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Universal Basic Income in Developing Countries: Pitfalls and Alternatives

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Abstract

This article studies the short- and long-term effects of Universal Basic Income programs - a uniform transfer to every individual in society - in the context of a developing economy and compares this policy with other schemes that condition the transfer on household characteristics such as income and education. We construct a dynastic heterogeneous-agent model, featuring uninsurable idiosyncratic risk, investment in physical and human capital, and choice of labor effort. We calibrate the model to Brazilian data and introduce a UBI transfer equivalent to roughly 4.5% of average household income. We find that, over the short run, this policy alleviates poverty and increases welfare, especially for the poor. Over time, however, income falls and poverty and inequality increase as fewer people stay in school, labor supply decreases, and savings fall. We then explore the consequences of an equivalent transfer that is both subject to means testing and requires recipients to enroll their children in school. This policy outperforms the UBI in several dimensions, increasing overall income, reducing poverty and inequality, and improving welfare. This result is robust to varying the magnitude of the cash transfer. We then investigate which aspects of the CCT make it so effective, and find that the schooling conditionality is crucial in ensuring its long- and even short- run success.

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1 Introduction

Universal Basic Income (UBI) programs are transfer schemes that provide a uniform cash payment to every individual in society, without any conditionality. They have attracted attention lately due to their inherent simplicity and to the promise of a widespread social effect, such as the reduction of poverty and inequality. The simplicity lies mainly in the fact that transfers reach the entire population, which eliminates monitoring costs and other bureaucracies. In addition, because it is a uniform lump sum transfer, economists argue that a UBI does not distort households' behavior. Further, in spite of its uniform nature, the same cash transfer to the poor and the rich has a larger impact on the former's income than on the latter's, which highlights its powerful redistributive nature.

UBI programs, however, are not without their problems. They can be very expensive, requiring large increases in taxes, with potential distortions to economic activity. They can also discourage labor supply, savings and even education, due to large income effects, as it ensures a steady and riskless income flow. In this sense, *conditional* cash transfers (CCT) programs can be an attractive alternative. These programs have been implemented in a variety of countries, with well known examples including the Mexican "Oportunidades" and the Brazilian "Bolsa Familia". The latter covered more than a fifth of Brazilian families in the years after 2010. CCT programs display two features that makes them different from a standard UBI: first, they are usually targeted at the poorest families in society; in addition, they come with strings attached, typically requiring that recipients' children attend school or pay frequent visits to a doctor.[1] These programs are thus generally less fiscally burdensome than UBIs. Furthermore, the conditionalities may partly offset some of the perverse incentives generated by the UBI program. .

In this article, we study the effects of UBI programs, with particular focus on comparing their performance relative to alternative CCT schemes on alleviating poverty and inequality, and impacting education and a variety of macroeconomic variables. To this end, we build an overlapping-generations model where households face uninsurable idiosyncratic risk and make optimal decisions regarding consumption, savings, school attendance, and labor supply. The introduction of a

[1]Conditional cash transfers can also require the recipient to spend the proceeds in a pre-specified way. The Food Stamps program (SNAP) in the United States is one such example. This class of policy are sometimes denominated labeled cash transfers.

cash transfer policy affects their choices in several ways. First of all, it has a direct impact on income, especially for poorer households. Transfer resources can be used not only for consumption, but also for investments in education or savings. Thus the policy can not only alleviate current poverty but also improve standards of living for the future generations, by potentially increasing their educational outcomes and/or their wealth.

But a cash transfer can also have indirect effects, operating through incentives or prices in general equilibrium. For instance, in our model the extra insurance provided can cause households to substitute from riskless savings into investing in (risky) human capital accumulation. On the other hand, these policies also have a fiscal cost, leading to an increase in taxes. This raise can distort households' optimal decisions, potentially discouraging labor supply, human capital accumulation, and savings. It is precisely here where the *conditionalities* can play an important role: by requiring that households maintain a certain behavior, or by targeting the transfers to those whose behavior is less likely to be distorted, CCTs can, by construction, mitigate some of the adverse discouraging impacts of cash transfer policies.

Our model encompasses all the mechanisms highlighted above. To evaluate their relative importance under distinct cash transfer schemes, we calibrate the model to Brazilian data in 1997, before CCT programs were introduced in that country. In addition to the availability of quality data, Brazil is a good laboratory for the experiments that we seek to implement as it is a country with large income inequality and high levels of poverty. Furthermore, there is a great disparity in access to education and low levels of schooling among the poor. Thus the introduction of UBI and CCT programs has great potential to impact the economy, alleviate poverty, and reduce inequality.

We then introduce to the benchmark economy a stylized UBI program. We calibrate the size of the individual transfer to the one paid by the Brazilian Bolsa Familia in 2013, which corresponds to 4.5% of per-household GDP. The short run effects are close to what one would expect and reproduce results of exercises from static or partial equilibrium models. There is, for instance, a steep reduction on poverty, which falls by more than a fourth upon the introduction of the policy. Over the medium and the long run, however, several macroeconomic indicators start to deteriorate: there is a slow but steady reduction in GDP, consumption, and on labor productivity, this last one reflecting a deterioration in educational outcomes. Remarkably, a large share of the short-term benefits in terms of poverty reduction are wiped out, and the steady-state (long-run)

reduction in poverty headcount is just 4.5%.

This and other unintended consequences of the UBI program in the long run are caused by behavioral responses. There is an increase in the fraction of individuals that do not finish primary school. Hours worked also fall, as do savings. Consequently, output and consumption are reduced by about 10% each. This can be partially explained by a combination of the steep increase in income taxation necessary to finance transfers and their income effects: agents have less incentives to work, save or even study. These effects offset the benefits brought about by the UBI, which explain the at best modest reduction of poverty in the long-run.

Thus, our results indicate that, after taking into account general equilibrium effects and incentives, one must be very careful when extrapolating the short-term impacts of UBI policies. To understand whether the imposition of conditionalities can address the unintended consequences described above, we perform a comparison between the UBI and a CCT equivalent to the Brazilian Bolsa Familia in 2013, with a total redistribution amounting to 0.55% of GDP. This policy differs from the UBI in that it requires the recipients' children attend school and it is subject to means testing, but we set the individual allowance to be the same.

The results are contrasting: output sharply increases over the long-run, following a spur in educational and physical capital investments, which leads to a strong reduction in poverty and inequality. The short term impact on poverty, for instance, is very close, albeit slightly weaker, than that of the UBI program. But the number of poor households falls continuously and in the long-run they end up representing less than 5% of the population. This can be explained by a virtuous cycle triggered by the initial increase in school attendance. A better educated workforce then encourages investments, which again makes human capital investments more attractive due to higher wages.[2] The resulting increase in overall income means that a lower tax rate is required to finance the transfer, and thus the distortions caused by the CCT are relatively small: in the case of the UBI, a tax hike of 5 percentage points is required to fund the policy, while the equivalent number for the CCT is 0.67%.

We then perform a succession of experiments by varying the transfer size in both the case of the UBI and the CCT. Throughout them all, our main results hold: a UBI scheme performs poorly

[2]In the model, factors are priced according to their marginal product. Due to labor-capital complementarity, a higher level of aggregate capital increases the marginal product of labor and, by consequence, wages.

over the long run, as opposed to the CCT. In addition, we also simulate a means-tested version of UBI, where families are eligible if their income is below a given threshold. The main take-away from this exercise is that conditioning the transfer on income is insufficient to ensure the long-run success of a cash transfer program. It turns out that the schooling conditionality guarantees that such policy will not only have a strong impact on poverty but also increase overall income in the long-run.

Our paper relates to a large and diverse literature that studies the impacts of cash transfer programs. See Gentilini et al. (2020) and Hanna and Olken (2018) for a reviews of studies on UBI programs. As for empirical studies that consider general equilibrium effects, Egger et al. (2019) looks at the consequences of a one time cash transfer program in Kenya, which result in a very large fiscal multiplier; Angelucci and De Giorgi (2009) reports beneficial indirect effects associated with the introduction of Mexican cash transfer program Progresa. These studies exploit within-country regional level variation to identify consequences of introducing a cash transfer program. Our work instead considers a nation as a whole, and studies the introduction of permanent transfer policies.

Very much in the spirit of our model, Todd and Wolpin (2006) use a discrete-choice framework to compare the impact distinct cash transfers schemes on education, child labor, and fertility. Bourguignon et al. (2003) performs a similar study, with focus in Brazil. Our main contribution with respect to this literature is to consider general equilibrium. We show that the effects of increased taxation and changes in labor demand are crucial determinants of the success of cash transfer policies.

Another set of studies uses detailed micro data to simulate how a certain cash transfer scheme affects households' income. Bezerra de Siqueira and Bezerra Nogueira (2020) is a recent example for Brazil. These works have the virtue on being able to look at the empirical distribution of households' demographics, and thus compute with precision how a certain cash transfer scheme would affect their income. They do not, however, consider the role of behavioral responses. Relative to this literature, this is where the contribution of our work lies.

