in enrollments is due to the capacity effect as well as the affordability effect (income effect at the household level), as we assume that the benefit from the operational grants are split between the service provider and the household. For vouchers, the effect on enrollments is through the affordability effect (the income effect at the household level). In the short term, we assume that there is no capacity impact as a result of the vouchers.<sup>xii</sup>

*Table 2: Summary of Enrollment Effects in the Model under Different Subsidy Schemes*

	<b>Impact on Enrollments through Impact on Capacity</b>	<b>Impact on Enrollments through Impact on Affordability (Income Effect)</b>
Investment Grant (as in Scenario1)	√	
Operational Grant (as in Scenario 2A and 2B)	√	√
Vouchers (as in Scenario 3)		√

The estimated expected capacity increase due to the investment grants and operational grants coming from the supply-side simulation is incorporated into the model. In order to achieve this, the number of children aged 3-5 who are currently enrolled in preschool or daycare in the EU SILC 2012 dataset is multiplied with the estimated capacity increase coming from the supply-side simulation for each scenario. This allows us to find out the number of spots that will be available for the children who are not currently enrolled in the SILC data set.

Once the new capacity is calculated, this value is divided by the total number of children attending preschool in Turkey in the baseline. Lastly, this value is used as the percent capacity increase and it is multiplied by the number of children attending preschool in the data set. This again allows us to find out the number of spots that will be available for the children who are not currently enrolled in the SILC data set.

After the capacity increase amounts in SILC are all determined, the number of new spots due to the increased capacity are allocated to the children in the data set aged 3-5, based on their propensity to attend preschool. This propensity is calculated using a *probit* model which uses a wide range of independent variables to predict a child’s propensity to attend preschool. The *probit* equation is as follows:

$$P(\text{attending preschool or daycare}) = \varphi(X'\beta) \tag{Eq (9)}$$

where the independent variables X are as follows: child’s age, mother’s level of education, mother’s employment status, father’s level of education, father’s employment status, per capita household income, household size, number of adults in the household aged 65+, number of children in the household aged 0-6 and region the household is located in.

Using this equation, the probability to attend is calculated for all children whether they currently attend a center or not. The calculated capacity increase is allocated to the children starting from the child who is currently not attending but has the highest *propensity* to attend child care among the non-attenders and the allocation stops when the increased capacity is filled. This exercise allows us to observe who is more likely to benefit from a capacity increase as a result of an operational grant or investment grant.

For the case of operational grant *with a price cap* a slightly different exercise needs to be adopted. In the price cap scenario, the child care centers in the supply-side model with the highest prices keep their prices and do not opt-in for the grant since it will not be profitable for them to do so. Hence, we need to incorporate this fact into our demand-side simulation. We try to achieve this by assuming that children who do not currently attend preschool in households in the highest income quintile will not benefit from the capacity increases since the school their families would prefer would not opt-in for operational grants.<sup>xiii</sup>

Overall to calculate the number of children enrolled due to capacity increase, individual weights of these children who are newly enrolled are summed up, using the equation below:

$$\sum_1^{\% \text{ capacity increase in } Sc X} \frac{\text{Number of children enrolled due to the capacity increase}_{Sc X}}{\text{Number of currently enrolled children in the dataset}} \times \text{Individual weight in the dataset} \quad \text{Eq (10)}$$

Operational grants also have a positive effect through increasing affordability by decreasing prices. To show this impact, the probability to attend preschool is calculated for the children (i) P1-when there is an operational grant and children are allocated the new capacity and (ii) P2- when there is an operational grant and children are allocated the new capacity and there is also the positive income shock. These probabilities are calculated using the *probit* equation described above. As a second step, expected number of children benefiting from affordability increases are calculated by multiplying the probabilities with weights of the children and adding them up for the whole population. In the operational grants, the benefit of the subsidy is shared between the households and service providers, hence there is an increase in enrollments due to both the capacity increase and the affordability increase (the income effect).

For the voucher scenario, the main impact is through the income effect introduced by the voucher – hence the increased enrollment is due to increased *affordability* as a result of the voucher. The probability to attend preschool is calculated for the children using the *probit* equation above (i) in the baseline where there is no voucher and (ii) when there is a voucher creating a positive income effect. In the second step expected number of children attending preschool in the baseline and when there is an income effect will be calculated. Note that there is no capacity impact in the short term in the voucher scenario, since the benefit is fully absorbed by the households.

The expected number of children attending preschool as a result of the affordability increases is calculated using the equation below:

$$E(\text{Number of children enrolled due to affordability increase}_{Sc X}) = \sum (P2 - P1) * \text{individual weight in the dataset} \quad \text{Eq (11)}$$

In summary, for each scenario the number of children who will be enrolled due to the capacity impact is summed up with the predicted number of children who will be enrolled in child care due to the affordability increase in order to come up with the total number of newly enrolled children.

$$\text{Number of newly enrolled children}_{Sc X} = \text{Number of children enrolled due to the capacity increase}_{Sc X} + E(\text{Number of children enrolled due to affordability increase}_{Sc X}) \quad \text{Eq (12)}$$

### 5.2.3 Fiscal Impact and Cost Effectiveness

Different calculations are necessary to calculate the cost of the investment, operational grants, the vouchers and the scenarios where municipalities open up child care centers.

