UNIVERSIDAD DEL CEMA
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DOCUMENTOS DE TRABAJO

Área: Economía

ALLOCATION PROBLEMS IN CHILD BENEFIT PROGRAMS USING A MICROECONOMIC THEORY APPROACH

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Enero 2021
Nro. 775

www.cema.edu.ar/publicaciones/doc_trabajo.html
UCEMA: Av. Córdoba 374, C1054AAP Buenos Aires, Argentina
ISSN 1668-4575 (impreso), ISSN 1668-4583 (en línea)
Editor: Jorge M. Streb; asistente editorial: Valeria Dowding jae@cema.edu.ar

Allocation Problems in Child Benefit Programs Using a Microeconomic Theory Approach

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January 4, 2021

Abstract

This paper intends to illustrate theoretical bases for positive factors as well as major problems associated with UCT and CCT programs. It is important to highlight that there is diverse empirical evidence regarding support schemes and their effects on schooling, health and nutrition. However, literature regarding the allocation of child benefit transfers between household members is rather limited. This paper provides a theoretical explanation of how conventional child benefit programs may have transmission problems, which may prove to be counterproductive in terms of social welfare. The allocation flaws are evident in the model and are very intuitive, however similar schemes have prevailed in practice. It is unclear to what extent these perceptions are borne out of a concern for children's (or individuals') wellbeing or are guided by political interests. For this reason, the last section of the paper offers a different perspective on certain programs, taking into consideration political incentives. The final aim is not necessarily to provide an optimal scheme but instead to draw attention to certain features of child benefit programs under a clear microeconomic scope.

JEL Classification: D11, E31, E62, I380.

Key Words: Child Benefit Programs, Family Economics, Conditional Cash Transfer Programs, Unconditional Cash Transfer Programs.

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I would like to thank Sian Kelly for her constant insights and considerable support.

The author's point of view does not reflect that of the University of CEMA.

1 Introduction

Unconditional cash transfer programs (UCTs) aimed at reducing poverty and inequality have lead to important efficiency discussions throughout history. There is enough evidence highlighting that welfare programs without any conditions on the receivers' actions do in fact present positive results in terms of nutrition, education and inequality reduction. However, there is considerable discussion regarding the cost of these. Secondly, "no strings attached" programs may lead to inefficient use of government resources or socially undesirable effects. For example, there are discussions regarding how UCTs may increase substance abuse (Watson, Guettabi, & Reimer, 2018; Dobkin & Puller, 2007; Evans & Popova, 2014). UCTs may also be used to, specifically, improve children's lives when brought up in more vulnerable conditions. For instance, income transfers may be provided in the hopes of reducing cost of transports to schools, improve quality of education and provide better nutrition.

That said, problems may rise when using UCT. For example, parents[1] may sometimes focus more on their own interests rather than those of their children. This dynamic is known as *incomplete altruism* (Fiszbein & Schady, 2009). One of the main sources for this issue is the lack of information or difference perceptions of the same information. For example, parents decide on the education of their children, but their choices may not be perfectly aligned with those of children or the ones society -in our models reflected through the policy maker- considers appropriate. In such circumstances, UCTs from the government may come up short in the solution of problems in addition to depleting the government resources. Therefore, voucher systems (analogically endowment transfers) and conditional cash transfer programs (CCTs) emerged. Only the latter will be presented in this paper to show a possible theoretical alternative to try to solve the allocation problem.

Regarding CCTs, the difference with UCTs relies on a pre-specified set of conditions that those households are bound to. That is, a list of conditions to be met in order for the person to keep receiving the aid. In the particular cases of child benefits, these conditions are normally related to investments in the human capital or health of their children. Evidence in Latin America starts with Mexico's *Progresa*, Brazil's *Bolsa Escola*, Honduras' *Programa de Asignación Familiar* (PRAF II) in the 90's. Since then, there were several CCT programs world wide. Some of the most known cases in Latin America include Chile's *Chile Solidario*, Colombia's *Familias en Acción* (both established in 2002), Peru's *Juntos* (established in 2005) and Argentina's *Asignación Universal Por hijo* (AUH) (established in 2009). Various innovative and groundbreaking CCTs have been applauded for increasing school attendance rates and contributing to improvements in health and nutrition, which all together helps to reduce inequality and poverty.

[1]This includes a mother, father or guardian. For this paper the distinction is irrelevant to the analysis itself; any of the terms may be used.

A commonality between these programs, and a central point of this paper, is that CCTs rarely base their conditions on material aspects. For instance, parent are required to send their children to school and to have proper vaccinations (which are provided for free most of the time) in order to keep their benefit, but it is not a requirement that parents provide their children with adequate school utensils, books, shoes, underwear, diapers, hygiene products and so on. Perhaps the challenges of establishing similar conditions to the ones mentioned previously relies on the practical difficulties, for the policy maker, to ensure conditions are met.

To a certain extent, Chernichovsky and Zangwill (1990) point out that a significant number of households, particularly with children or women, remain malnourished even where there is an overall adequate supply of food. To a certain extent they attribute these problems to a variety of household factors that are associated with the risks of malnutrition: "size and composition, command over human and non-human resources, environmental conditions, and a host of cultural and social attributes". Although their paper is focused on nutrition, the scope may be widened to incorporate school supplies, general clothing or expenditure in general.

It is impossible to dissociate the reasons previously mentioned with the concept of bargaining power in the household context. In our models the bargaining power is taken to the extreme given that parents exert absolute control over their children's consumption. Specification of bargaining power is not necessary for this paper, yet nonetheless, a model which includes children's own financial income or a type of non monetary component that allows for them to retain some bargaining power (at least between siblings in the household) may be of use (Laferrère & Wolff, 2006). This last point can even be extended to the discussion regarding household dynamics with regards to the head of a family (Duggan, 1995).

Lastly, it is important to understand political dynamics in the context of social programs. Particularly in Latin America it seems impossible to detach the inexorable relationship between low income social policies and populism. Sachs (1989) shows evidence that inequality in Latin America boosted political pressures for macroeconomic policies to raise the incomes of lower income groups, which in turn contributes to bad policy choices and weak economic performance. Particularly, he analyzes policy failures under what is commonly called *the populist policy cycle*. This paper does not present a macroeconomic framework but it will (under a political economy framework) aim to point out how electorate density contributes to the quantity of people receiving a subsidy vs the nominal amount of subsidy.

