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# Allocation Problems in Child Benefit Programs Using a Microeconomic Theory Approach

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

# 1 Introduction

Unconditional cash transfer (UCT) programs 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 UCT programs may increase substance abuse (Watson, Guettabi, & Reimer, 2018; Dobkin & Puller, 2007; Evans & Popova, 2014). UCT programs may also be used to, specifically, improve children's lives when brought up in more vulnerable conditions. For instance, income transfer programs reduce families transport costs to schools, improve quality of education and provide better nutrition.

That said, problems may rise when implementing UCT programs. 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, UCT programs may come up short in the solution of problems, in addition to depleting government resources. Therefore, voucher systems (analogically endowment transfers) and conditional cash transfer (CCT) programs emerged. Only the latter will be presented in this paper to show a possible theoretical alternative to try to solve the allocation problem.

Regarding CCT programs, the difference with UCT programs 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 CCT programs have been applauded for increasing school attendance rates and contributing to improvements in health and nutrition, which

[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.

all together helps to reduce inequality and poverty.

A commonality between these programs, and a central point of this paper, is that CCT programs 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. Clearly, the challenges when establishing more adequate conditions relies on the practical difficulties. Policy makers may struggle to figure out if conditions were 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. Authors 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, making a particular emphasis on the allocation of resources from parents towards children. All models presented will be static models with three agents: government, parents and children. The idea behind these 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 CCT programs as a way to reduce these allocation problems. Additionally, the third section elaborates on the costs and issues that may arise when implementing CCT programs. 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 Basic framework: households under UCT programs

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, a child support transfer $\tau_i$, is wired to a family with at least on child provided 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 indexed 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 size of the set $J$ depends on

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

where $\frac{\partial \Gamma}{\partial \overline{m}} > 0$. On the other hand, $\mu$ 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[2]:

$$M = \int_0^1 m_i di = \int_0^J m_j dj + \int_J^1 m_r dr$$

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*[3] 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 $\chi_i$ 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 $U_i^p = F(U_i^c)$ meaning the parent is completely altruistic and only cares about the child's wellbeing. The concept of $\chi_i$ a fundamental piece of the analysis. The aggregate child's utility function can be expressed as

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

[2]We are not going to model fertility in this model, nor the effect of any social welfare program on fertility. We will assume that a set of households have a pre-specified number of children. Those families that do not have children are hidden in the set $R$.

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

With the following description we will not worry about reciprocal altruism[4]. 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

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

where $u_{i,s}^c$ is the utility level of the child $s \in S_i$ 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

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

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 aggregate total expenditure on children-essentially a weighted average- pondered by $\hat{\varphi}_{i,s}$.

First, we are going to focus on the parent's decision of consumption, meaning how the parent decides the allocation or resources between the child and themself. In this model the child does not face an optimization process. There are two reasons for this. Firstly, we assume the child is too young and doesn't get to decide how much money the family spends on the child. Instead, it receives an allowance set by the parent. The second reason is that, even if the child has its 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 $J$.

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

The optimization problem will indeed be;

$$\max_{y_j;x_j} U_j^p = F(y_j; U_j^c, \chi_j)$$
$$st.\ U_j^c = G(x_j)$$
$$P_x x_j + P_y y_j \leq \tau_j + m_j$$

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 ($\lambda_j > 0 \forall j$). 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;

$$y_j^d = y_j^d(P_y, P_x, \chi_j, \tau_j + m_j) \tag{2.7}$$
$$x_j^d = \frac{[m_j + \tau_j]}{P_x} - \frac{P_y}{P_x} y_j^d(P_y, P_x, \chi_j, \tau_j + m_j) \tag{2.8}$$

For any given set of $\{P_y, P_x, \tau_j + m_j, \chi_j\}$ 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 The allocation problem using 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 the model was set, parents have an exogenous income in addition to a government transfer. In this case money is fungible, meaning that the parent does not differentiate the sources of income when allocating the resources.[5] This also implies that, later on, there will be -potentially undesired- scale effects; parents -belonging to the set $J$- with a higher endowment are more likely to comply with the government's requirements since the minimum expenditure ratio required to comply decreases as the endowment increases.