For investment grants, we first estimate the expected number of new child care centers that will be opened up as a result of the subsidy. This is calculated by dividing the number of new enrollments by the average size of a child care center (in our case, this was 50 children per center on average). The expected number of *new* child care centers (countrywide), is multiplied with the level of the investment grant.

$$\text{Cost} = (\text{Number of children enrolled due to the capacity increase} / \text{Average capacity of a center}) * \text{Investment grant} \quad \text{Eq (13)}$$

For the operational grant, when there is no price cap, all the schools that already exist are assumed to opt-in, hence the cost of the grant will be equal to the country wide level of expected enrollment multiplied with yearly value of the operational grant and summed up over 5 years.

$$\text{Total cost} = \sum_{t=1}^5 \frac{\left( \frac{\text{Number of enrolled children in Turkey (after grant)}}{\text{Average capacity of a center}} * \text{per child grant} \right) * 12}{(1+r)^t} \quad \text{Eq (14)}$$

For the operational grant with the price cap, first the country-wide number of children enrolled from the bottom 80% is calculated using SILC.<sup>xiv</sup> Then the estimated number of children who will be newly enrolled is added to this value to find the total number of beneficiaries. Similar to the previous step, 5 year value of the operational grant is calculated to find the total cost.

$$\text{Total cost} = \sum_{t=1}^5 \frac{\left( \frac{\text{(Number of children already enrolled in the bottom 80\% + Number of newly enrolled children)}}{\text{Average capacity of a center}} * \text{per child grant} \right) * 12}{(1+r)^t} \quad \text{Eq (15)}$$

The cost of the vouchers is calculated by first adding up number of children already enrolled from the bottom 40% with the expected number of children newly enrolled to childcare after the voucher shock is received and then multiplying this value with the value of the voucher. This value is then summed up for a 5 year period.

$$\text{Total cost} = \sum_{t=1}^5 \frac{\left( \frac{\text{(Number of children already enrolled in the bottom 40\% + Number of newly enrolled children)}}{\text{Average capacity of a center}} * \text{per child voucher} \right) * 12}{(1+r)^t} \quad \text{Eq (16)}$$

Two kinds of tax revenue are calculated for each scenario. These are corporation tax revenues and income tax revenues from newly employed staff at the centers.

(i) Tax revenues obtained from the newly opening centers: This is in the form of income and corporation taxes making a cumulative total of 32% of the profits<sup>xv</sup>; and

(ii) Tax revenues obtained from employee contributions: This is composed of the women working in child care centers that opened up as a result of the grants. Hence as a lower bound estimate for tax revenue - all the women employed in new child care centers are assumed to be receiving the minimum wage<sup>xvi</sup>. Net present value of tax revenues are calculated for a period of 10 years.

Net cost is calculated for each scenario by taking the difference between total costs and total tax revenues. Finally, the cost effectiveness of each scenario is calculated by dividing the net costs of each scenario with the total number of newly generated enrollments through the capacity and increased affordability effects of the scenario and dividing this number further by 10 which is the assumed years of operation for these centers.

## 6. Main Findings

The results of the supply- and demand-side simulations are presented in this section when the methodology is applied to the case of Turkey taking into consideration the (i) impact on capacity and estimated number of new centers (ii) impact on enrollments which are derived both from capacity increase as well as affordability increase in the household and hence may be higher than the amount of capacity increased (iii) benefit incidence of new enrollments and grants (% of children in the bottom 40% of the income distribution that benefit from the expansion and households in the bottom 40% that benefit from the grants), (iv) costs and revenues and (v) cost effectiveness in terms of the net cost of the policy per child enrolled.

### 6.1 Impact on capacity and estimated number of new centers

Capacity increase is maximized in the scenario that combines the investment grant and the operational grant (and does not impose a price cap). This scenario (provided under Scenario 4A) expands existing preschool capacity by 30 percent. The estimated number of newly opened centers in this scenario is 4,132 creating space for 206,608 newly enrolled children (additionally 29,738 children are expected to be enrolled due to an affordability increase). When a price cap is introduced to these scenarios (Scenario 4B) the impact on capacity is slightly lower though still higher than if an investment grant or operational grant were provided alone.

When an investment grant is provided alone (Scenario 1), there is a small increase in capacity, while the impact on capacity of only providing operational grants is projected to be higher (Scenario 2A and 2B). With a one-time investment grant and without operational grants, the capacity increase is estimated to be about 6 percent. The one-time investment grant *does not* create enough incentive in the model to expand capacity for child care centers, rather the operational grants seem to have a more convincing impact: when operational grants –with or without a price cap- are provided per child per month for 5 years, the impact on capacity is estimated to be 17 percent with price cap and 24 percent without the price cap (an estimated 2,394 and 3,306 new centers respectively).

Where an operational grant is introduced with a price cap (Scenario 2B), the capacity increase is – as expected - smaller compared to no price cap scenarios. In the supply side simulation model, when an operational grant is introduced with a price cap, child care centers that charge more than the cap do not find it profitable to opt in. As a result, capacity increase remains smaller compared to the scenario with no price cap where every service provider would have the incentive to opt-in. Hence for instance in the scenario when an operational grant of 300 TL is provided without a price cap a capacity increase of 24 percent is expected as opposed to a capacity increase of 17 percent when the same grant is provided but with a price cap of 750 TL per month per child.