This paper analyzes the relevance of child benefit programs and the effect on household consumption pattern, particularly the allocation of resources to parents and children. The models that will be presented in general will be static models with three agents: government, parents and children. The idea behind the models is to provide a theoretical framework in order to analyze a set of questions from a microeconomic scope: 1) Does the unconditional money transfer mechanism bring any undesired allocation problems? 2) If it does, are there any ways to reduce those problems? 3) If there are, at what costs? 4) May political agendas create additional allocation problems?

The paper contains four analytical sections. The first section establishes a basic model which will be the baseline framework for the whole paper. The second section introduces a policy maker who determines what is considered the optimal allocation under this approach. This section is fundamental since it highlights the potential allocation problems provided by the current transmission mechanism. The third section analyses the role of CCTs as a way to reduce these allocation problems. Additionally, the third section elaborates on the costs and issues that may arise when implementing CCTs. The last analytical section discusses a government with its own political agenda. The purpose of this section is to expose how non-benevolent planners may contribute to the allocation problems.

2 UCT Household Basic Framework

For a simple illustration, the household situation is condensed in two agents, a parent and an aggregate child. The model provides one unique optimizing parent and an aggregate child who is not old enough to influence the family spending decisions.

First of all, child support transfers τ_i, is wired to families with children providing they do not reach a minimum level of income (in this case it is a fixed endowment m_i). We will assume that parents do not receive any subsidy if their endowment is above $\overline{m}$. Therefore, a subsidy is given according to the following rule;

$$\tau_i(m_i) = \begin{cases} \tau_i = 0 & \text{if} \quad m_i > \overline{m} \\ \tau_i > 0 & \text{if} \quad m_i < \overline{m} \end{cases}$$

Families may be divided into those who receive government transfers and those who do not. Let's define I as the set containing all families and J as the set containing all families that qualify for -and receive- child support, that is, families bounded by $\overline{m}$ such that

$$J = \{m_j \in M : m_j < \overline{m}\}$$

From now on, families who receive child support will be indexed by j. It is evident that the number of families in J depends on

$$|J| = \Gamma(\overline{m}, \mu) \tag{2.1}$$

where $\frac{\partial \Gamma}{\partial \overline{m}} > 0$. On the other hand, μ is a variable that expresses other factors, such as, household income distribution and the individual household decisions.

Therefore, the aggregate household endowment may be decomposed in the following manner:

$$M = \sum_{i=1}^{I} m_i = \sum_{j=1}^{J} m_j + \sum_{r=1}^{R} m_r$$

Following Becker (1991), the aim of the model is just to explain consumption decisions within the family. For this, a parent with an altruistic utility function[2] will be assumed, which takes into account their consumption of goods and the utility provided by their children

$$U_i^p = F(y_i, U_i^c, \chi_i) \tag{2.2}$$

where U^p represents the parent's utility -aggregated in one unique parent-, y_i, U^c, represent the goods available for the parents consumption, the aggregate child's utility, respectively, for the family i. The altruism is presented by incorporating the child's utility as an input in the parent's utility function. The parameter χ_i stands for the relative weight of the child's utility in the parent's utility function with respect to the parent's own consumption level. When $\lim_{\chi_i \to 1}$ the parent has no altruistic behavior, meaning $U_i^p = F(y_i)$. Instead, when $\lim_{\chi_i \to 0}$ then $U_i^p = F(U_i^p)$ meaning the parent is completely altruistic and only cares about the child's wellbeing. The aggregate child's utility function can be expressed as

$$U_i^c = G(x_i)$$

With the following description we will not worry about reciprocal altruism[3]. In addition, the following components are assumed in the model

$$F_y > 0 \qquad F_{yy} < 0 \qquad F_x > 0 \qquad F_{xx} < 0$$
$$G_x > 0 \qquad G_{xx} \leq 0 \qquad F_{yx} = F_{xy} = 0$$

One should envision the concept of an "aggregate child" as

$$U_i^c(x_i) = \sum_{s \in S} \sum_{n \in N} \tilde{\varphi}_{i,s} u_{i,s}^c(x_{i,s,n}) \qquad \text{were} \qquad \sum_{s \in S} \tilde{\varphi}_{i,s} = 1$$

where $u_{i,s}^c$ is the utility level of the child s belonging to the family i, when consuming the baskets composed of n different goods. On the other hand, $\tilde{\varphi}_{i,s}$ is the relative weight of child s in the parent's utility. Similarly, expenditure on children may be described as

$$P_x x_i = \sum_{s \in S} \sum_{n \in N} \hat{\varphi}_{i,s} P_{x,s,n} x_{i,s,n} \qquad \text{were} \qquad \sum_{s \in S} \hat{\varphi}_{i,s} = 1$$

[2]Becker (1991) suggested to drop the term altruism and call this form of preferences "*deferential*".

[3]See (Laferrère & Wolff, 2006) for examples of reciprocal altruism in multiple household members.

Assuming a competitive market for all types of goods, $P_{x,s,n}x_{i,s,n}$ represents the expenditure on the child s, in the family i, on good n, while $P_x x_i$ represents the total expenditure on children, composed of the weighted average price and quantity- given by $\hat{\varphi}_{i,s}$.

First, we are going to focus on the parent's decision of consumption, meaning how the parent decides expenditure allocation between the child and themself. In this model the child does not face an optimization process. There are two reasons for this. Firstly, the child is too young and doesn't get to decide how much money the family spends on them. Instead, they receive an allowance set by the parent. The second reason, is that even if the child has their own optimizing problem, it would be a subproblem; first the parent decides how much money the child gets and then with the endowment provided by the parent, the child faces a conventional consumer problem which would not add any value to this research. This paper does not focus on the discussion regarding the choices made by the parent or the child regarding the specific type of goods available in the market but rather the distribution of expenditure within the household members.