In this section it will be assumed that there is a benevolent 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. There will be no assumption for the distribution of $\chi$ other than it has a finite mean $\widehat{\chi}$ which is know by the policy maker. Finally it will also be assumed that families from $J$ and $R$ have identical distributions for $\chi$.[6]

The policy maker has its 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 $\hat{\chi}$. The optimization problem is described as

$$\max_{y,x} W = (1-\phi)U^p(y; U^c, \hat{\chi}) + \phi\, U^c(x)$$

$$St. \quad \tau \geq P_y y + P_x x$$

where $\phi$ is the relative valuation of the policy maker towards the child.[7] 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

[5]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.

[6]It is worth questioning this last assumption. If $\chi_i$ and $\chi_j$ have the same distribution then it follows that $\chi$ is income independent. One might question this assumption and seek an empirical followup.

[7]Notice that subscripts were removed to emphasis that the policy maker does not contemplate one specify family when determining the optimal quantities.

assumed that the policy maker does not decide how the parent uses their own money but rather how they distribute the subsidy with the child. 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[8].

First order conditions:

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

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

And the slackness condition

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

Again, because of the nature of the functions, 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.

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

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

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

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.

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

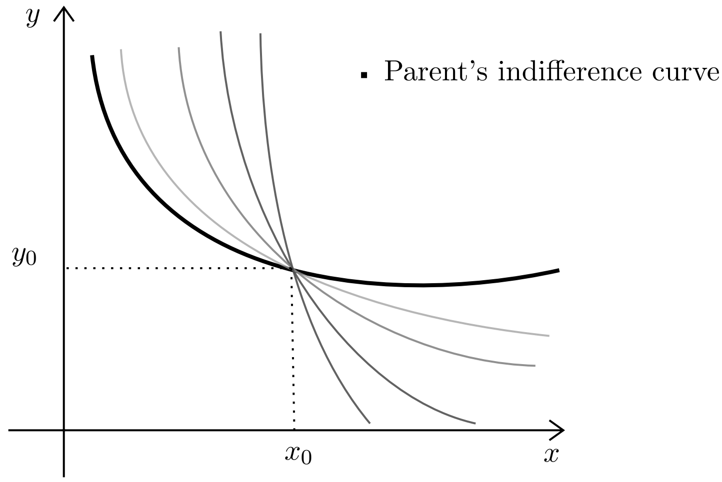


Figure 1: Policy maker vs parent's indifference curve

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 $\tau_0$. 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 $\Delta m$ such that $\Delta m + m_0 = m_1 < \overline{m}$ a parent that before did not comply with requirements now can (meaning $x^*(m_1) \geq x^o > x^*(m_0)$ (check figure 2) .

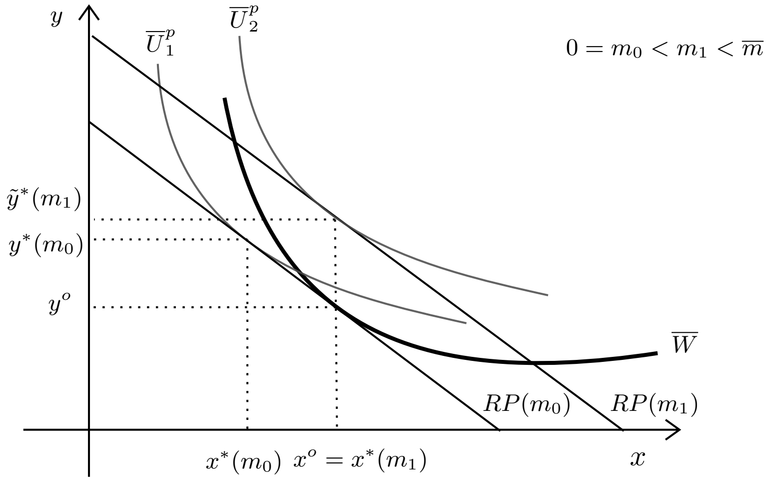


Figure 2: Illustration of the Income effect

This proves that it is easier for households with higher endowments (but still within the income threshold) to reach the targets set by the policy maker. We could tackle this problem and offer alternative schemes, for instance the policy maker could set the transfer as a continuous functions depending on income so that all individuals earn an equal *basic income*. But this would be extremely complicated to implement in practice. The other point is that, if the subsidy is proportional to the income level -specially for the lower income population- then the model has to contemplate hours of labour as it would be impossible to ignore the externalities associated with a policy of that kind. For this particular paper, adding more variants to the model will not necessarily add value to the point intending to illustrate, therefore the model will remain as presented.

# 4 Models for CCT programs

## 4.1 CCT programs 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 programs 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[9] or they do not suffer starvation 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.