The vouchers - when provided alone - are not expected to create new capacity in the short term in the model. The impact of the vouchers on enrollments are built into the model through their impact on “affordability” of child care for the household, hence they work through the demand-side simulation and are projected to have no impact on the supply-side capacity in the short term.

### 6.2 Impact on preschool enrollment

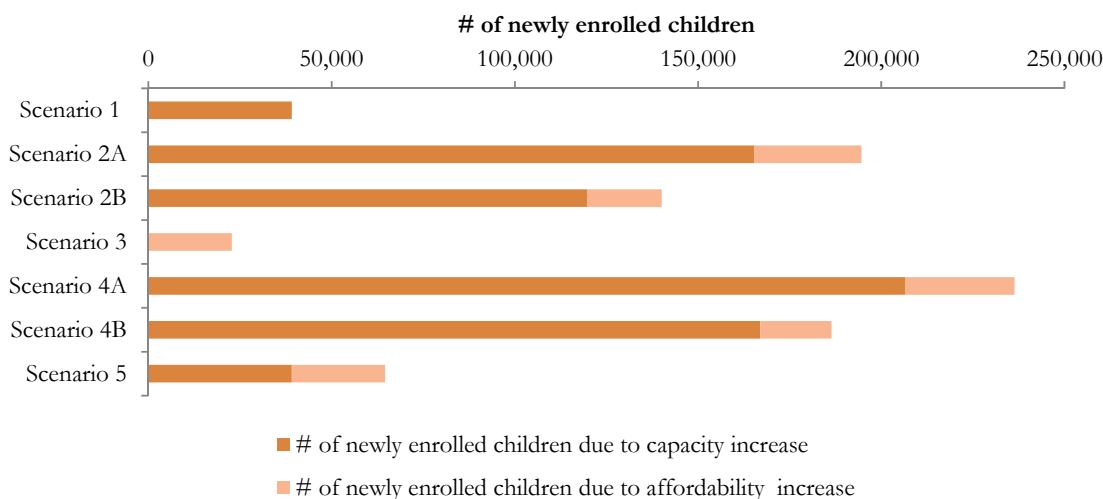
The increase in the enrollment figures come from the increase in capacity in the supply-side model (which is assumed to be taken up fully by new enrollments) as well as the increase in affordability of child care by households in the demand-side model. As explained in the methodology section, the investment grants have an impact on enrollments only through their impact on capacity, whereas the vouchers impact enrollments through their impact on affordability of child care (hence are assumed to have no impact on capacity). The operational grants have an impact on both capacity and affordability by the household –the benefit derived from the grants are assumed to be shared by the child care centers and households equally and enrollments increase in these scenarios both through the capacity increase on the supply side and the affordability increase on the demand side (and hence increased enrollment in existing capacity). Number of newly enrolled children as a result of each scenario through impact from these two channels can be seen in Figure 3.

The highest levels of new enrollments are observed in the set of scenarios that include investment grants and operational grants together (Scenario 4A and 4B). This is in parallel with the fact that these scenarios also



create the highest capacity increases. The increase in enrollments is highest when there is no price cap. Current enrollment rate increases by 9.6 percentage points in the case where the one-time investment grant is 50,000 TL and the operational grant is 300 TL per month per child. A total of 236,346 children are expected to be enrolled in preschool, the majority of which are enrolled through the capacity increase (206,608 children). When a price cap is introduced (Scenario 4B) the increase in enrollments is estimated to be 7.6 percentage points in this scenario.

**Figure 3.** Number of newly enrolled children due to capacity or affordability increase



Source: Authors' calculations using SILC 2012 and Supply Side Data of "Supply and Demand for Child care Services in Turkey"

Providing only demand-side vouchers to families (Scenario 3) has a minimal impact on enrollments. Provision of vouchers to the bottom 40% of the population increases preschool enrollment rate by only 0.9 percentage points. As a result of this scenario, a total of 22,735 children are expected to be enrolled in preschool, all of whom are enrolled due to an increase in affordability (See Figure 3). This is due to our assumption that vouchers do not have a supply-side impact, hence they do not have any impact on capacity. Because the main constraint in the sector is on the supply side (a capacity constraint), the demand-side stimulation introduced by these transfers to the household do not address the main constraint in the market and are ineffective in terms of increasing enrollments. We also see that the voucher scenarios also happen to be the *least cost-effective* way of expanding enrollments in terms of money spent per new child enrolled (See Section 5.5 for more details).

Overall affordability increase generates a smaller impact as opposed to the capacity increase. In every scenario, the number of children enrolled due to the capacity increase is almost always higher compared to the number of children enrolled due to the affordability increase (See Annex Table A1). For instance in the scenario where only an operational grant is provided and there is no price cap, the number of children enrolled due to the capacity increase is 165,293 while the number of children enrolled due to the affordability increase is estimated at 29,289. This is due to the supply-side constraints in the sector – and signals that an impact on enrollments in the sector will mainly be achieved by interventions that target the supply-side capacity of child care in the country.