Our paper is most closely related to a literature that studies the short- and long-run impacts of cash transfer programs using heterogeneous-agent models. Céspedes (2014) and Peruffo and Ferreira (2017) study the long-run impacts of CCT programs, the former with focus on its redistri-

bution and welfare consequences and the latter on child labor and education. Pedroni and Dyrda (2016) and Boar and Midrigan (2020) study redistribution policies with a focus on distinct taxation schemes. Doherty Luduvice (2019) and Daruich and Fernández (2020) consider the introduction of a UBI in the United States. Our work differ from theirs in two critical dimensions: first and foremost, we conduct an extensive comparison between a UBI and a CCT. This comparison highlights the mechanisms operating in the implementation of each policy, providing relevant information about the trade-offs involved. Second, we focus on a developing country, which is reflected not only in our calibration targets, but also on our explicit modeling of educational choices.[3]

The paper proceeds as follows: section 2 presents our framework, 3 explains our calibration strategy, section 4 explain and contextualizes the policies we consider. Section 5 explores the long-run consequences of transfer policies, while section 6 focus on the short run and on transitional dynamics. Section 7 discusses their welfare consequences, and section 8 concludes.

2 Economic Environment

Time is discrete and infinite. The economy is populated by a unit measure of *dynasties*, which are the relevant decision-makers. At any point in time, four generations coexist: children, young adults, prime-age adult parents and mature adult parents. A model period consists of 17 years.

Individuals live for four periods. A dynasty can either consist of one child and one prime-age adult or one young and one mature adult. In what follows we discuss the role of each type of individual in the economy. For lack of better words, we denote the dynasties whose adult is prime aged as *young dynasty* and the one whose adult is mature as *old dynasty*.

We start by the young dynasty. At the beginning of the period, the prime-age adult gives birth to a child. Children can only go to school or dedicate his time to leisure. This decision is made by the parent who cares about the young *dynasty's* felicity function (to be described shortly). At the end of the first period of life, a child becomes a young adult and a prime-age adult becomes a mature adult. The prime-age adult supplies her labor at a utility cost, and become a mature adult at the end of the period. Finally, the dynasty selects how much to save and consume.

[3] Doherty Luduvice (2019) abstracts from educational choices while Daruich and Fernández (2020) only considers college education. In contrast, we do consider primary and secondary school attendance decisions, as in developing countries the rate of completion on these can be far from 100%.

At the beginning of a period, the old dynasty receives a college preference shock.[4] If a young adult has completed secondary schooling, she can pursue college education, which takes a fraction ϖ of her time endowment and costs a certain amount of resources. Both adults in the old dynasty supply their time endowment in the form of labor, at a disutility cost, and choose how much to save or consume. Finally, at the end of the period, the mature adult exits the model and the prime-aged becomes a mature adult.

2.1 Technology

Schooling. There are four levels of human capital, $h_i \in \{h_0, h_1, h_2, h_3\}$, which refer, respectively, to no schooling, primary schooling, secondary schooling, and college education.[5] Attending school has an explicit cost in terms of units of goods. We denote by $\kappa(h)$ the direct cost of obtaining h units of human capital. We assume that that these costs scale with output.

The time allocated to schooling in the first period, given by the function $\varsigma(\cdot)$, is strictly increasing in h.

Production. There is a constant-returns-to-scale final goods producer who rents capital from and hires households and displays the following production function:

$$Y_t = F(K_{t-1}, L_t) = AK_{t-1}^{\alpha} L_t^{1-\alpha} \tag{1}$$

where K_{t-1} and L_t denotes the aggregate level of capital and labor, respectively, and A is the total factor productivity (TFP). We assume that all levels of human capital are perfect substitutes (we will return later to labor market clearing). Capital and labor are priced at their marginal products:

$$w_t = A(1-\alpha)\frac{Y_t}{L_t} \tag{2}$$

$$r_t + \delta = \alpha \mathbb{E}_t \frac{Y_{t+1}}{K_t} \tag{3}$$

[4]This shock is a common modeling device in the educational choice literature. See, for instance, Daruich and Fernández (2020) and references therein.

[5]In the model, "no schooling" is to be interpreted as "incomplete primary schooling", as in the calibration procedure we consider the share of the adult population that has *completed* each level of education. Therefore, the first level of education, h_0, includes individuals who did not complete primary schooling.

2.2 Government

The only role of the government in this economy is to redistribute resources. We abstract from other (potentially important) government functions to concentrate on the redistribution policies that are the focus of this paper. It levies taxes on (total) income. There's a tax rate τ, endogenously determined by the size of the transfer policy. We denote such transfer by η, and will detail them in section 4. Finally, the government balances its budget each period.

2.3 Preferences

We assume time-separable preferences of the GHH (Greenwood et al. (1988)) form:

$$u(c,\ell) = \frac{1}{1-\gamma}\left(c - \chi\frac{\ell^{1+\theta}}{1+\theta}\right)^{1-\gamma}, \tag{4}$$

were c is the dynasty's consumption and ℓ represents hours of labor supplied. Each dynasty maximizes the discounted stream of period utilities. We resort to presenting the household in a recursive form, to which we now move on.

2.4 Consumers' Problems

The Young Dynasty. We denote the value function o the young dynasty by V^y, and the analogue for the old family by V^o. The young dynasty's recursive problem is:[6]

$$V^y(x_y) = \max_{c,h'_c,\ell,a'} u(c,\ell) + \beta\mathbb{E}_{Z'|z}V_o(z',h,h'_c,a')$$

$$c + \kappa(h'_c) + a' = a + (1-\tau)[wz\xi_{pa}(h)\ell + ra] + \eta(x_y,h'_c,a')$$

$$x_y \equiv \{z,h,a\}$$

$$a' \geq 0$$

[6] For ease of notation, we ignore time subscripts in this exposition.

The relevant state for the young dynasty, x_y, consists of current asset holdings, the prime-age adult's education level, and a random dynasty-specific labor productivity shock z. We assume that z, the dynasty-specific productivity shock, follows a log-normal distribution:

$$\log(z') = -\frac{\sigma^2}{2} + \rho \log(z) + \epsilon, \qquad \epsilon \sim N(0, \sigma^2)$$

The choice variables are savings (a'), consumption (c), the child's education h'_c, and labor supply ℓ. Expenditures are distributed among consumption, savings, and education costs. Total income consists of asset holdings and the net return thereof ($(1-\tau)ra$), and net labor income ($(1-\tau)wz\xi_y(\ell)\ell$. Here, $\xi_{pa}(\ell)$ refers to the labor productivity associated with prime-aged adults with educational level h. Also, note that transfers η *can* depend not only on the state but also on the dynasty's choice. Lastly, households cannot borrow, an assumption meant to represent the flaws of credit market in the developing world.

The Old Dynasty. It is useful to divide the old dynasty's problem into two, depending on whether the child has attended secondary school or not (and thus has the opportunity of pursuing college education). For those who do not (i.e. $h_c \in \{h_0, h_1\}$), we have:

$$V^o(x_o) = \max_{c,g,a',\ell} u(c,\ell) + \beta \mathbb{E}_{z'|z} V^y(z', h', a') \tag{5}$$

subject to:

$$c + a' = a + (1-\tau)[z(\xi_{ma}(h) + \xi_{ya}(h_c))w\ell + ra] + \eta(x_o, a')$$

$$x_o \equiv \{z, h, h_c, a\}$$

$$h_c \in \{h_0, h_1\}$$

$$h' = h_c a' \qquad \geq 0$$

Here, $\xi_{ya}(h_c)$ and $\xi_{ma}(h)$ refer to the productivities associated with each level of education for

respectively young and mature adults. Labor income takes into account the sum of the productivities of both individuals in the households and the labor which they jointly decide to supply. Finally, note that the continuation value takes into account V^y, the value of the young dynasty, associated with the level of education of the young adult, h_c. As mentioned before, dynasties are perfectly altruistic, and this is why the discount factor of the old dynasty also equals β.

We now turn our attention to the problem of the old dynasty whose young member has the opportunity to attend college. Again, it is useful to define this problem in two. First off, the dynasty decides whether to send the young adult to college:

$$V^o(x^o; h_c = h_2) = \max_g \{g(V^{o,c} + \varepsilon_c) + (1 - g)(V^{o,nc} + \varepsilon_{nc})\}$$

The binary variable $g \in \{0, 1\}$ determines college attendance; if $g = 0$, the young adult does not go to college. In this case, the dynasty's problem is represented by the problem (5). If in turn the young adult goes to college, the dynasty's problem is slightly different, and we will described it shortly.

The i.i.d disturbances ϵ_c and ϵ_{nc} follow an Extreme Value distribution of the type one (EV1), parameterized by a shifter $\mu = 0$ and a dispersion parameter σ_ε, which we will calibrate. In the Appendix we show how to compute the ex-ante probability of certain young individual attending college, and how to compute the *ex-ante* expected value of V^o.