The parent faces the following budget constraint

$$\tau_i + m_i = P_x x_i + P_y y_i \tag{2.3}$$

We will assume that there is no financial market and households acquire a constant endowment. P_y and P_x are the competitive prices for each set of goods. From now on, the emphasis will be on those families in J.

The optimization problem will indeed be;

$$\max_{y_j;x_j} U_j^p = F(y_j; U_j^c, \chi_j)$$

$$\begin{aligned} st.\ U_j^c =& G(x_j) \\ P_x x_j + P_y y_j \leq& \tau_j + m_j \\ -y_j \leq& 0 \\ -x_j \leq& 0 \end{aligned}$$

The first order conditions will be

$$\frac{\partial U_j^p}{\partial y_j} - \lambda_j^p P_y = 0 \tag{2.4}$$

$$\frac{\partial U_j^p}{\partial U_j^c}\frac{\partial U_j^c}{\partial x_j} - P_x \lambda_j^p = 0 \tag{2.5}$$

And the slackness condition

$$0 \leq \lambda_j \qquad \lambda_j \left[\tau_j + m_j - P_x x_j + P_y y_j\right] = 0$$

Because of the nature of the second derivatives, one should expect the budget constraint to always be binding. Combining the first two equations, we arrive to the conclusion that the marginal rate of substitution between goods will have to be equal to the relative prices.

$$\frac{1}{\frac{\partial U^p}{\partial U^c}} \frac{\frac{\partial U^p}{\partial y_j}}{\frac{\partial U^c}{\partial x_j}} = \frac{P_y}{P_x} \tag{2.6}$$

For this general case we can derive the Marshallian demands for both goods, which will be;

$$y_j^d = y_j^d(P_y, P_x, \chi_j, m_j) \tag{2.7}$$

$$x_j^d = \frac{[m_j + \tau]}{P_x} - \frac{P_y}{P_x} y_j^d(P_y, P_x, \chi_j, m_j) \tag{2.8}$$

For any given set of $\{P_y, P_x, m_j, \chi_j\}$ there is at least one equilibrium $\{y_j^*\ ,\ x_j^*\}$ that satisfy the problem.

As we can see from (2.8), the demand for the child's goods will depend upon the relative prices, the income of the parent and the altruistic behavior from the parent towards the child. A crucial point is that, at no point, the household will internalize the government subsidy, meaning that the household will never know if its actions influence the amount of subsidy they get (if they get any).

3 UCT Allocation Problem Under Social Welfare Theory

The first question this paper will try to tackle refers to the possibility of the wrong allocation of government resources. This is an important factor when making public policy decisions. If the current system has allocation problems, there might be a need for alternative policies or mechanisms that reduce these types of problems.

Given the way we have set the model, parents have their own exogenous income and endogenous transfers where money is fungible, meaning that the parent does not differentiate the sources of income when allocating the resources.[4] This also implies that, later on, there will be scale effects; parents with a higher endowment are more likely to comply with the government's requirements.

[4]This might not necessarily be the case in practice. For instance the theory of mental accounting R. Thaler (1985; 1999) suggests that individuals can separate their budget into different accounts for specific purposes including splitting budget by sources of income.

In this section we are going to assume that there is a policy maker who decides to implement a certain direct transfer policy to improve the condition of both the parent's and the child's quality of living. However, the policy maker cannot make decisions on an individual basis and instead has to do so based on a representative household. So far, no assumption regarding the distribution of χ_i has been made. It will now be assumed that

$$\chi_i \sim \text{Beta}(p, q)$$

Additionally, we will assume that the subgroup J also follows the same distribution

$$\chi_j \sim \text{Beta}(p, q)$$

It is worth questioning this assumption. If both χ_i and χ_j have the same parameters for their distribution then it follows that the distribution of χ is independent of the income percentile. One might question this assumption and seek an empirical followup.

The policy maker has their own welfare function which contemplates both the average parent and child. Because the policy maker can't differentiate among families, they will make their decision using the mean value $\hat{\chi}$ and $\hat{m}$ and face the following optimization problem.

$$\max_{y,x} W = (1-\phi)U^p(y; U^c, \hat{\chi}) + \phi\, U^c(x)$$
$$St. \quad \tau = P_y y + P_x x$$

where ϕ is the relative valuation of the policy maker towards the child. When $\lim \phi \to 1$ then $W = U^c$. In this case, the optimization problem is slightly different to the one used in the previous model. It is assumed that the policy maker considers that they should not intervene with how the parent uses their own money but rather how they distribute the subsidy amongst the children. In addition to this, the policy maker's budget constraint implies that the money available for transfers was previously determined, either by the policy maker or someone above their office. This is consistent with decentralized organizations. For instance, the Ministry of Finance/Economics may determine, through the national budget, how much money the Ministry of Social and Family Development will receive and then the latter will allocate the resources as it sees fit. The policy maker focuses solely on determining the optimal allocation of resources but not the optimal level of transfers[5].

First order conditions:

$$(1-\phi)\frac{\partial U^p}{\partial y} - \lambda^W P_y = 0 \tag{3.1}$$
$$(1-\phi)\frac{\partial U^p}{\partial U^c}\frac{\partial U^c}{\partial x} + \phi\frac{\partial U^c}{\partial x} - P_x\lambda^W = 0 \tag{3.2}$$

[5]We will revisit this statement in the next section.

And the slackness condition

$$0 \leq \lambda^W \qquad \lambda^W \left[\tau - P_x x + P_y y\right] = 0$$

Because of the nature of the derivative, one should expect the constraint to always be binding. Combining the first two equations, we arrive to the conclusion that the marginal rate of substitution between goods will have to be equal to the relative prices.

$$\left[\frac{(1-\phi)}{(1-\phi)\dfrac{\partial U^p}{\partial U^c}+\phi}\right]\frac{\dfrac{\partial U^p}{\partial y}}{\dfrac{\partial U^c}{\partial x}} = \frac{P_y}{P_x} \tag{3.3}$$

Notice that (if χ_j=$\hat{\chi}$) is possible to find an equivalence in both MRS when

$$\left[\frac{(1-\phi)}{(1-\phi)\dfrac{\partial U^p}{\partial U^c}+\phi}\right] = \frac{1}{\dfrac{\partial U^p}{\partial U^c}}$$

This only occurs when $\phi = 0$, meaning that the policy maker will only be satisfied with the parent's distribution of income if they value the decision in exactly the same way as the parent. Figure (1) shows that if $\phi = 1$ the parent's consumption is irrelevant (provided the assumption that there is no reciprocal altruism) and when $\lim \phi \to 0$ the policy maker's utility function converges to the parent's indifference curve.