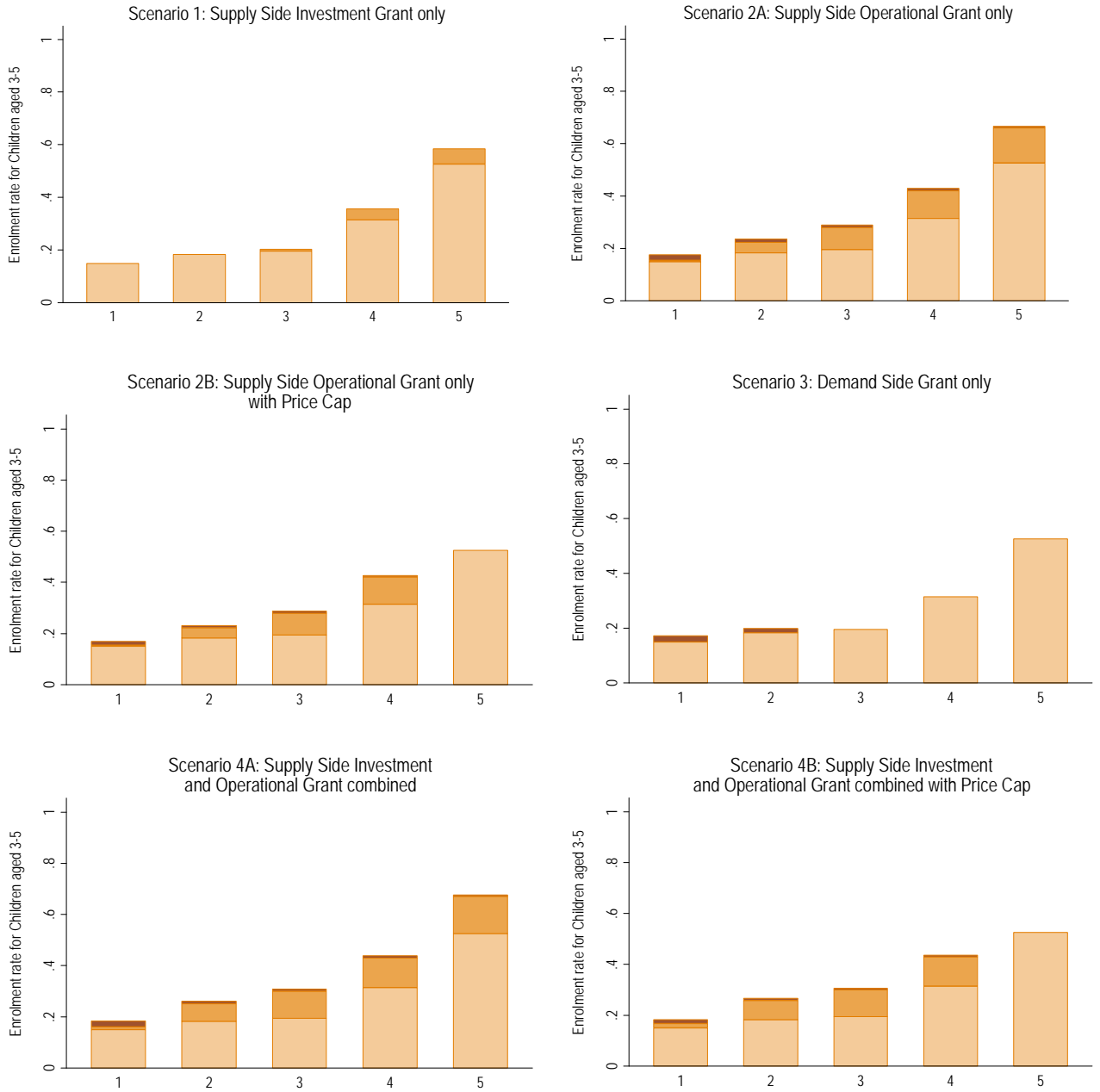
### 6.3 Benefit incidence of new enrollments and grants

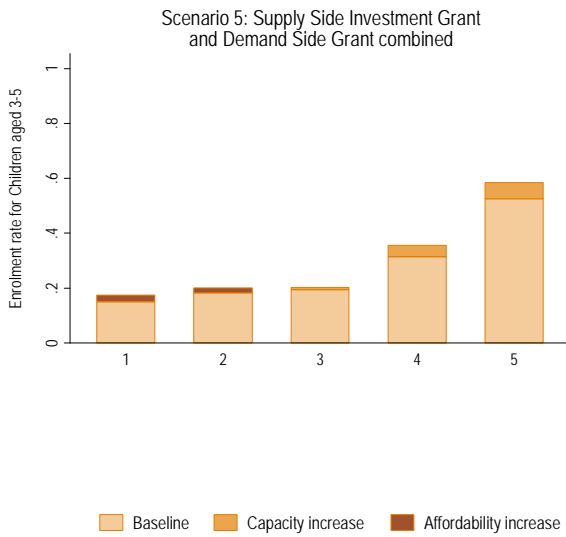
The distributional impact of the grants across income groups is another important dimension analyzed by the simulation. In each scenario, who benefits from the expanded capacity and who benefits from increased affordability depends very much on whether there is a price cap attached to the grants and whether there is a targeted voucher system.

In the scenarios where there are no price caps, the newly created capacity accrues regressively and benefits the higher income quintiles disproportionately. In other words, the children who are likely to be enrolled come from families in the top quintiles of the income distribution. For instance, in the scenarios with the operational and investment grants implemented together (scenario 4A) without the price cap, 30.3 percent of capacity generated is utilized by children in the bottom 40% of the distribution. When there is a price cap in the scenarios with operational grants, the utilization of new capacity becomes more equitable. Looking at Scenario 4B where the operational and investment grants are provided together, we find that with the price cap imposed at 750 TL per child, the new capacity generated accrues more to the poor- with 39.9 percent of capacity being utilized by children in the bottom 40 % of the income distribution.