The problem of the dynasty whose young adult goes to college is:

$$V^{o,c}(x^o; h_c = h_2) = \max_{c,a',\ell} u(c, \ell) + \beta \mathbb{E}_{z'|z} V^y(z', h_3, a') \tag{6}$$

subject to:

$$c + a' + \kappa(h_3) = a + (1 - \tau)z[\xi_{ma}(h) + (1 - \varpi)\xi_{ya}(h_3))w\ell + ra] + \eta(x_o, a')$$

$$x_o \equiv \{z, h, h_2, a\}$$

$$a' \geq 0$$

Here, ϖ represents the share of time the young adult spends in college, which we assume to induce a proportional loss in productivity.[7]

2.5 Equilibrium

An equilibrium consists of a stream of value functions ($\{V_t^y, V_t^o\}$), policy functions for education (g_t^h and g_t), savings ($g_t^{a,y}$ and $g_t^{a,o}$), labor supply ($g_t^{l,y}$ and $g_t^{l,o}$), and consumption decisions ($g_t^{c,y}$ and $g_t^{c,o}$), prices ($\{r_t, w_t\}$), government policies (τ and $\eta(\cdot)$) and measures over states ($\lambda_t^y(z, h, a)$ and $\lambda_t^o(z, h, h_c, a)$)

1. Given policies and prices, dynasties solve their problems, as shown in 2.4
2. The Government budget is satisfied:

$$\tau_t(r_{t-1}K_{t-1} + w_t L_t) = \int \eta(x_y, h_c', a')d\lambda_t^y(x_y) + \int \eta(x_o, a')d\lambda_t^o(x_o)$$

3. Assets, goods, and labor markets clear:[8]

$$\begin{aligned}
K_t &= \int g_t^{a,y}(x_y)d\lambda_t^y(x_y) + \int g_t^{a,o}(x_o)d\lambda_t^o(x_o) \\
Y_t &= \int g_t^{c,y}(x_y)d\lambda_t^y(x_y) + \int g_t^{c,o}(x_o)d\lambda_t^o(x_o) + \delta K_{t-1} + \int \kappa(g_t^h)g_t^h(x_y)d\lambda_t^y(x_y) + \int \kappa(h_3)g_t(x_o)d\lambda_t^o(x_o) \\
L_t &= \int g_t^{l,y}(x_y)d\lambda_t^y(x_y) + \int g_t^{l,o}(x_o)d\lambda_t^o(x_o),
\end{aligned}$$

3 Calibration

We calibrate the model to features of the Brazilian economy at the end of the 1990's, before the enactment of a large conditional cash transfer program at the beginning of the 2000's (*Bolsa Familia*,

[7] Specifically, our assumption implies that for every unit of labor supplied, the young adult forfeits $\frac{1}{1-\varpi}$ units of leisure time. This means that, in practice, supplying more labor, and getting a higher paid, requires more time spent with college education.

[8] For easy of notation, we assume that $g_t^{l,y}$ $g_t^{l,y}$ already include labor productivity.

see Peruffo and Ferreira (2017))

We separate the parameters in this model by those that have a direct data counterpart and those that are identified within our framework. We calibrate the first set *externally* by using their direct empirical counterpart or using the existing literature. We calibrate the latter internally, via simulated method of moments. We start by describing those that are externally calibrated.

This group consists of $\sigma, \phi, \rho, \delta, \alpha$, the function(s) $\xi(h)$, and time spent in college ϖ. We set $\varpi = 0.265$, corresponding to 4.5 years in college. Yearly capital depreciation is set to 0.06, so $\delta = 0.6507$. The capital share on production function, α, is set to 1/3, also a standard value. Also standard are the inverse coefficient of risk aversion, $\sigma = 2$, and the inverse Frisch elasticity, $\phi = 2$.

We calibrate the functions $\xi_{ya}(h)$, $\xi_{pa}(h)$, and $\xi_{ma}(h)$ using the 1997 National Household Survey (*Pesquisa Nacional por Amostra em Domicilios, PNAD*, which is a large household survey conducted every year in Brazil). We compute simple averages of observed wages in each age bin (17-34, 35-51, and 51-68 year-olds) and assign values relative to the normalization $\xi_{ya}(h_0) = 1$. Finally, we set $\rho = 0.69$, which corresponds to an yearly autocorrelation coefficient of 0.978, in line with Peruffo and Ferreira (2017).

The externally calibrated parameters are summarized in Table 1 and in Table B1 in the appendix.

Table 1: Externally Calibrated Parameters

Parameter	Value	Description
δ	0.6507	Physical capital depreciation
α	$\frac{1}{3}$	Physical capital share (production function)
ϖ	0.265	Fraction of period required to attend college
ρ	0.69	income autocorrelation
σ	2	inverse risk aversion coefficient
ϕ	2	inverse Frisch elasticity

Finally, the last eight parameters are jointly calibrated by matching the same number of data moments. These are the schooling costs $\kappa(\cdot)$, the discount factor β, the labor supply shifter χ_ℓ, the income shock variance, σ, and the college taste shock dispersion parameter σ_ε.

Even though all parameters are determined jointly, each of them is most closely related to a

particular data moments. In what follows we explain the moments we target, along with their closely related model. First off, we normalize output to unity, which is done by setting an appropriate value of χ_ℓ. We set the costs of schooling, $\kappa(\cdot)$, so that we match the share of adults that have *completed* each education level (primary, secondary, and college). We set dispersion in income shocks so that we match a Gini coefficient of 0.55, a value within the estimates for Brazil.[9] Finally, we select the dispersion of the college taste shock, σ_ε, so as to match the share of college parents' offspring that pursues college education. We set that value to 60%, from Ferreira and Veloso (2003).[10] Finally, the discount factor β is identified by the economy's investment rate. We match the gross capital formation of 0.17, which is the average between the years 1992 to 2002, using data from the Brazilian Statistics Agency (IBGE).

Table 2 displays the moments, parameter values, and the quality of the match of the calibration procedure. Overall, the calibrated parameters reproduce very closely the data.

Table 2: Calibration

Target	**Model**	**Data**	**Closest Parameter**	**Source**
Output Ratio	1	-	$\chi\ell = 8.21$	Normalization
Gross Capital Formation	0.17	0.17	$\beta^{\frac{1}{17}} = 0.969$	IBGE 1992 - 2002
Cost of Primary Education	19.1%	19.2%	$\kappa(h_1) = 0.13$	PNAD 1997
Cost of Secondary Education	24.2%	24.9%	$\kappa(h_2) = 0.31$	PNAD 1997
Cost of College Education	7.5%	7.8%	$\kappa(h_3) = 1.38$	PNAD 1997
Income Gini	0.56	0.55	$\sigma = 0.17$	World bank
College Persistence	0.61	0.60	$\sigma_\epsilon = 0.112$	Ferreira and Veloso (2003)

4 Transfer Policies

Our main exercise compares a UBI transfer system with a means-tested transfer policy that requires that recipients enroll their children in school. The Brazilian economy has a CCT program of latter kind since the beginning of the 2000s, the *Bolsa-Família*.

[9] See, for instance, the page *Estatísticas do Século XX* in the IBGE homepage.

[10] Intuitively, a high value of σ_ε makes the college choice more reliant on the shock itself, rather than on the fundamental value associated with college education ($V^{o,c}$ versus $V^{o,nc}$). Conversely, as σ_ϵ approaches 0, the choice becomes entirely deterministic.

The *Bolsa-Família* program was created in 2004 to replace and unify several existing welfare programs in Brazil. The major innovation in the *Bolsa-Família* program is that it does not restrict how the transfer must be spent, provided that families met eligibility criteria. These criteria essentially are family income per capita, school enrollment, and regular health checkups. There is a categorization of beneficiaries between extremely poor families and poor families. The former are families with income per capita below R$89, while the latter are families with income per capita between R$89,01 and R$178.[11] Those beneficiaries who are extremely poor receive a basic transfer of R$89. Also, these extremely poor families receive an additional transfer that varies according to their family per capita income and the amount already received by the program. Families of both categories receive a monthly variable benefit conditioned on school registration of its child.[12]

We calibrate transfer value and, whenever relevant, the income thresholds in our model to be in line with the transfer in the case of the *Bolsa-Família*. Using the calibration described above, we compute an alternative steady-state equilibrium using a conditional cash transfer as follows:

$$\eta_{CCT}(x_y, h'c, a') = \begin{cases} 0 \text{ if } h'_c = h_0 \\ \mathbf{1}\{ra + wz\ell \leq \bar{y}\}T \cdot (1 + c_1(ra + wz\ell)) \text{ if } h'_c = h_1 \\ \mathbf{1}\{ra + wz\ell \leq \bar{y}\}T \cdot (1 + c_2(ra + wz\ell)) \text{ if } h'_c = h_2 \end{cases}$$

$$\eta_{CCT}(x_o, a') = 0$$

The symbol $\mathbf{1}$ above represents the indicator function. In addition, the functions c_1 and c_2 are meant to capture both the extra transfer due to children, depending on their age and attendance, and due to extreme poverty, as explained above. Also, note that the transfer is only paid to prime-aged adults.

From the expression above, we calibrate the parameters T and $\bar{y}$ so that the total resources transferred represent 0.55% of GDP, and the share of recipients in the population amounts to 20.7%.[13] These were the values observed for 2013 in Brazil. Our benchmark UBI experiment

[11] The dollar-to-real nominal exchange rate in 2013 varied from 2 to 2.30.

[12] Families with children from 0 to 15 years old receive a benefit of R$35 per children (limited to five children). Pregnant mothers and families with children aged between 0 to 6 months also received this benefit. Families with adolescents from 16 to 17 years old receive a benefit of R$ 42 per teenager (up to two adolescents).

[13] Our qualitative results are robust to also including either c_1 or c_2 in the UBI as well. We later experiment with different values of the base UBI transfers.

then uses the value of T calibrated above ($T = 0.044$), but without placing any restriction on who can receive it . Formally:

$$\eta_{UBI}(x_y, h'c, a') = \eta_{UBI}(x_o, a') \equiv \eta_{UBI} = T$$

We now proceed to analyze the results.