The model assumes 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 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 criteria's are met for an average household, meaning that it will accept a suboptimal result on individual basis.

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

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 those parents who are submitted for revision, If they are found to be in rule, 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[10],

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

There might be an incentive for the non-complying parent to increase the child's consumption level. Given that there are material risks of been excluded from the program, if the expected utility is lower than the utility gathered from spending the minimum required to comply with regulations, there might be an incentive to shift behaviour.

Formally, this happens when

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

where $\tilde{y}^*$ is the leftover expenditure after spending the minimum level required for the child in order to comply with regulations[11].

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

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

[10]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.

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

The implicit condition means that, for (1-$\Omega^*$) to exist, the utility of an unrestricted parent without the subsidy must be lower than the utility the parent gets when the planner provides a subsidy but restricts expenditure choices to a minimum of $x^o$. To put it simply, the income effect coming from the subsidy must be big enough for the parent to consider altering its behaviour.

On a broader level, 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 the policy maker does not necessarily only care about the child's utility. As long as $\phi$ oscillates between $(0;1)$ there will be a trade off where the parent does not necessarily have to spend all the aid on the child. The closer $\phi$ 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 the unrestricted level $U_j^p(y^*; x^*|\chi_j, m_j, \tau_j > 0)$ and declines linearly until it reaches $U_j^p(\tilde{y}^*, x^o(\tau, \phi, \hat{\chi})|\chi_j, m_j, \tau_j > 0)$, this happens when probability hits $(1-\Omega^*)$. 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).

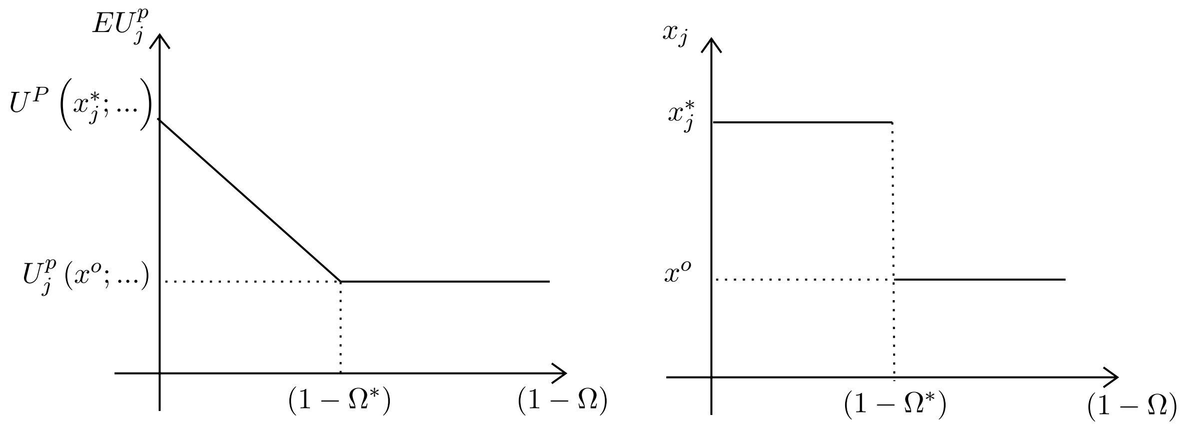


Figure 3: Expected utility and consumption decision across $\Omega$

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

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

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

These functions could be interpreted as reaction functions. Individuals now try to maximize their expected utility making their own decisions based on relative prices but also taking into account the fact that government transfers are now conditional on behavior and the risks of not complying. The government will internalize these reaction functions in its optimization problem. This means that the policy maker understands how the average household reacts under different stimulus and will make the appropriate decision based on that.

## 4.2 CCT programs with an endogenous controlling system

So far, it has been assumed that the number of controlling government officers was given exogenously. The probability was the same without depending on the amount of parents or officers. Additionally, there were no implied costs to the government.

In this case we are going to propose a more realistic version in which this lower-level 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 either, 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[12]. The probability of getting submitted for revision will be,

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

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 parents comply. This means, $\frac{\partial \widetilde{\Omega}}{\partial k} < 0$ and $\frac{\partial \widetilde{\Omega}}{\partial |J|} > 0$.

[12]In some cases, this might also be interpreted as the cost to maintain the administrative infrastructure of the program.