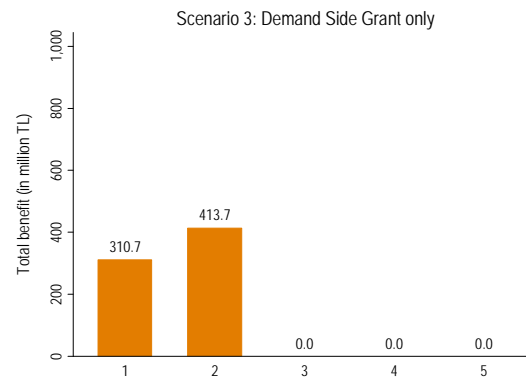
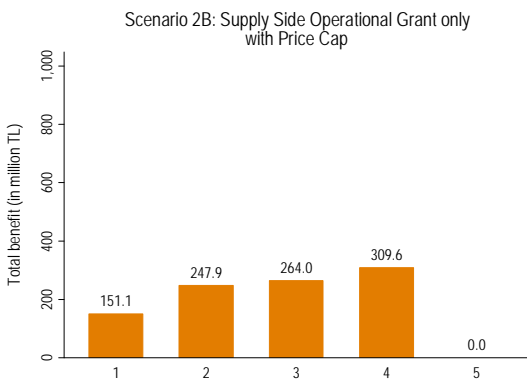
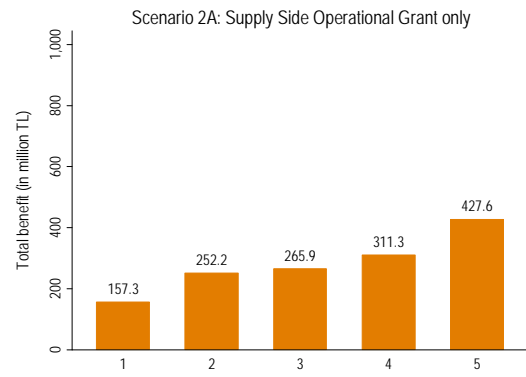
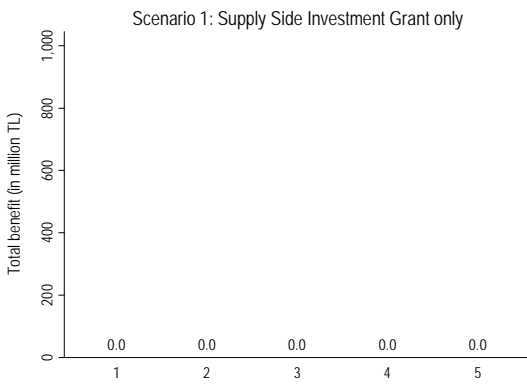
The vouchers can be targeted to benefit the poorest households and hence they have appeal. However, when we look carefully at the results, because the impact of the voucher scheme is *too small* on enrollments, the *overall* impact of the scheme even on poor households is estimated to be limited. In the voucher scenario, the enrollments increase by only 1.9 percent for the bottom 40%, while overall enrollments increase by 0.9 percent. The benefit incidence of the grant is pro-poor, meaning the grant would be received only by the low income households – for instance, in the targeted voucher scheme, 44% of the benefits are estimated to accrue to households in the bottom 20% of the income distribution, which is the best scenario in terms of targeting when compared to the scenarios with the operational grants. However, because the enrollment impact is limited under this scenario (since the voucher system works through the demand side and through improved affordability of existing services – rather than by increasing capacity), the overall impact on the poor children is very limited. We find that the enrollments of the bottom 40 % of children increase more (about 6 % points in Scenario 4B) in the scenarios with the investment and operational grants provided together, while in the voucher scenario providing the same level of investment grants and providing the vouchers to the household the enrollment increase for the bottom 40% is only 2.1 percent (Scenario 5). This is a very interesting and important result that suggests that *targeting the poorest households through a demand side transfer might not always be the most pro-poor policy*. In the case of child care in Turkey, it seems that these households do not benefit from these services, not because they are not *affordable* to them, but because they are not *available* to them – hence before resolving supply side capacity issues targeting the unaffordability problem through a demand-side transfer to households turns out to be an ineffective policy for expanding access to services.

**Figure 4.** Preschool enrollment rates of children aged 3-5 by per capita income quintile

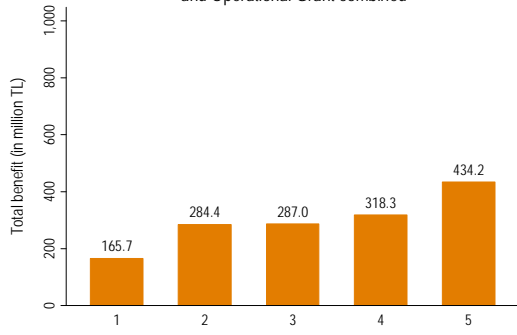




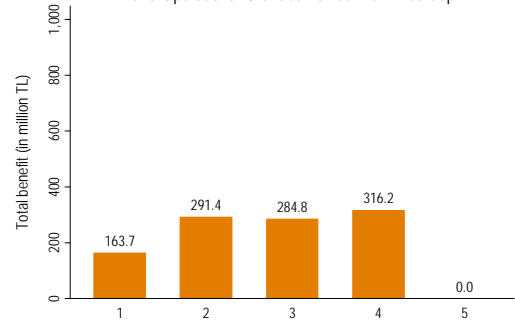
**Figure 5.** Benefit incidence of the grants and/or vouchers by per capita income quintile