5 The Long-Run Effects of Transfer Policies

In this section we compare economies with distinct transfer policies over the long run, computing their steady-state equilibria and comparing their outcomes. The "benchmark economy" corresponds to the calibrated economy, where such programs are absent. Results are presented in Tables 3 and 4, where we compare the benchmark economy with both the CCT and the UBI programs described in the previous section.

Table 3: Education and Inequality

	Benchmark	CCT	UBI	% CCT	% UBI
Incomplete Primary Education	48.6%	3.0%	54.5%	-93.8%	12.0%
Primary Education	19.4%	46.3%	16.6%	138.7%	-14.5%
Secondary Education	24.3%	48.1%	21.7%	97.7%	-10.8%
College Education	7.6%	2.5%	7.2%	-66.6%	-5.4%
Schooling spending (% of output)	11.5%	12.7%	10.6%	10.8%	-8%
Labor productivity	5.15	5.39	4.97	4.53%	-3.52%

Notes: In the benchmark model there is no transfers. CCT is the conditional cash transfer economy. UBI is the economy with a universal transfer. Column % CCT displays the variation relative to the benchmark value for the CCT economy, as does column % UBI.

We start by looking at educational outcomes. Table 3 shows that incentives to human capital accumulation are strongly affected by these policies. Education completion, at all levels, is reduced under the UBI program. For instance, the share of individuals that do not complete primary school increases by 10.7%. The unconditional transfer cause students to drop out of school earlier than

otherwise. In contrast, under the CCT program all but the share of college graduates improve. The share of individuals that do not finish primary falls to less than 4% (from almost 50%). In sum, average labor productivity in the case of the UBI is reduced by 3.5%, while the CCT increases it by 4.5%. These results indicate that the CCT, by requiring recipients to enroll their children in school, ensures the existence of a more qualified labor force.[14]

We now move to macroeconomic, poverty, and inequality indicators. These are shown in Table 4. The UBI displays a detrimental effect on output, which owes to several reasons. This policy leads to a vicious circle, whereby the high taxes discourage labor supply and investments in human and physical capital. The latter is further discouraged because of lower precautionary motives due to the insurance provided by the transfer. Furthermore, precisely because income is low, the tax rate required to finance the program has to be relatively high, further compounding the vicious circle. The long-run consequences are appalling: consumption and output drop by respectively 11.8% and 9.6%, reflecting the fall in hours (6.3%) and capital (15.3%), not to mention the strong effects on education, as shown in Table 3.

[14]The smaller share of college graduates under the CCT program is somewhat puzzling, since there is a larger share of households who now complete secondary education, and thus could pursue college education. But it can be explained by two facts: first, the cost of education scales with output, and so college gets more expensive because GDP increases by 20% (Table 4). Keeping the cost of college constant does not overturn this qualitative result, but the drop in the share of college students becomes quantitatively very small. These results are available upon request. Second, the educational premiums given by the age-earnings profile are kept constant by assumption. We conjecture that endogeneizing the college premium, by for instance imposing some pattern of substitution between workers with different skills, could dampen but not necessarily revert this qualitative result.

Table 4: Macroeconomic indicators

	Benchmark	CCT	UBI	% CCT	% UBI
Output	1.00	1.20	0.89	18.81%	-11.83%
Interest rate	2.83%	2.94%	3.02%	3.66%	6.66%
Tax rate	0.00%	0.67%	5.92%	0.67%	5.92%
Savings	0.27	0.31	0.23	16.24%	-15.26%
Consumption	0.72	0.84	0.65	17.13%	-9.61%
Hours	0.38	0.44	0.35	14.90%	-6.36%
Transfer coverage	0.00%	20.66%	100.00%	20.66%	100%
Transfer budget (% of output)	0.00%	0.55%	4.94%	0.55%	4.94%
Labor Income Gini	0.55	0.37	0.56	-33.4%	1.5%
Labor + Transfers Gini	0.55	0.36	0.53	-35.5%	-4.7%
Poverty Rate	20.4%	4.1%	19.5%	-79.8%	-4.5%

Notes: In the benchmark model there is no transfers. CCT is the conditional cash transfer economy. UBI is the economy with a universal transfer. % CCT displays the variation relative to the benchmark value for the CCT economy, as does % UBI. Interest rate is annualized.

The comparison with the CCT could not be more striking: under this policy, output and consumption rise by respectively 18.8% and 17.1%. This owes to a virtuous circle initially triggered by the education conditionality. When we analyze the transitional dynamics of these policies we will see how this cycle plays out. For now, it suffices to say that a more educated labor force encourages investment in physical capital due to its complementarity with labor, which then increases human capital investments and labor supply due to an increase in wages. Because of the overall increase in income, the tax rate that is required to fund the policy then becomes relatively small, with consequent low discouragement effects.

The fact that the CCT program is targeted to those in need and imposes education conditionalities has a strong equalizing effect on labor income, reducing its Gini by a whopping third.[15] In

[15]The values of the Gini coefficient of income (and other measures of income and wealth inequality) that we compute throughout the paper involve a breakdown of the old dynasty into two distinct income units (mature adult, and young adult). We assign the entirety of the capital income to the mature adult, consistent with the fact that the young adult

contrast, the UBI is unable to reduce labor income inequality, which actually increases marginally. This surprising result is explained by the fact that schooling levels fall across the board, but less so for college, concentrating income at the top.

By comparing the Labor Income Gini with its analogue that include transfers we obtain a sense of the *direct* impact of the policy on inequality: in the case of the UBI, this is relatively large (0.03), but for the CCT is is marginal (0.01). While for the former the majority of the reduction of inequality accrues from its direct effect, for the latter this is dwarfed by the indirect effects that operate through improved educational outcomes.

Figure 1 displays selected quantile income shares for each of the counterfactual policies, and compares these with the baseline economy. It includes the income shares of the bottom 10%, 20%, and 50%, along with the top 1%. The CCT increases the income share of the (low) middle-class, while reducing the share of the top 1%. Although the UBI has a similar effect, it is much more modest. In particular, under CCT, the bottom 50% of the distribution receives 25.4% of total income, while in UBI this value is just 19.5%.

has not yet bequeathed the family wealth at that point in time. We believe that by undertaking this procedure, our model-based Gini is measured in way that is more closely related to how the data is measured than the alternative, which would have involved computing measures of income and wealth dispersion at the *dynasty* level.

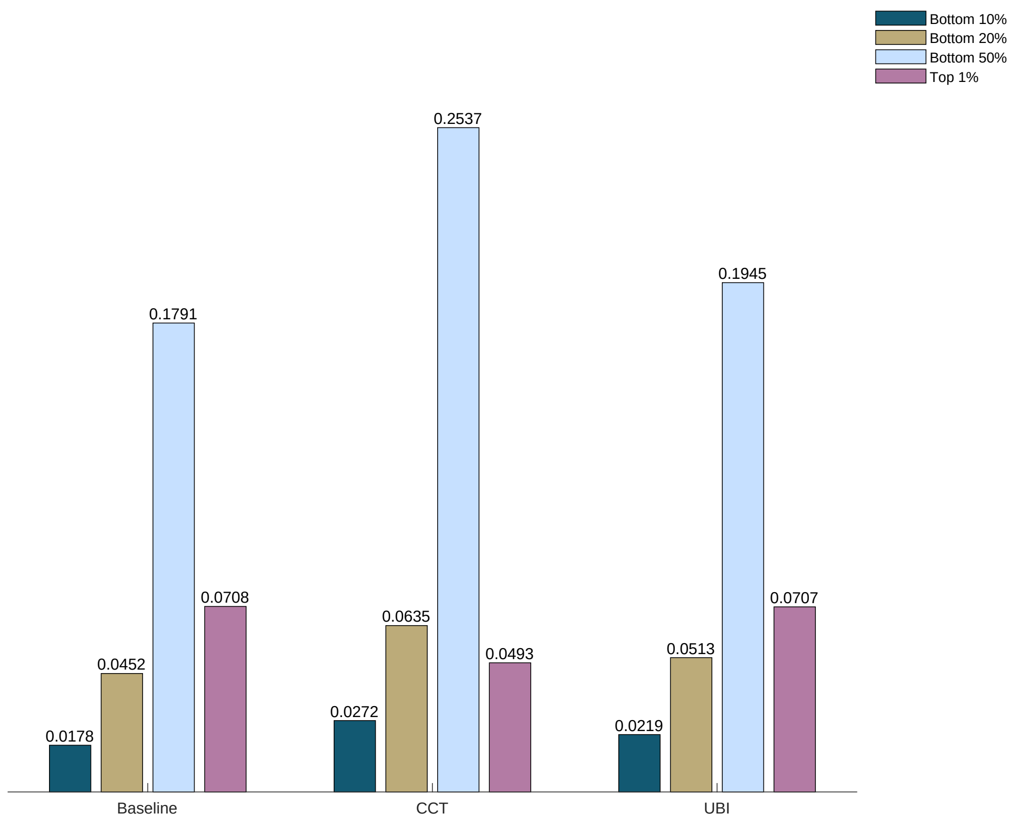

Figure 1: Share of total income earned by selected distribution quantiles.

As for poverty rates, we see that the beneficial impact of UBI is very modest relative to the CCT program - a decrease of 5.25% versus a reduction of almost 80%.[16] By conditioning on school enrollment, the CCT alleviates poverty not only through its direct impact on income, but also for future generations. In contrast, the UBI does not encourage human capital accumulation, keeping the poor from climbing the social mobility ladder and, as a result, its effects on poverty are modest.