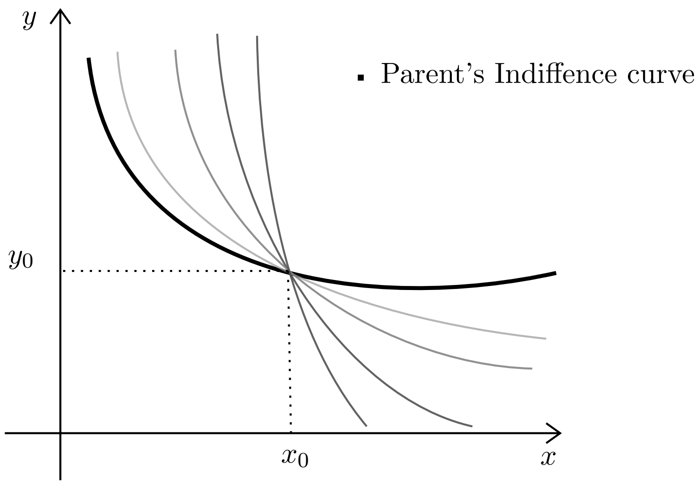

Figure 1: Policy maker vs parent's indifference curve

This suggest that there is room (at least from a theoretical perspective) for allocation problems from the policy maker's point of view.

The mechanism to solve this problem is identical to the initial problem and the solution follows a pair of $\{y^o; x^o\}$ for a given set of parameters $\{P_x, P_y, \tau, \hat{\chi}, \phi\}$. From now on, x^o will be a benchmark condition. Simply put, x^o represents the optimal allocation for the child according the policy maker.

It will be useful to define the *optimal allocation function* as

$$x^o = \widetilde{H}(\tau | P_x, P_y, \hat{\chi}, \phi) \tag{3.4}$$

This function establishes the adequate level of x^o according the level of subsidy and the additional relevant set of parameters.

The central problem of this paper is the subsidy's distribution channel. The policy maker wants to improve the level of consumption of the child and would be happy to transfer them money in order to reach a minimum level x^o. However, given that the child is under age or too young to handle money, the policy maker has to transfer the subsidy to the parent hoping that they distribute it in the same way that the policy maker would. If the parent's preferences do not line up with the the policy maker's, there will be a misallocation of resources leading to a suboptimal equilibrium (from the policy maker's point of view). Notice that because the previous assumption was that policy maker does not interfere in how the parent spends their own money but rather the transfers, there is room for income effect, even within the below threshold income group. For example, there can be a case where the policy maker stipulates x^o provided τ_0. Let's suppose that a low income parent chooses $x^* < x^o$ given their resources $m_0 + \tau_0$. Perhaps it is possible that with an increase Δm such that $\Delta m + m_0 = m_1 < \overline{m} \Rightarrow x^o = x^*(m_1)$, meaning that it is easier for households with higher endowments (but still within the threshold) to reach the targets set by the policy maker (check figure 2).

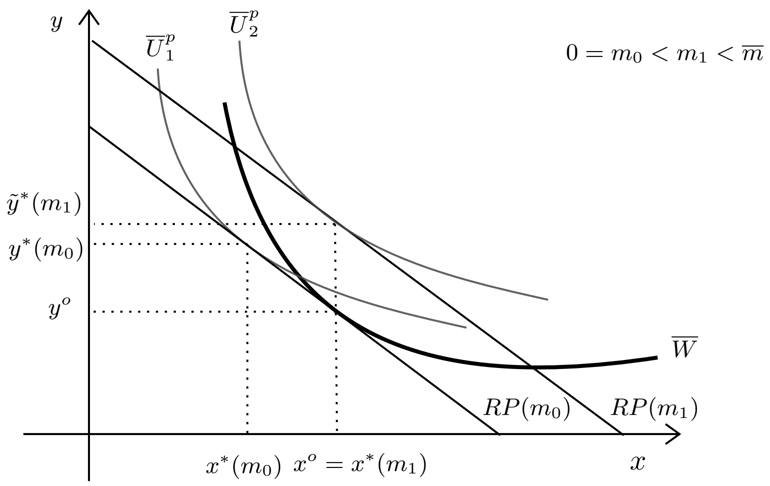

Figure 2: Illustration of the Income effect compensation

4 CCTs Models

4.1 CCTs with an exogenous controlling system

The second questions refers to the possibility of reducing these allocation problems. There are a couple of potential alternative schemes to replace UCT programs; mainly voucher or endowment systems or, the most conventional method- conditional cash transfer (CCT) programs. This paper will not analyze voucher systems and will instead focus on CCT programs.

This paper defines two possible control approaches for conditional cash transfer programs *passive or active* controlling mechanisms. The first one refers to the cases where the state does not directly control parents' monetary behavior but rather ask for some set of human capital conditions that the parent has to prove they comply with, such as school attendance reports, vaccination reports and adequate medical check-ups. The second one refers to processes where the government (though a social worker or similar) have various meetings with beneficiary family members to check whether those conditions are met (Ibarrarán et al., 2017). Both types can be applied simultaneously since they are not mutually exclusive.

One of the problems of CCT is not necessarily that conditions are not met but rather that the resources are still wrongly used. For example, it could be the case that a child does attend school regularly, however does not have the appropriate school supplies[6] or they do not suffer malnutrition but have a very unbalanced diet or are lacking in other fundamental areas such as proper hygiene or clothing. For those reasons, implementing systems to ensure the allocation of money might be relevant.

In this model we assume that there will be a random check which will determine with exact precision the total expenditure on the child. From now on, the policy maker understands that if the child's needs are not covered there is no further incentive to continue offering child benefits. Therefore, through a credible threat of withdrawing the financial assistance, the policy maker intends to persuade the parent to reconsider the aid distribution in the family.