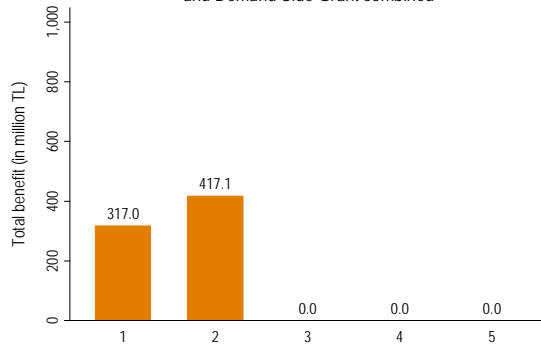
Scenario 4A: Supply Side Investment and Operational Grant combined



Scenario 4B: Supply Side Investment and Operational Grant combined with Price Cap



Scenario 5: Supply Side Investment Grant and Demand Side Grant combined



## 6.4 Cost Effectiveness

Implementing each scenario results in its own costs and potential tax revenues. In order to look at cost effectiveness, we first consider net costs of each scenario, looking at costs and potential tax revenues to be generated. While the costs are the total costs of the investment grants, operational grants, or vouchers, the tax revenues are collected in the form of (i) corporation and income taxes of the newly established centers and (ii) employee taxes of the employees working in these centers. The costs are calculated as the total cost of the one-time investment grant and the 5 year on-going cost of grants and vouchers and are provided in net present values. The costs and revenues in each scenario are provided in Annex Table A1.

Providing operational grants for 5 years in addition to investment grants turns out to be the most costly alternative. When an operational grant of 300 TL is provided for each child enrolled in the centers for 5 years without a price cap in addition to a 50,000 TL investment grant, the total cost is 5.8 billion TL in net present value. This cost which is the highest among the others is equivalent to about 0.30 percent of Turkey's 2015 GDP.<sup>xvii</sup>

While costs are higher in general when operational grants are provided, revenues are also higher since more centers are established under these scenarios - leading to the collection of more corporation and income taxes. In fact, the scenario that provides operational grants of 300 TL without a price cap and an investment grant of 50,000 TL generates the highest amount of revenues with 1.9 billion TL. In comparison, the lowest amount of revenues is generated when vouchers are provided alone. In fact no revenue is generated from providing vouchers for 5 years since vouchers do not lead to the establishment of new centers.

One of the policies presented here are “net revenue generating” policy options. According to the simulation model, when the investment grants are applied on their own – the net cost of the program ends up being negative, meaning that the tax revenue from corporation taxes and income taxes from employees in these centers -over the 10 year period for which these centers are expected to operate-, exceed the initial set up grants provided to these centers. For instance, providing a 50,000 TL investment grant to these centers is estimated to cost 39 million TL initially, and generate 353 million TL in tax revenues in the 10 year period making the total net cost -314 million TL for this investment. The main assumption here is that the child care centers would truthfully report profits and that the employees would be *formally* employed at these centers. As long as these requirements are tracked and enforced, *net positive revenues* are expected to be generated with this kind of an investment subsidy.

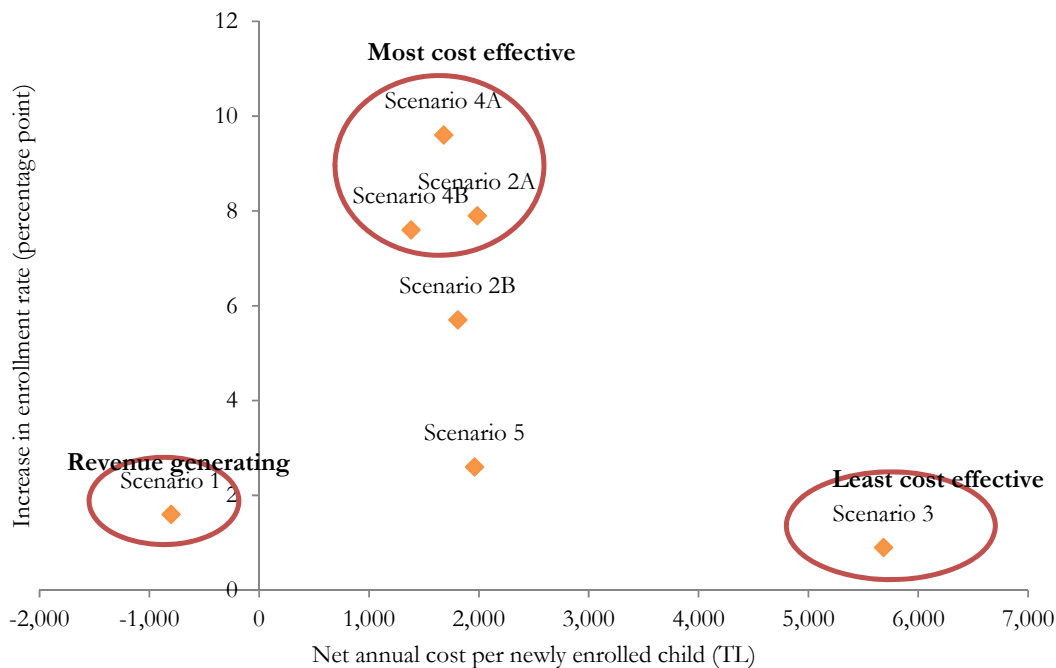
In comparison, scenarios with only operational grants and operational grants provided together with investment grants end up having the highest net cost. When 300 TL operational grant without a price cap is provided together with a 50,000 TL investment grant net cost is 4.0 billion TL. But it is useful to remember that these are also the scenarios that generate the highest changes in the capacity and enrollment rates for children. In order to assess the *cost-effectiveness* -and therefore value for money- of each scenario, we have plotted the percentage point increase in enrollments as a result of the policy against the per child net cost of implementing each policy in Figure 6.