What Aspects of Cash Transfers Matter?

Overall, in the long-run, a CCT policy appears to be vastly superior to an equivalent (in value of transfers) UBI policy. Does this fact owe to particular features concerning the two policies, such as the total transfer (T) or the income threshold $\bar{y}$? In this section, we consider alternative values for

[16]We compute the poverty rate as the income associated with the 0.205 percentile of its distribution. This corresponds to the poverty rate in Brazil in 1997, according to the World Bank.

these policy parameters. We start by the total transfer size T. Figure 2 plots the long-run outcomes generated by multiple simulations of our model economy for distinct values of T. We consider a range from $T = 0$ to $T = 0.1$, which corresponds to 10% of the initial per dynasty GDP[17].

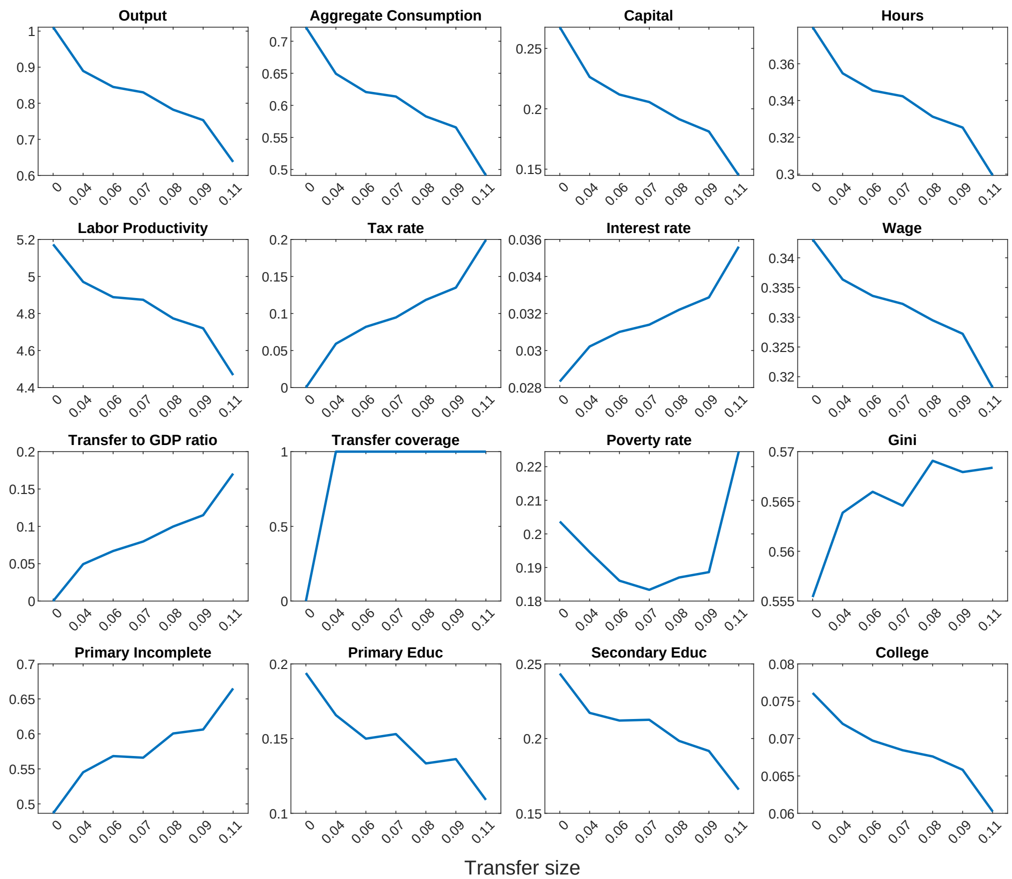

Figure 2: Comparative analysis between different transfer sizes in a UBI economy. The first value is the benchmark economy. Transfer equal to 0.06 is equivalent to redistribute R$600 per family which is the nominal value of the Emergency Aid given by the Brazilian government during the Covid pandemics. Transfer equal to 0.08 is equivalent to redistribute R$900 per family, which is the mean value of the Emergency Aid. Transfer equal to 0.04 is equivalent to redistribute the value given in the CCT economy to every family. The remaining values are equivalent to 1.5, 2, 2.5 and 3 times the transfer value in the CCT economy.

There are two main takeaways from Figure 2. First, a larger transfer leads to further deterioration in several macroeconomic outcomes, causing output and consumption to decrease, following

[17]For comparison, Andrew young, a 2020 Democratic presidential candidate in the United States, proposed a UBI policy that would pay $1,000$ to each household. This amounts to close to 20% of per-household income.

an overall reduction of educational outcomes, hours, and savings. Second, a relatively low level of transfer can reduce the poverty rate. This is due to its direct effect on household income. But for higher level of transfers, these benefits are offset by distortions to incentives and the poverty rate actually increases.

Figure 3 shows analogue graphs for the Conditional Cash Transfer Policy. We see that small transfer levels have strong economic effects, both on macroeconomic indicators and on poverty and inequality. The effects slowly fade as the transfer gets larger, but are still positive. On the one hand, this shows that the qualitative findings on the previous section are robust to the size of the CCT. In addition, it suggests that the benefits of such policy are decreasing on the size of the transfer, but remain positive even for large transfers.

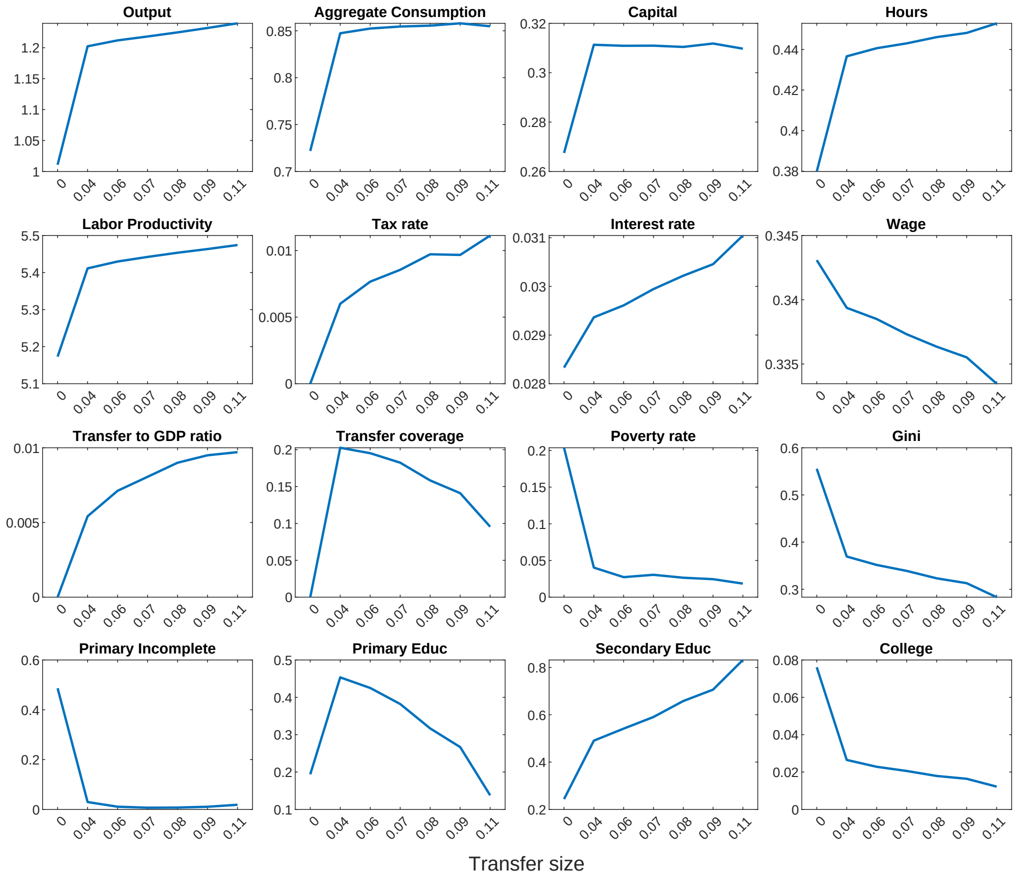

Figure 3: Comparative analysis between different transfer sizes in a CCT economy. The first value is the benchmark economy. Transfer equal to 0.06 is equivalent to redistribute R$600 per family which is the nominal value of the Emergency Aid given by the Brazilian government during the Covid pandemics. Transfer equal to 0.08 is equivalent to redistribute R$900 per family, which is the mean value of the Emergency Aid. Transfer equal to 0.04 is equivalent to redistribute the value given in the CCT economy to every family. The remaining values are equivalent to 1.5, 2, 2.5 and 3 times the transfer value in the CCT economy. Both enrollment conditionality and income threshold are kept constant.

Finally, note that the tax rate associated with the CCT is rather small relative to that of the UBI. This again owes both to the targeting nature of the CCT, which covers only X% of the population, and to the fact that this policy leads to an increase in income. Moreover, at high levels of the transfer, policy coverage even starts to decrease as a larger proportion of households has an income above the threshold $\bar{y}$, contributing to the policy's low fiscal impact.

In sum, these simulations reinforce our previous findings: over the long-run, regardless of transfer size, a means-tested cash transfer policy with schooling requirements is superior to a pure

UBI. We now investigate what makes the CCT so beneficial: its targeting nature or its education requirement?