This paper will ignore the inter-temporal dynamics and assume that everything happens in the same temporal space, mainly because it adds complexity and does not provide significant improvements to the model. We will define the government social workers who will randomly select people to control, with probability $(1-\Omega)$ where $\Omega \in [0;\, 1]$, those parents will be put under supervision of how well they distribute their financial aid. A terminal condition for the support scheme is imposed. If $x_j^* < x^o$ then

[6] Check "50,000 Israeli children lack basic school supplies, 20% without computers, internet."

financial assistance is removed from the parent. If on the other hand, $x_j^* \geq x^o$ government agents will allow the parent to keep the aid. This translates to:

$$\tau_j = \begin{cases} \tau_j > 0 & x_j^* \geq x^o \\ \tau_j = 0 & x_j^* < x^o \end{cases} \tag{4.1}$$

It's important to highlight that x^o resulted from the policy maker's optimization process when taking into account an average household. That means that it is possible that if the policy maker were to analyze the particular case of household j, they would choose a different x_j^o. Since the latter is not the case, the policy maker is willing to overlook these discrepancies as long as what the policy maker feels is right for an average household is fulfilled (even at the cost of the policy maker's welfare function).

In terms of this model, the expected utility will be:

$$\begin{aligned} EU_j^p(x_j^* \geq x^o) =& \Omega U_j^p(y^*; x^*|\chi_j, m_j, \tau_j > 0) + (1-\Omega)U_j^p(y^*; x^*|\chi_j, m_j, \tau_j > 0) \\ =& U_j^p(y^*; x^*|\chi_j, m_j, \tau_j > 0) \end{aligned}$$

The idea is straightforward since there are no costs implied for the parent (for those who are submitted for revision). If they are found to be complying with the expected distribution, their consumption levels should not be altered. However, if conditions are not met, the expected utility will be a weighted average between the equilibrium utility with transfers and the equilibrium utility without transfers, pondered by the probability of being submitted for revision. Formally[7],

$$EU_j^p(x_j^* < x^o) = \Omega U_j^p(y^*; x^*|\chi_j, m_j, \tau_j > 0) + (1-\Omega)U_j^p(y^*; x^*|\chi_j, m_j, \tau_j = 0) \tag{4.2}$$

There might be an incentive for the non-complying parent to increase the child's consumption levels if

$$EU_j^p(x_j^* < x^o) < U_j^P(\tilde{y}^*, x^o(\phi, \hat{\chi})|\chi_j, m_j, \tau_j > 0)$$

where $\tilde{y}^*$ is the leftover expenditure after spending the minimum level required for the child in order to comply with regulations[8].

[7]Note that there is not an additional punishment other than to remove the benefits. With a harsher process if the parent is caught not providing enough resources to the child then the government does not only take away their benefits but also sets a fine big enough that the parent has no disposable income, or at least a fraction of it. That said, this seems too unrealistic and would also worsen the child's financial position which goes against the optimal scheme. One may also argue that $\tau = 0$ is an excessive punishment on its own and seems politically unlikely. Perhaps one can argue that $\tau = h(m)$ with $h'(m) < 0$ represents a more realistic punishment for non-compliance.

[8]This applies for those cases were equation 4.1 is binding.

The equilibrium condition in this case will be

$$\Omega^* = \frac{U_j^p(\tilde{y}^*, x^o(\tau, \phi, \hat{\chi})|\chi_j, m_j, \tau_j > 0) - U_j^p(y^*; x^*|\chi_j, m_j, \tau_j = 0)}{U_j^p(y^*; x^*|\chi_j, m_j, \tau_j > 0) - U_j^P(y^*; x^*|\chi_j, m_j, \tau_j = 0)} \tag{4.3}$$

For this problem to make sense there is also an implicit condition that has to follow

$$U_j^p(y^*; x^*|\chi_j, m_j, \tau_j > 0) - U_j^p(y^*; x^*|\chi_j, m_j, \tau_j = 0) > 0$$

This implies that it is possible to find a potential Ω that can influence the parent's choice. This happens when the equilibrium utility of the parent without the subsidy is lower than the utility they get when the planner provides them with a subsidy but conditions them to provide x^o for the child.

The intuition behind (4.3) is that, for the parent to be indifferent, the probability of being submitted for revision has to be high enough in order to compensate the net utility from an increase in the government transfers, and allocating them however the parent wants, relative to the net increase in transfers but spent however the planner specifies.

An interesting aspect to consider is that since the policy maker does not necessarily just care for the children's utility. As long as ϕ oscillates between $(0;1)$ there will be a trade off where the parent does not necessarily have to spend all the aid on the children. The closer ϕ gets to 0, the easier it will be for the parent to reduce their consumption to meet the policy maker's will.

To summarize, the expected utility starts from $U_j^p(y^*; x^*|\chi_j, m_j, \tau_j > 0)$ and declines linearly until $U_j^p(\tilde{y}^*, x^o(\tau, \phi, \hat{\chi})|\chi_j, m_j, \tau_j > 0)$ as the probability reaches $(1 - \Omega^*)$. At that point, the parent decides to consume the policy maker's optimal amount for x^o rather that their own choice, meaning there is a discrete jump in the child's consumption (check Figure 3).

One could potentially define these new, very complex, non-linear and kinked expected utility functions in the form of

$$EU_j^p = \widetilde{F}(y_j, x_j|x^o(\tau, \hat{\chi}, \phi, P_x, P_y), \tau_j, m_j, \chi_j, P_x, P_y, \Omega) \tag{4.4}$$

$$EU_j^c = \widetilde{G}(y_j, x_j|x^o(\tau, \hat{\chi}, \phi, P_x, P_y), \tau_j, m_j, \chi_j, P_x, P_y, \Omega) \tag{4.5}$$

One could think of these functions as reaction functions. Individuals now try to maximize their expected utility making their own decision based on relative prices but also considering risks and levels of subsidies. The government will internalize these reaction functions in its optimization problem.