According to this analysis, a typology of scenarios come up when the model is applied to the Turkish case:

- Revenue generating scenario (Scenario 1 – Investment Grant Scenario): The investment grant scenarios are expected to be revenue generating within the 10 year spectrum. They have little impact on enrollments and hence are not advised to be applied on their own if the intention is to expand services and increase enrollments – though if they are provided on their own they are likely to have a positive impact on the budget in the medium term.
- Least Cost Effective scenario: (Scenario 3 – Only voucher scenario): The scenario that uses vouchers *only* without an investment support, is the most expensive scenario in the analysis in terms of per child enrolled. This is because incentivizing a household to use these services using the demand-side vouchers only – when availability of services is low – is difficult hence the vouchers do not address the most binding problems in the child care sector in the country.

Most Cost Effective scenarios (Scenarios 2A, 4A and 4B – Investment and Operational Grants with or without Price Cap and only operational grant without price cap): The most cost effective scenarios in terms of budget spent per child enrolled as a result of these policies, are represented by Scenarios 2 and 4 where the operational and investment grants are provided together. As discussed in section 5.3 when a price cap is introduced the benefit incidence accrues more to the poor households. Hence Scenario 4B where operational grants are provided together with investment grants and *with* a price cap is the most cost-effective and pro-poor scenario in terms of benefit incidence. Overall, these are the most cost effective and hence most recommended scenarios in the simulation – whereby the twin goals of attaining higher capacity and enrollments are also matched with a concern for lower costs per child and a pro-poor distribution.

**Figure 6.** Cost effectiveness



Source: Authors' calculations using SILC 2012 and Supply Side Data of "Supply and Demand for Child care Services in Turkey"

## 7. Conclusions

The mechanism for the delivery of a child care subsidy matters for results. The initial conditions of the child care market, not only determine the marginal benefit incidence of additional supply, but also have an impact on the cost effectiveness of targeted subsidy measures. This paper has demonstrated a practical financing model for child care using empirical data from Turkey's child care sector, and applicable to other countries. Combining the supply-side investment incentives of firms given a supply-side subsidy and the demand-side incentives of households in the face of more available supply and reduced prices, the model has predicted the capacity enhancement, benefit incidence and distribution of new capacity as well as the incidence of public money spent on households by welfare quintile. By considering the cost of each measure and the new enrollments induced by each scenario, the paper has come up with a methodology for predicting the most cost-effective policy measure for the country for expanding child care through public subsidies through supply-side investment or operational grants or demand-side vouchers that target households. The paper has shown that the mechanisms for the transfer alone make a difference in the model in how pro-poor

delivery of services is - and simply targeting “poor households” may not be the most pro-poor way of expanding services or subsidizing child care.



## Annex

Table A1. Summary of the results under each scenario

Scenario Type		Scenario 1	Scenario 2A	Scenario 2B	Scenario 3	Scenario 4A	Scenario 4B	Scenario 5	
		Supply Side Investment Grant only: One-time investment grant to child care centers.	Supply Side Operational Grant only: Monthly per student operational grant (no price cap)	Supply Side Operational Grant only with Price Cap: Monthly per student operational grant (with price cap)	Demand Side Grant only: Vouchers to households per child enrolled	Supply Side Investment and Operational Grant combined: One-time investment grant and monthly per child operational grant combined (no price cap)	Supply Side Investment and Operational Grant Combined with Price Cap: One-time investment grant and monthly per child operational grant combined (with price cap)	Supply Side Investment Grant and Vouchers: Combined: One-time investment grant and monthly voucher to households combined	
<b>Grant levels</b>	Investment grant level	50,000 ₺	- ₺	- ₺	- ₺	50,000 ₺	50,000 ₺	50,000 ₺	
	(TL - one time grant)								
	Operational grant level	- ₺	300 ₺	300 ₺	- ₺	300 ₺	300 ₺	- ₺	
	(TL per month per child)								
	Voucher level	- ₺	- ₺	- ₺	300 ₺	- ₺	- ₺	300 ₺	
	(TL per month per child)								
	Price cap	-	-	750 ₺	-	-	750 ₺	-	
	(TL per month per child)								
<b>Results</b>	% capacity increase	A	6	24	17	0	30	24	6
	# of newly enrolled children due to capacity increase	B	39,145	165,293	119,688	0	206,608	166,974	39,145
	# of new centers	C = B / 50 (B/100 for Sc. 1)	783	3,306	2,394	0	4,132	3,339	783
	# of newly enrolled children due to affordability increase	D	0	29,289	20,371	22,735	29,738	19,430	25,442
	Total number of newly enrolled children	E = B+D	39,145	194,581	140,060	22,735	236,346	186,404	64,586