The policy maker faces the following optimization problem:

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

$$St.$$

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

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

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

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

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

Where $\Psi = \{\widehat{\chi}, \phi, P_x, P_y\}$. 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. Optimality is reached when the relative wealth effect coming from changes in the subsidy/controllers ratio rests on the policy maker's budget constraint. In essence, if government wants to increase subsidies it needs to consider two things 1) Higher transfers come at a monetary cost which translates into less controlling officers; 2) There are some non-monetary costs associated to the fact that the probability of catching not-complying parents diminishes when less controlling officers are hired.

## 5 CCT programs under political incentives

So far the model 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 overall electoral support,$V(\tau, \overline{m})$, for the current administration. Where,

$$V(\tau, \overline{m}) = \gamma(\overline{m}) V^R(\tau, \overline{m}) + [1 - \gamma(\overline{m})] \, V^J(\tau) \tag{5.1}$$

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[13] ($V^J$) and those whose income is above the threshold level ($V^R$). The density of people that are above the threshold, $\gamma(\overline{m})$, depend on how high the threshold is set. The higher the threshold the higher the number of families that will receive social assistant ($\frac{\partial \gamma}{\partial \overline{m}} < 0$). Those who receive transfers have a function which is increasing on the level of transfers and those who do not receive transfer have a function which is decreasing on the level of transfers and quadratic on the level of the threshold. Formally,

$$\frac{\partial V^J}{\partial \tau} > 0, \qquad \frac{\partial V^R}{\partial \tau} < 0$$

$$\frac{\partial V^R}{\partial \overline{m}} = \begin{cases} \dfrac{\partial V^R}{\partial \overline{m}} > 0 & \text{if } \overline{m} \leq \breve{m} \\[2ex] \dfrac{\partial V^R}{\partial \overline{m}} < 0 & \text{if } \overline{m} > \breve{m} \end{cases}$$

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 if the threshold surpass $\breve{m}$ because it implies fewer people to finance and a greater tax burden for those who remain. The implicit idea is that those families who do not receive transfers are those who finance other families subsidies through taxes. Those who do not receive transfers are happy to see that the program exists and some families in need have access to social assistance. That said, if $\overline{m}$ keeps increasing their marginal support gain will be lower and if the threshold surpasses $\breve{m}$ the remaining tax paying families will reduce their support.

Since the 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

[13] 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.

by

$$|J| = \widetilde{\Gamma}(\overline{m}) \tag{5.2}$$

We also adjust the budget constraint to show that a lower income threshold means more people receiving transfers while less tax payers in the economy, this leads to less money available per individual.

$$Q = \widetilde{Q}(\overline{m}) \qquad \text{where} \quad \frac{\partial \widetilde{Q}}{\partial \overline{m}} < 0 \tag{5.3}$$

The policy maker now has three choice variables, $\tau, k, \overline{m}$ and faces the following optimization problem:

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

$$St.$$

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

By incorporating restrictions in a specific way, policy maker only needs to decide upon $\tau$ and $\overline{m}$. Formally, 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,

$$\frac{\partial U^W}{\partial \tau} : \quad \omega \left[\frac{\partial W}{\partial \widetilde{H}}\frac{\partial \widetilde{H}}{\partial \tau} + \frac{\partial W}{\partial \Omega}\frac{\partial \Omega}{\partial \widetilde{B}}\frac{\partial \widetilde{B}}{\partial \tau}\right] + (1-\omega)\frac{\partial V}{\partial \tau} = 0 \tag{5.4}$$

$$\begin{aligned}
\frac{\partial U^W}{\partial \tau} : \quad \omega & \left[\left[(1-\phi)\frac{\partial \widetilde{F}}{\partial \widetilde{H}} + \phi\frac{\partial \widetilde{G}}{\partial \widetilde{H}}\right]\frac{\partial \widetilde{H}}{\partial \tau} + \left[(1-\phi)\frac{\partial \widetilde{F}}{\partial \Omega} + \phi\frac{\partial \widetilde{G}}{\partial \Omega}\right]\frac{\partial \Omega}{\partial \widetilde{B}}\frac{\partial \widetilde{B}}{\partial \tau}\right] + \\
& (1-\omega)\left[\gamma(\overline{m})\frac{\partial V^R}{\partial \tau} + [1-\gamma(\overline{m})]\,\frac{\partial V^J}{\partial \tau}\right] = 0
\end{aligned} \tag{5.5}$$

As expected, equation 5.5 implies that the marginal utility of the policy maker- when changing $\tau$- is affected by a linear combination of marginal changes in $W$ and $V$ determined by $\omega$. It should not be of any surprise that the first term of 5.5 is identical to 4.8. However, the right term 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 $|\frac{\partial V^R}{\partial \tau}| - |\frac{\partial V^J}{\partial \tau}|$. To put it plain and simple, if the economy has a high percentage of its population under social programs, and increase in the subsidy will be politically appealing. On the other hand, if only a small minority receives government support, then the government will not benefit politically from an increase in the levels of subsidy.