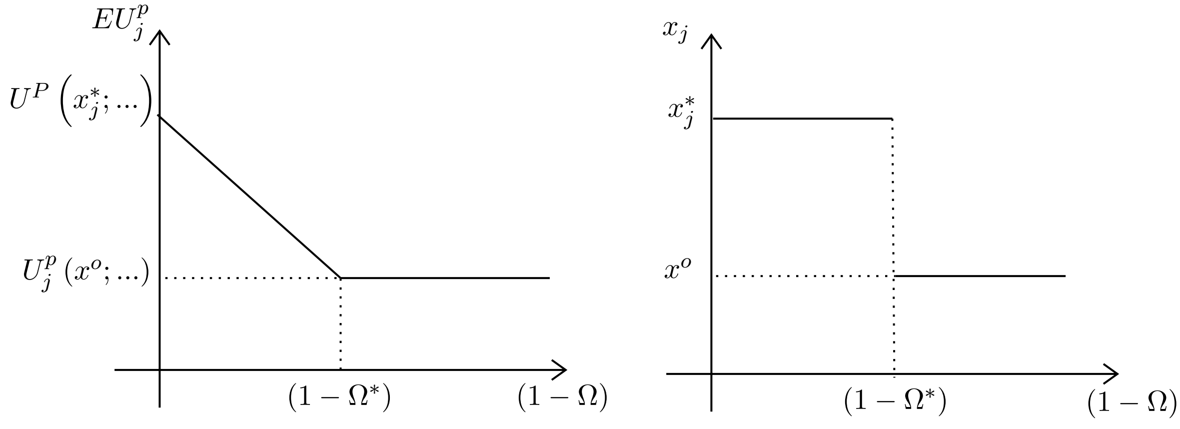

Figure 3: Expected utility and consumption decision across Ω

This means that the policy maker understands how households (the average household) reacts under different stimulus and will make the appropriate decision based on that.

4.2 CCT with an endogenous controlling system

So far, it has been assumed that the number of government officers was given exogenously. The probability was the same without depending on the amount of parents an officer had to visit or their efficiency to control them and also there are no implied costs to the government.

In this case we are going to propose a more realistic version in which this sub-administration has a given budget provided by a higher-level administration. The decision to be made refers to how to adequately distribute the available budget Q on direct transfers for the child benefit program or resources to improve controls (particularly more officers), therefore leading to the new budget constraint

$$Q = \tau + P_k k \quad \Rightarrow \quad k = \widetilde{B}(\tau, p_k, Q) \tag{4.6}$$

where G is the amount of money the government has designated for the project and p_k is the unit price of additional officers (k) designated to improve control performance. The probability of getting submitted for revision will be,

$$\Omega = \Omega(k, |J|) \tag{4.7}$$

where $k, |J| \in \mathbb{Z}$. We should expect that more resources to controllers increase the probability for an average person to be submitted for revision. On the other hand, the more families that participate in the program the harder to ensure that the parents comply. This means, $\dfrac{\partial \Omega}{\partial k} > 0$ and $\dfrac{\partial \Omega}{\partial |J|} < 0$.

The policy maker faces the following optimization problem:

$$\max_{k,\tau} \; W = (1-\phi)EU^p + \phi \, EU^c$$

$$St.$$

$$k = \widetilde{B}(\tau, p_k, Q)$$

$$EU^p = \widetilde{F}(x^o, \Omega, \Psi)$$

$$EU^c = \widetilde{G}(x^o, \Omega, \Psi)$$

$$x^o = \widetilde{H}(\tau, \Psi)$$

$$\Omega = \Omega(k, |J|)$$

When incorporating all the restrictions the problem becomes:

$$\max_{\tau} W = (1-\phi)\widetilde{F}(\widetilde{H}(\tau,\Psi), \Omega(\widetilde{B}(\tau,p_k,Q),|J|),\Psi) + \phi\,\widetilde{G}(\widetilde{H}(\tau,\Psi), \Omega(\widetilde{B}(\tau,p_k,Q),|J|),\Psi)$$

First order condition for the problem:

$$\frac{\partial W}{\partial \tau}: \quad (1-\phi)\frac{\partial \widetilde{F}}{\partial \widetilde{H}}\frac{\partial \widetilde{H}}{\partial \tau} + (1-\phi)\frac{\partial \widetilde{F}}{\partial \Omega}\frac{\partial \Omega}{\partial \widetilde{B}}\frac{\partial \widetilde{B}}{\partial \tau} + \phi\frac{\partial \widetilde{G}}{\partial \widetilde{H}}\frac{\partial \widetilde{H}}{\partial \tau} + \phi\frac{\partial \widetilde{G}}{\partial \Omega}\frac{\partial \Omega}{\partial \widetilde{B}}\frac{\partial \widetilde{B}}{\partial \tau} = 0$$

$$\underbrace{\left[(1-\phi)\frac{\partial \widetilde{F}}{\partial \widetilde{H}} + \phi\frac{\partial \widetilde{G}}{\partial \widetilde{H}}\right]}_{\frac{\partial W}{\partial \widetilde{H}}}\frac{\partial \widetilde{H}}{\partial \tau} + \underbrace{\left[(1-\phi)\frac{\partial \widetilde{F}}{\partial \Omega} + \phi\frac{\partial \widetilde{G}}{\partial \Omega}\right]}_{\frac{\partial W}{\partial \Omega}}\frac{\partial \Omega}{\partial \widetilde{B}}\frac{\partial \widetilde{B}}{\partial \tau} = 0 \tag{4.8}$$

$$-\frac{\frac{\partial W}{\partial \widetilde{H}}\frac{\partial \widetilde{H}}{\partial \tau}}{\frac{\partial W}{\partial \Omega}\frac{\partial \Omega}{\partial k}} = \frac{\partial \widetilde{B}}{\partial \tau} \tag{4.9}$$

Notice that $\left[(1-\phi)\frac{\partial \widetilde{F}}{\partial \widetilde{H}} + \phi\frac{\partial \widetilde{G}}{\partial \widetilde{H}}\right]$ is nothing but the linear combination, weighed up by the policy maker, regarding the effect on both the parent and child's expected utility under changes in the optimal subsidy policy. Analogously, $\left[(1-\phi)\frac{\partial \widetilde{F}}{\partial \Omega} + \phi\frac{\partial \widetilde{G}}{\partial \Omega}\right]$ represents the linear combination, weighed up by the policy maker, regarding the effect on both the parent and child's expected utility under changes in probability of skipping control. At the end of the day, after cleansing the equations, this complicated optimization process provides some intuitive results. First, optimality is reached when the quotient between, the effect of marginal changes in welfare from changes in the number of social workers and the effect of marginal changes in welfare from changes in the subsidy rate, equal to the relative cost associated with the increase in the subsidy levels in terms of social workers (reflected by the budget constraint).