		1.6	7.9	5.7	0.9	9.6	7.6	2.6
Increase in enrollment rate (percentage point)	$F = E / (\text{Total number of children aged 3-5})$							
Increase in enrollment rate of the bottom 40% (percentage points)	G	0.0	4.1	3.6	1.9	6.0	6.2	2.1
% of the newly enrolled children from bottom 40%	H	0.0	25.2	30.8	100.0	30.3	39.9	39.4
Total benefit accruing to households (million TL)	I	0	1,414	973	724	1,490	1,056	734
% of the benefit going to bottom 40%	J	.	29	41	100	30	43	100
% of the benefit going to bottom 20%	K	.	11	16	43	11	16	43
Total cost (million TL)	L	39	5,353	3,612	1,292	5,832	4,081	1,619
Total number of new personnel needed	M	2,349	9,918	7,181	0	12,396	10,018	2,349
Total tax revenue from newly employed women in centers (TL)	N	20	84	61	0	105	85	20
Total tax revenue from corporation and income tax (32% of profits)	O	333	1,407	1,019	0	1,759	1,422	333
Total tax revenue (million TL)	$P = N + O$	353	1,492	1,080	0	1,864	1,507	353
Total Net Cost (million TL)	$Q = (L - P)$	-314	3,861	2,532	1,292	3,968	2,574	1,266
Net annual cost per newly enrolled child (TL)	$R = (Q / E) / 10$	-803	1,985	1,808	5,683	1,679	1,381	1,960

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## Endnotes

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<sup>i</sup> Rate for Turkey is from the Ministry of Education's National Education Statistics 2015/16, gross enrollment rate for 3-5 year olds. Rates for OECD and the EU are from World Bank, World Development Indicators (gross enrollment ratio, pre-primary, both sexes (%))

<sup>ii</sup> World Bank 2015. Supply and Demand for Child Care Services in Turkey

<sup>iii</sup> World Bank 2015. Supply and Demand for Child Care Services in Turkey

<sup>iv</sup> World Bank 2015. Supply and Demand for Child Care Services in Turkey

<sup>v</sup> World Bank, World Development Indicators. (Percentage of enrollment in pre-primary education in private institutions (%))

<sup>vi</sup> Rate for Turkey is obtained from Turkish Statistical Institute's website, it is the annual figure for 2014 for women 15 years old and older. Rates for OECD and EU are obtained from World Development Indicators of World Bank, they are for women 15 years old and older and they are national estimates.

<sup>vii</sup> Note that these providers can also be municipalities or creches within working places. As long as they are regulated and conform to certain standards, they can be eligible for this funding.

<sup>viii</sup> The terminal value is calculated using the EBITDA (Earnings Before Interest, Taxes, Depreciation and Amortization) Multiple. The final year's profits is multiplied by a constant, in our model this value is set at 10.5 following international benchmarking. See source: BAIRD 2015. Education Services Report. <http://content.rwbaird.com/RWB/sectors/PDF/TechnologyServices/education-services-report.pdf>

<sup>ix</sup> Assumption here is that above the risk free interest rate there needs to be about a 30% premium.

<sup>x</sup> This is assumed to be 32% of profits based on tax rates in Turkey; calculated by first taking 20% of the profit as corporate tax and then taking 15% of the remaining profit as income tax. The level of cumulative taxes on profits would vary by country.

<sup>xi</sup> This also holds for the scenarios for the municipalities opening up crèches as well. These scenarios (Scenario 1) also only have an impact on enrollments through increased capacity.

<sup>xii</sup> In other words, the full benefit of the voucher is captured by the households that receive them (without an increase in prices) and the full effect of an investment grant is captured by the service providers that receive them (without a reduction in prices). These simplified assumptions allow us to run the model smoothly, although variations of these scenarios can be applied. For the purposes of this simple model, we propose to stick to these definitions.

<sup>xiii</sup> This assumption is reasonable due to the information gathered in the demand side survey in 2014 for the World Bank study Supply and Demand for Child care Services in Turkey. According to the data, mothers living in households with per capita income greater than 821 TL (the minimum per capita monthly income for the 9th decile according to SILC 2012 dataset) or 1012.59 TL in 2014 values, have a willingness to pay of 780 TL on average. Hence with any price cap lower than this value, our assumption is reasonable. (In order to find the 2014 nominal value of the 2011 per capita income value, we used December 2011 TUFİ index of 200.85 and December 2014 TUFİ value of 247.72 obtained from Turkish Central Bank's website.)

<sup>xiv</sup> Due to the assumption that top 2 deciles will opt out of the program since their willingness to pay is higher.

<sup>xv</sup> Cumulative tax is calculated as: 20 percent of profits as corporate taxes and 15% of the remainder (80 percent of revenue) as income taxes.

<sup>xvi</sup> The tax collected by the government for each woman is calculated by adding up the taxes on the minimum wage, making up a total of 98.98 TL as posted by the Ministry of Labour and Social Security for the first 6 months of 2016. Using the information related to minimum wage in The Ministry of Labor and Social Security's website. <http://www.csgb.gov.tr/Contents/Istatistikler/AsgariUcret>

<sup>xvii</sup> Turkey's 2015 GDP is 1,953,561 million TL in nominal terms. Source: <http://www.tuik.gov.tr/PreHaberBultenleri.do?id=21510>