Figure 4 shows that only means testing is not enough to ensure the long-run success of a basic income policy. Here, we plot analogue of Figure 3, except that at this time the policy does not require school attendance. Only the means-testing conditionality remains, and is set to be equal to the baseline CCT economy. Again, for any of the transfer values considered, macroeconomic indicators such as output, consumption, and labor productivity deteriorate over the long run.

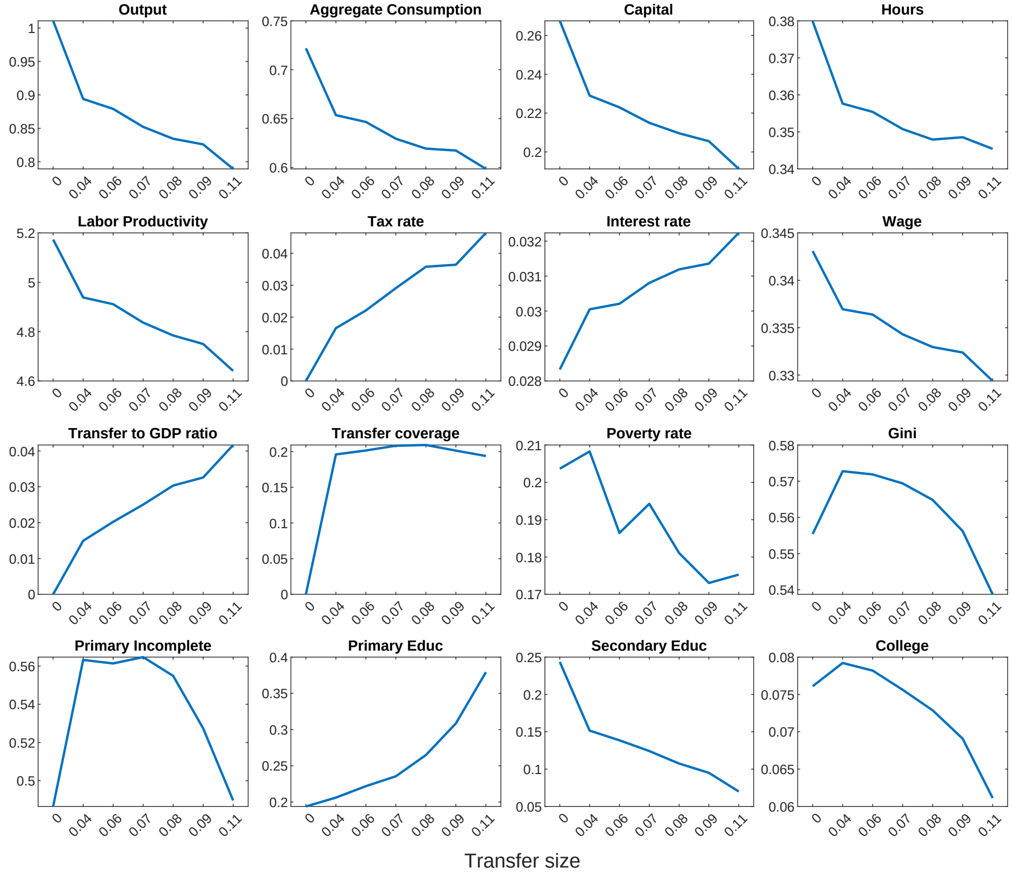

Figure 4: Comparative analysis between different transfer sizes in a CCT economy with same rules as *Bolsa-Familia* but no school requirements. The first value is the benchmark economy. Transfer equal to 0.06 is equivalent to redistribute R$600 per family which is the nominal value of the Emergency Aid given by the Brazilian government during the Covid pandemics. Transfer equal to 0.08 is equivalent to redistribute R$900 per family, which is the mean value of the Emergency Aid. Transfer equal to 0.04 is equivalent to redistribute the value given in the CCT economy to every family. The remaining values are equivalent to 1.5, 2, 2.5 and 3 times the transfer value in the CCT economy. The income threshold is kept constant.

The conclusion from the three experiments above is that, in the long run, the schooling requirements are behind the success of the CCT policy.

6 Short Run and Transitional Dynamics

The long-run analysis presented in the previous section conceals important short-run and transitional dynamics considerations. We now turn our attention to these by studying how the economy

evolves from the baseline equilibrium to long-run counterfactual steady states featuring the UBI and the CCT described in Table 4.To that end, we simulate perfect foresight transition paths, where the government introduces the relevant policy at once. Economic agents then become aware of this introduction, and adjust their expectations and decisions accordingly.

Figure 5 shows the evolution of key macroeconomic indicators, while figures C2 and C1 in the appendix show the evolution of the distribution of educational outcomes for prime-aged adults. In these plots, the initial period ($t = 0$) corresponds to the steady-state equilibrium. Thus the period of the shock realization is $t = 1$.

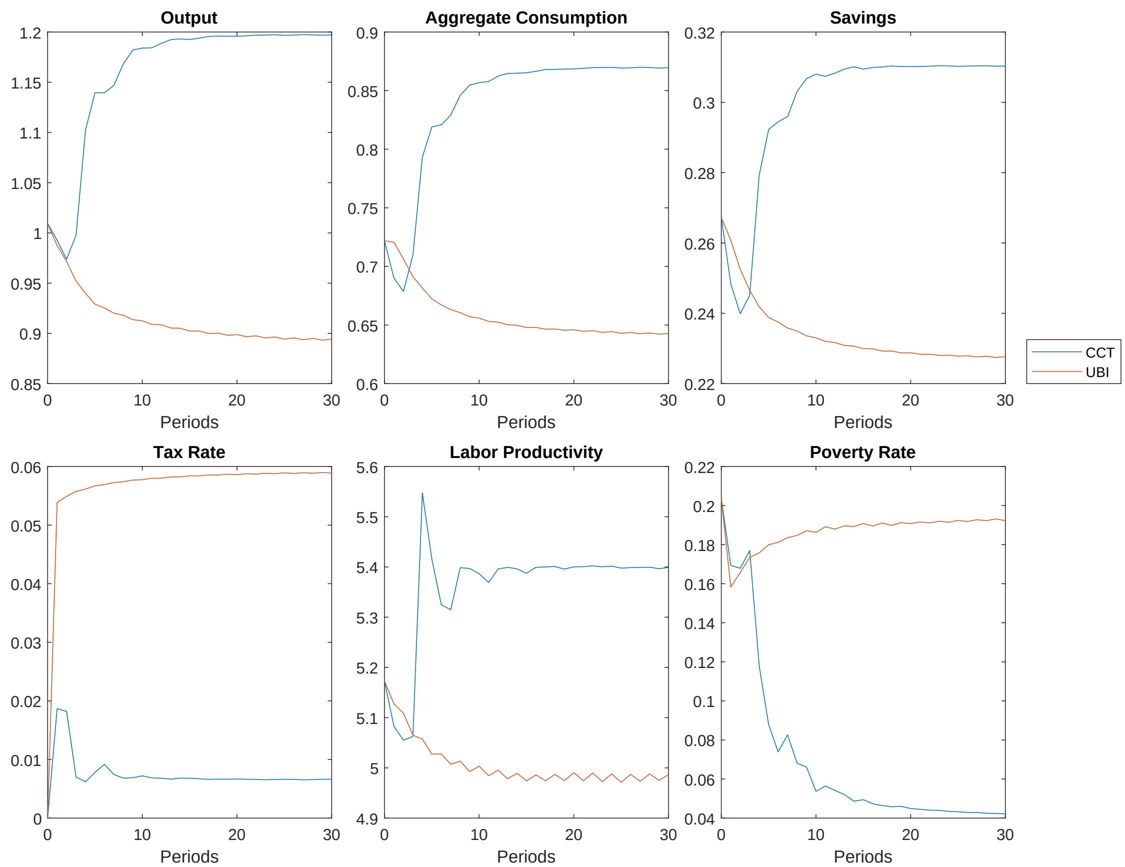

Figure 5: Dynamics of selected aggregate variables along the transition between the baseline steady-state and the policy steady-state.

We start by discussing the short-run. By short-run, we refer to the on-impact effects of the policy ($t = 2$ in the graphs). At this horizon, both policies produce similar consequences. Output

drops by a similar amount, but consumption and savings fall by more in the case of CCT. This is due to increase investments in education. The tax rate increases much more in UBI relative to the CCT. This is due to the means-testing nature of the CCT, which limits its coverage. Finally, the UBI is even *more* effective than the CCT in reducing the poverty rate. This, again, is due to its larger coverage.

For the medium run - the lives of two generations - the impact of UBI and CCT are similar. In both cases poverty rates reduces by about 25%, output and consumption and savings falls. After this, however, results are strikingly dissimilar. Poverty rates continues to fall in the CCT economy, but increases in the UBI case.

This is a result of distinct dynamics triggered by the introduction of each type of policy. For the UBI, a *vicious circle* is created, whereby the high tax rate discourages labor supply for the current and future generations. The former effect causes a reduction of hours (not shown), while the latter discourages human capital investments (Figure C1 in the appendix). Consequently, investments in physical capital, whose marginal returns depend on the total efficiency units of labor supplied, are reduced. This, in turn, reduces wages – the marginal product of labor – further reinforcing the circle. This is a relatively slow process, the full extent of its consequences spanning a few generations, which explain its apparent success on the short run.