5 CCT Under Political Incentives

So far we have assumed a benevolent policy maker. Let's introduce a government with an independent agenda. For this, it is important to define a function representing the electoral support

$$V(\tau, \overline{m}) \tag{5.1}$$

The electoral support depends on the level of transfers and the number of people that receive the social benefit. Assuming there are two predominant groups of families in the economy, the ones whose income is low enough to receive government support and those whose income is above the threshold income[9]. The distribution of people that meet the threshold to access a social benefit depends crucially on the income threshold. Those who receive transfesr have a function $V^J(\tau)$ which is increasing on the level of transfers and those who do not receive transfer have a function $V^R(\tau, \overline{m})$ which is decreasing on the level of transfers and increasing on the level of the threshold[10]. Overall, the electoral support can be described by

$$V(\tau, \overline{m}) = \gamma(\overline{m})V^R(\tau, \overline{m}) + [1 - \gamma(\overline{m})]\, V^J(\tau) \tag{5.2}$$

where $\dfrac{\partial V^J}{\partial \tau} > 0$, $\dfrac{\partial V^R}{\partial \tau} < 0$ and $\dfrac{\partial V^R}{\partial \overline{m}} > 0$.

Since income threshold is now an endogenous variable it is worth bringing back a modified version of equation 2.1. In this case given the new assumptions made above, the correct specification is given by

$$|J| = \widetilde{\Gamma}(\overline{m}) \tag{5.3}$$

We also adjust the budget constraint to show that the lower income threshold implies that more people will receive government transfers but less money will be available for the representative individual.

$$Q = \widetilde{Q}(\overline{m}) \qquad \text{with } \frac{\partial \widetilde{Q}}{\partial \overline{m}} < 0 \tag{5.4}$$

The policy maker faces the following optimization problem:

[9] Technically having a child is a requirement for the program. For this mental exercise we will assume all families have at least one child therefore the debate focuses on the income threshold itself.

[10] The implicit assumption is that those who do not receive transfers are those who finance the transfers of others through taxes. We will not model the tax collection aspect of the economy but we will assume that those tax payers feel dissatisfied with the government when they increase the level of transfers or the number of people receiving the transfer increases because it implies fewer people to finance and a greater tax burden for those who remain.

$$\max_{\tau,k,\overline{m}} U^W = \omega W + (1-\omega)V(\tau,\overline{m})$$

$$St.$$

$$\begin{aligned} k &= \widetilde{B}(\tau, p_k, Q) \\ W &= (1-\phi)EU^p + \phi EU^c \\ EU^p &= \widetilde{F}(x^o, \Omega, \Psi) \\ EU^c &= \widetilde{G}(x^o, \Omega, \Psi) \\ x^o &= \widetilde{H}(\tau, \Psi) \\ \Omega &= \Omega(k, |J|(\overline{m})) \\ |J| &= \widetilde{\Gamma}(\overline{m}) \\ V(\tau,\overline{m}) &= \gamma(\overline{m})V^R(\tau,\overline{m}) + [1-\gamma(\overline{m})]\, V^J(\tau) \\ Q &= \widetilde{Q}(\overline{m}) \end{aligned}$$

were $\Psi = \{\hat{\chi}, \phi, \hat{m}, P_x, P_y\}$. When incorporating all the restrictions, the problem becomes:

$$\begin{aligned} \max_{\tau,\overline{m}} U^W = \quad & \omega \left[(1-\phi)\ \widetilde{F}(\widetilde{H}(\tau,\Psi), \Omega(\widetilde{B}(\tau,p_k,\widetilde{Q}(\overline{m})), \widetilde{\Gamma}(\overline{m})), \Psi) + \phi\ \widetilde{G}(\widetilde{H}(\tau,\Psi), \Omega(\widetilde{B}(\tau,p_k,\widetilde{Q}(\overline{m})), \widetilde{\Gamma}(\overline{m})), \Psi)\right] \\ & + (1-\omega)\left[\gamma(\overline{m})V^R(\tau,\overline{m}) + [1-\gamma(\overline{m})]\, V^J(\tau)\right] \end{aligned}$$

This yields two first order conditions. First,

$$\frac{\partial U^W}{\partial \tau}: \quad \omega\left[\frac{\partial W}{\partial \widetilde{H}}\frac{\partial \widetilde{H}}{\partial \tau} + \frac{\partial W}{\partial \Omega}\frac{\partial \Omega}{\partial \widetilde{B}}\frac{\partial \widetilde{B}}{\partial \tau}\right] + (1-\omega)\frac{\partial V}{\partial \tau} = 0 \tag{5.5}$$

$$\begin{aligned} \frac{\partial U^W}{\partial \tau}: \quad \omega\Bigg[\left[(1-\phi)\frac{\partial \widetilde{F}}{\partial \widetilde{H}} + \phi\frac{\partial \widetilde{G}}{\partial \widetilde{H}}\right]\frac{\partial \widetilde{H}}{\partial \tau} + \left[(1-\phi)\frac{\partial \widetilde{F}}{\partial \Omega} + \phi\frac{\partial \widetilde{G}}{\partial \Omega}\right]\frac{\partial \Omega}{\partial \widetilde{B}}\frac{\partial \widetilde{B}}{\partial \tau}\Bigg] + \\ (1-\omega)\left[\gamma(\overline{m})\frac{\partial V^R}{\partial \tau} + [1-\gamma(\overline{m})]\frac{\partial V^J}{\partial \tau}\right] = 0 \end{aligned} \tag{5.6}$$

As expected, equation 5.6 implies that the marginal utility of the policy maker- when changing τ- is affected by a linear combination of marginal changes in W and V determined by the relative weight ω. It should not be any surprise that left hand side of 5.6 is identical to 4.8. However, the right hand side has opposite marginal effects, $\frac{\partial V^J}{\partial \tau} > 0$, $\frac{\partial V^R}{\partial \tau} < 0$. In essence, because changes in the subsidy level do not affect the distribution of people accessing the subsidy, the overall change in the political support will depend on the ratio of families that receive the subsidy and the dominating effect between $|\frac{\partial V^R}{\partial \tau}| - |\frac{\partial V^J}{\partial \tau}|$.