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

$$\frac{\partial U^W}{\partial \overline{m}} : \quad \omega \frac{\partial W}{\partial \Omega} \frac{\partial \Omega}{\partial \widetilde{B}} \frac{\partial \widetilde{B}}{\partial \overline{m}} + (1-\omega) \frac{\partial V}{\partial \overline{m}} = 0 \tag{5.6}$$

$$\frac{\partial U^W}{\partial \overline{m}} : \quad \omega \underbrace{\left[ (1-\phi) \frac{\partial \widetilde{F}}{\partial \Omega} \frac{\partial \Omega}{\partial \widetilde{B}} + \phi \frac{\partial \widetilde{G}}{\partial \Omega} \frac{\partial \Omega}{\partial \widetilde{B}} \right]}_{\frac{\partial W}{\partial \Omega} \frac{\partial \Omega}{\partial \widetilde{B}}} \underbrace{\left[ \frac{\partial \widetilde{B}}{\partial \widetilde{Q}} \frac{\partial \widetilde{Q}}{\partial \overline{m}} + \frac{\partial \widetilde{B}}{\partial \widetilde{\Gamma}} \frac{\partial \widetilde{\Gamma}}{\partial \overline{m}} \right]}_{\frac{\partial \widetilde{B}}{\partial \overline{m}}} + (1-\omega) \left[ \gamma(\overline{m}) \frac{\partial V^R}{\partial \overline{m}} + \frac{\partial \gamma}{\partial \overline{m}} \left[ V^R - V^J \right] \right] = 0 \tag{5.7}$$

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 affects the probability of efficient control. Changes in the probability affect child's consumption and utility which ultimately impacts on 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 might have a negative connotation for those who do not receive a subsidy if $\overline{m}$ is growing above $\breve{m}$. 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 even in those cases where $\overline{m} > \breve{m}$ there might be a political incentive to increase the threshold. That secondary effect (positive from the governments point of view) comes from the fact that there is a change in the electorate distribution. 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 from those discontent voters to supporters in the electorate.

Combining 5.4 and 5.6 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

$$\frac{\partial W/\partial \tau}{\partial V/\partial \tau} = \frac{\partial W/\partial \overline{m}}{\partial V/\partial \overline{m}} \tag{5.8}$$

Optimal levels of $\tau$ and $\overline{m}$ (and $k$ implicitly) are reached when the relative effect of $\overline{m}$ both in terms of social welfare and political support equals the analogous relative effect of $\tau$. 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. At the end of the day, children pay the implicit cost of those "politically incentivized" actions as there will be less investment in controlling. It is possible that there will be more children receiving support but the transfer per child will likely be less, this is important because the transfer has to be big enough to influence parent's decision. Overall, It is evident that political incentives may lead to suboptimal results in terms of social welfare, likely reducing children's welfare, just to maintain political support.

## 6 Conclusion

This paper provides a solid framework to illustrate child benefit programs and some issue that come along with it. Specifically, 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 $\chi$ and $\phi$. One expects a policy such as child support to focus primarily on children, yet its success is strictly related to the parent's altruism (through $\chi$), which is unclear what is the main driver. Reasons could vary, education levels, age, gender, culture and so on. This is relevant in practice because resources should perhaps be spent on policies that also tackles this issue. Future empirical research should seek for empirical support regarding the determinants of $\chi$ in order to provide a better assessment for policy makers.

On the other hand, the paper provides a theoretical basis to reduce these deficiencies. One should mention that the controlling mechanism proposed might have difficulties in practice, particularly in emerging economies were bankarization levels are lower in comparison, and could imply high costs of training. Even from a theoretical point of view there are several costs such as, monetary, social and political costs associated to the control mechanisms which are captured in the models. The last section, which is particularly relevant for Latin American 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. Follow up theoretical research should try to incorporate aspects of imperfect markets to understand money based decision but also the political and social context surrounding those decisions. Particularly, this framework should be extended to incorporate informality, clandestine operations, political disputes and hostile family environments as well as deeper levels of information asymmetry.

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