In all, in the short- and perhaps medium run, and especially when considering poverty rates, the UBI economy reproduces some empirical results in the literature.[18] In the long run, due to disincentives to physical and human capital accumulation and reduction of labor effort this fall of poverty it to a large extent reversed.

The dynamics following the introduction of the CCT are quite distinct. The initial increase in human capital investment caused by the CCT triggers a *virtuous circle*, whereby investments in physical capital increase the marginal product of labor, further encouraging schooling. Within the span of two generations, when the individuals who were children at the time of the policy introduction enter the labor force, the economy starts experimenting rapid and long-lasting economic growth. The resulting reduction in poverty dwarfs the one observed in the short-run.

The relative short-run success of the UBI naturally leads us to ask whether a policy-maker considering to adopt a cash transfer policy should or should not impose conditionalities, even if

[18] See Gentilini et al. (2020).

those lead to bad long-term consequences. We now proceed to address this question by analyzing these policies' welfare consequences.

7 Welfare

We compare each dynasty's welfare by taking transitional dynamics effects into account. This measure allows us to understand whether the generation contemporaneous to the policy reform would be better off. This is done by comparing the steady-state values V^{ss} with the dynasty's value function after the shock is revealed and the perfect-foresight path of the economy is determined, denominated by V^{pol}. We then expose changes in welfare in terms of consumption, net of labor disutility, equivalent units (CE).

Formally, for every x_j, $j \in \{y, o\}$, we compute ω by solving:

$$V_{ss}(x_j) = \sum_{t=0}^{\infty} \beta^t u(\omega_{ss}(x_j)),$$

The utilitarian measure of welfare in steady-state, given in CE, is:

$$\bar{\omega}_{ss} = u^{-1} \left(\mathbb{E}_x \frac{u(\omega^{ss}(x_o)) + u(\omega^{ss}(x_y))}{2} \right) \tag{7}$$

A similar procedure using V^{pol} yields $\bar{\omega}^{pol}$, the welfare associated with the policy. The net ratio between $\bar{\omega_{pol}}$ and $\bar{\omega}_{ss}$ represents the utilitarian welfare change due to the policy.[19]

On aggregate, the UBI increases welfare by 1.08%, while CCT increases it by 1.77%. Furthermore, the proportion of dynasties that is better off under the first policy is 37.8%, compared to 42.5% for the latter. Thus, for the policies considered, the fact that the UBI has no strings attached does not at all translate into higher welfare, nor it would draw the support of the majority of the population.

These averages, however, mask substantial heterogeneity across the income, welfare, and educational groups. We start by discussing the welfare dimension.

Figure 6 shows welfare changes across the wealth distribution. There is a monotonic pattern in which, for both policies, low wealth dynasties benefit the most, and high-wealth households lose.

[19] To obtain conditional measures of welfare changes, we condition the expected value in equation (7) in the relevant set of states.

This pattern is steeper for the UBI: the bottom 10% substantially benefits from the policy (12% in CE), but the bottom 50% loses on aggregate. On the other hand, the CCT is not that powerful in improving the lives of the bottom 10%, whose welfare increases by only 6%. But if we consider the bottom 20%, these would be better-off under the CCT than under the UBI. As for the wealthiest families in the economy, these lose 5.8% under the UBI, but only 2% under the CCT.

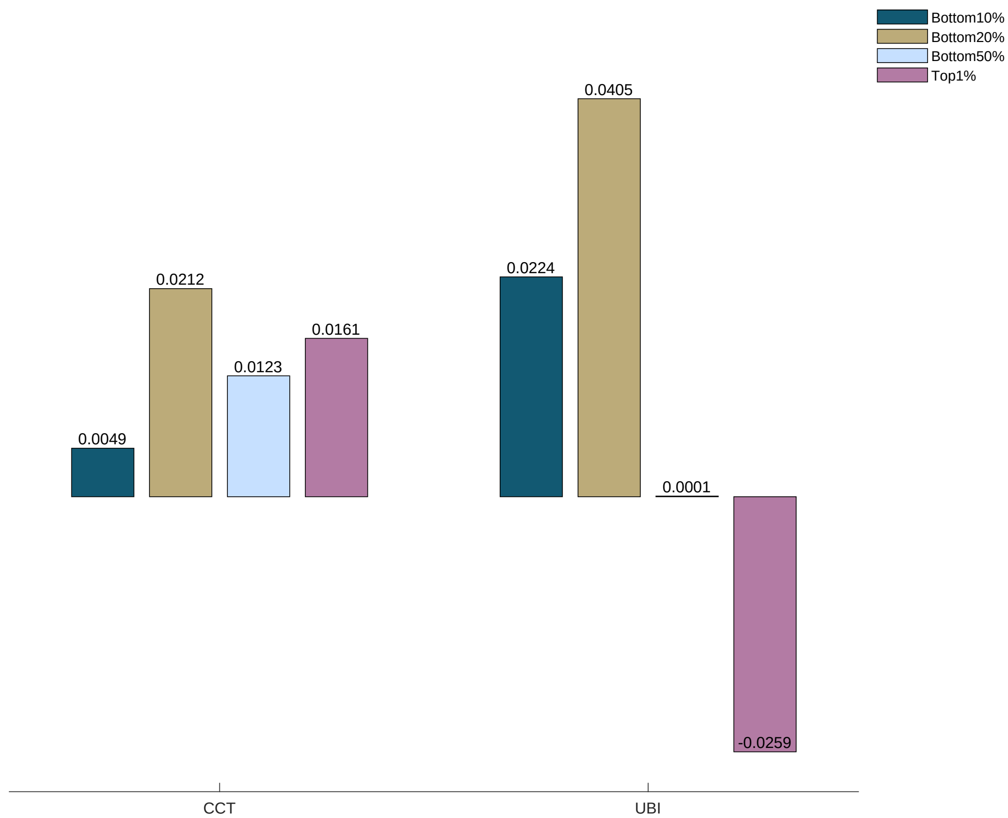

Figure 6: Welfare variation, in CE units, across asset holdings relative to baseline scenario without transfers.

Across educational groups, shown in Figure 7, the pattern above remains. College graduates are the main losers in both policies while people with incomplete primary schooling are the winners. Furthermore, the former group loses substantially more under the UBI (5.8%) than under the CCT (1.9%), while the latter benefits more under the UBI (12.5%) than the CCT (6.2%).

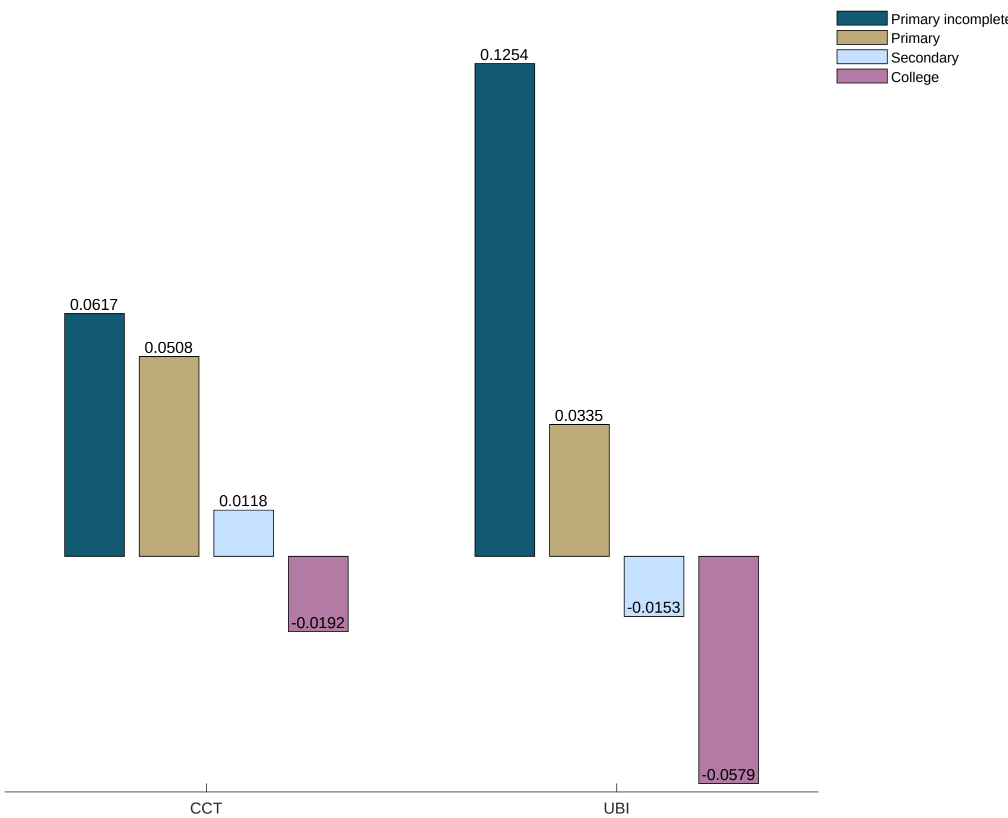

Figure 7: Welfare variation, in CE units, across educational groups relative to baseline scenario without transfers.