The second first order condition involves a *ceteris paribus* change in the threshold level.

$$\frac{\partial U^W}{\partial m} : \quad \omega \frac{\partial W}{\partial \Omega}\frac{\partial \Omega}{\partial \widetilde{B}}\frac{\partial \widetilde{B}}{\partial \overline{m}} + (1-\omega)\frac{\partial V}{\partial \overline{m}} = 0 \tag{5.7}$$

$$\frac{\partial U^W}{\partial \overline{m}} : \quad \omega \underbrace{\left[(1-\phi)\frac{\partial \widetilde{F}}{\partial \Omega}\frac{\partial \Omega}{\partial \widetilde{B}} + \phi \frac{\partial \widetilde{G}}{\partial \Omega}\frac{\partial \Omega}{\partial \widetilde{B}}\right]}_{\frac{\partial W}{\partial \Omega}\frac{\partial \Omega}{\partial \widetilde{B}}} \underbrace{\left[\frac{\partial \widetilde{B}}{\partial \widetilde{Q}}\frac{\partial \widetilde{Q}}{\partial \overline{m}} + \frac{\partial \widetilde{B}}{\partial \widetilde{\Gamma}}\frac{\partial \widetilde{\Gamma}}{\partial \overline{m}}\right]}_{\frac{\partial \widetilde{B}}{\partial \overline{m}}} + (1-\omega)\left[\gamma(\overline{m})\frac{\partial V^R}{\partial \overline{m}} + \frac{\partial \gamma}{\partial \overline{m}}\left[V^R - V^J\right]\right] = 0 \tag{5.8}$$

On the left hand side, $\frac{\partial W}{\partial \Omega}\frac{\partial \Omega}{\partial \widetilde{B}}\frac{\partial \widetilde{B}}{\partial \overline{m}}$ should be interpreted carefully. In essence, the combination reflects the changes in $\frac{\partial W}{\partial \overline{m}}$, however, the transmission mechanism is relevant. On a first level, more families with the same amount of social workers complicate the controlling system. On a parallel level, changes in the threshold level negatively affect the budget that the government has per household which also has potential effects on the probability of efficient control. Changes in the probability affect the parent and child's utility which impacts directly on the policymaker's welfare. If anything, that is the implicit impact coming from the household real consumption in the policy maker's objective function. On a second level, one should analyze the political impact of such actions. Increasing the number of families that receive child benefits has a negative connotation for those who do not receive a subsidy because they feel that it will lead to a higher tax burden for them in order to finance the additional members. This statement is reflected through $\gamma(\overline{m})\frac{\partial V^R}{\partial \overline{m}}$. On the other hand, $\frac{\partial \gamma}{\partial \overline{m}}\left[V^R - V^J\right]$ illustrates that in contrast to the political dislike from those who do not receive child support, there is a secondary effect (positive from the governmental point of view) coming from the fact that there is a change in distribution from the electorate. If we break down this last statement, $V^R - V^J < 0$ reflects the difference in support from both groups and $\frac{\partial \gamma}{\partial \overline{m}} < 0$ reflects the displacement of those discontent voters in the electorate.

Combining 5.5 and 5.7 yields,

$$\frac{\frac{\partial W}{\partial \Omega}\frac{\partial \Omega}{\partial \widetilde{B}}\frac{\partial \widetilde{B}}{\partial \bar{m}}}{\partial V/\partial \overline{m}} = \frac{\frac{\partial W}{\partial \widetilde{H}}\frac{\partial \widetilde{H}}{\partial \tau} + \frac{\partial W}{\partial \Omega}\frac{\partial \Omega}{\partial \widetilde{B}}\frac{\partial \widetilde{B}}{\partial \tau}}{\partial V/\partial \tau}$$

or

$$\frac{\partial W/\partial \tau}{\partial V/\partial \tau} = \frac{\partial W/\partial \overline{m}}{\partial V/\partial \overline{m}} \tag{5.9}$$

Optimal levels of τ and $\overline{m}$ (and k implicitly) are reached when the relative effect of $\overline{m}$ both in terms of social welfare and political impact equals the analogous relative effect of τ. This latest optimality condition embodies everything discussed so far regarding political incentives. A non-benevolent policy maker may choose to increase subsidy levels to create more sympathy in subsidy receiving groups, or, on the other hand, slightly reduce subsidy levels per capita in order to increase the span of parents to improve their polls. This is of course undesirable in terms of social welfare.

6 Conclusion

This paper provides a solid framework to illustrate child benefit programs and what appears to be a social problem. Allocation problems (from a policy maker's point of view) are produced due to the *planner to parent and parent to child* transmission mechanism. The discrepancy in the use of resources is directly link to ϕ and α. One expects a policy such as child support to focus primarily on children, however it is hard to understand the nature of α. Perhaps, given that the literature on these topic is scarce, future empirical research should seek for empirical support regarding the determinants of the "degree of deferential". On the other hand, the paper provides a theoretical basis to reduce these deficiencies on an aggregate level. One should mention that the controlling mechanism proposed might have difficulties in practice, particularly in emerging economies, and could imply high costs of training. Even from a theoretical point of view there are several costs such as monetary, social and political associated to the control mechanisms which are captured in the models. The last section, which is particularly relevant in emerging countries, includes aspects of political economy. The model clearly shows that the policy maker may choose to increase the level of subsidy merely to improve their polls within that social class or even increase the amount of people receiving subsidies in order to raise popularity. Models in this paper are based on competitive markets. The follow up theoretical research should try to incorporate aspects of imperfect markets to understand not only the human behavior but in the contexts where incentives are presented. Particularly, this framework should be extended to incorporate informality, clandestine operations, hostile behaviors among households and deeper levels of information asymmetry.

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