In sum, the UBI is *more effective* than the CCT in increasing the welfare of the ultra poor, those uneducated with very little wealth. This is due to two reasons: first, the high tax rate imposed under the UBI has limited effect over the poor, whose income is very low to begin with. Second, the schooling requirements associated with the CCT can be an important burden, with the schooling costs partially offsetting the income gain due to the transfer. This burden is typically heavier for low-wealth families, who have more difficulty insuring against income shocks.

Furthermore, the UBI does more harm to the wealthiest, more educated families than in the case of the CCT. That is due to taxes, which are much typically much higher for the UBI, both in the short- and in the long-run.

To further strengthen the conclusions from the analysis above, we now analyze the welfare

consequences of a transfer scheme whose means-testing requirements are exactly the same as in our baseline CCT experiment, but the school conditionalities are absent (henceforth CCTnoS).

In this case, the aggregate change in welfare is 5.79%, with 40.23% of households benefiting for the change. The pattern of welfare changes across wealth and education groups remains, with the comparison to the CCT and the UBI depicted in figures C4 and C5 in the appendix.

The fact that the aggregate welfare impact of the CCTnoS is larger than the CCT is not surprising. Absent general equilibrium effects, the dynasty's choice set in the CCT is a subset of that of the CCTnoS. In principle, general equilibrium forces – in particular, investments in physical capital driven by a more educated labor force – could overturn this result, but it turns out that their strength is insufficient to do so.

To conclude this section, Figure 8 shows the evolution of the aggregate welfare of the generations of individuals alive at a given point in time after the introduction of each of the three policies considered. It highlights a trade-off between the welfare of current and future generations. While the CCT clearly outperforms the UBI, the comparison with the CCTnoS is more nuanced. While schooling requirements reduce the welfare impact of a means-tested cash transfer policies, these remain positive. Furthermore, this requirement promotes large long-run benefits, while its absence will lead to future generations being worse off.

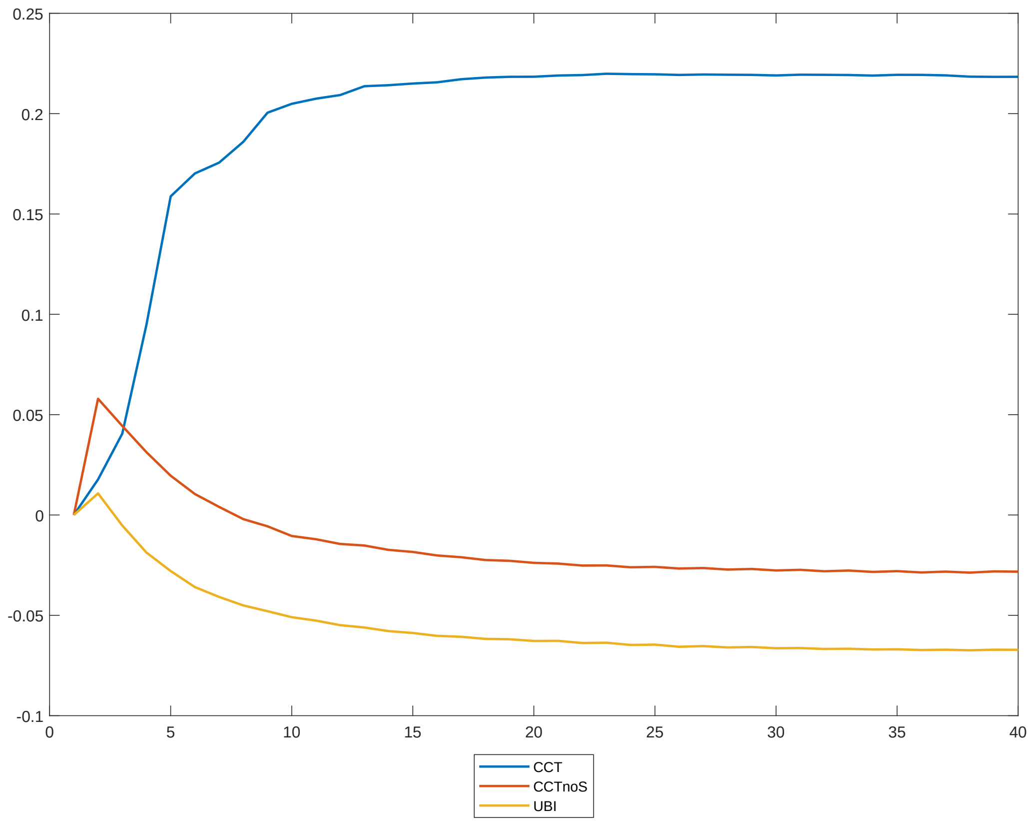

Figure 8: Welfare evolution along the transition between benchmark steady-state and each policy steady-state. By CCTnoS we mean a CCT transfer program without schooling requirements.

8 Conclusion

In this paper, we study the design of Universal Basic Income policies, comparing their performance to alternative means-tested cash transfer policies that require recipients to enroll their children in school (CCT). We study how effective these policies are with regards to alleviating poverty and inequality, and impacting education and a variety of macroeconomic variables. We build an overlapping-generations general-equilibrium model where households face uninsurable idiosyncratic risk and make optimal decisions regarding consumption, savings, school attendance, and labor supply. We calibrate the model to Brazilian data in 1997. We then simulate counterfactual cash transfers and study the evolution of the economy following their introduction. Our compari-

son highlights the mechanisms operating in the implementation of each policy, providing relevant information about the trade-offs involved.

We find that the introduction of a UBI policy leads to reductions in poverty and inequality in the short run. Over the medium run, however, the economy enters a downward spiral in which reduced human capital investments reduce physical capital investments, and vice-versa, causing a decline in economic activity. In contrast, a CCT is not so effective in alleviating poverty in the short run, but its incentives to education trigger a virtuous circle that over time promotes investments in physical capital, ultimately expanding average income and reducing poverty rate by 75%.

Even though in general our conclusion is that requiring school enrollment is the key to the success of a cash transfer policy, there are a few dimensions where a simple basic income policy is more beneficial. First, a UBI is more effective in alleviating poverty over the short- and even medium-run - which in fact corresponds to more than 30 years in our model economy. Second, a means-tested basic income policy that *does not* require school enrollment is perceived by the living generation of households as superior, in terms of welfare, to the one that requires enrollment. This happens in spite of the fact that the former policy triggers a long-run decline in economic activity similar to that of the UBI. As a consequence, the policy-maker faces a trade-off between the welfare of current and of future generations when deciding whether or not to require school enrollment upon the enactment of a cash transfer policy.

Despite the fact that in the long run a UBI policy is very damaging, it might still be useful as a transitory policy to soften major economic shocks such as the Covid-19 pandemic, or even as a way to provide economic security to individuals whose skills might become obsolete due to technical change. However, in terms of long-term development, a transfer system with education requirements is essential in the fight against poverty.

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Appendix

A College preference shock

We need to compute:

$$\mathbb{E}_\varepsilon(V(x_2^s)) = \mathbb{E}_\varepsilon(\max(V_2 + \varepsilon))$$

where ε is an extreme value shock that follows a Gumbel distribution (or EV type I). That is:

$$\varepsilon \sim G(0, \sigma_\varepsilon^2) \implies \frac{\varepsilon}{\sigma_\varepsilon} \sim G(0,1)$$

Therefore:

$$\mathbb{E}_\varepsilon(\max(V_2 + \varepsilon)) = \mathbb{E}_\varepsilon\left[\sigma_\varepsilon \max\left(\frac{V_2 + \varepsilon}{\sigma_\varepsilon}\right)\right] = \sigma_\varepsilon \mathbb{E}_\varepsilon\left[\max\left(\frac{V_2 + \varepsilon}{\sigma_\varepsilon}\right)\right]$$

It can be shown that if a variable $Y \sim G(0,1)$, then :

$$\mathbb{E}_Y \max_j((\delta_j + Y)) = \mu + \gamma + \log\left(\sum_j e^{\delta_j}\right),$$

where j stands for the distinct choice alternatives, $\delta_j := \frac{V_j}{\sigma_\varepsilon}$, γ is the Euler-Mascheroni constant, and μ is the location parameter of ε (in our case = 0).

Applying the result above, we obtain

$$\begin{aligned}\mathbb{E}_\varepsilon(\max(v_2 + \varepsilon)) &= \sigma \mathbb{E}_\varepsilon \max_j\left(\frac{v_{2j}}{\sigma_\varepsilon} + \frac{\varepsilon_j}{\sigma_\varepsilon}\right) \\ &= \sigma_\varepsilon\left[\gamma + \log\left(\sum_j e^{\frac{V_j}{\sigma_\varepsilon}}\right)\right]\end{aligned}$$

Finally, note that for any triplet $x_s^2 = z, h, a$, we are able to compute the following probability:

$$P(\text{going to college}) = P(V(x_s^2; h_3) > V(x_s^2; h_2)) = \frac{e^{\frac{V(x_s^2;h_3)}{\sigma_\varepsilon}}}{e^{\frac{V(x_s^2;h_3)}{\sigma_\varepsilon}} + e^{\frac{V(x_s^2;h_2)}{\sigma_\varepsilon}}} \tag{8}$$

where σ_ε is the standard deviation of the shock.

B Calibration

Table B1: Age-earnings profile.

ξ	h_0	h_1	h_2	h_3
$t = 1$	-	-	-	-
$t = 2$	1	1.37	2.28	5.42
$t = 3$	1.41	2.3	4.12	7.94
$t = 4$	1.29	4.17	4.47	9.26

C Figures

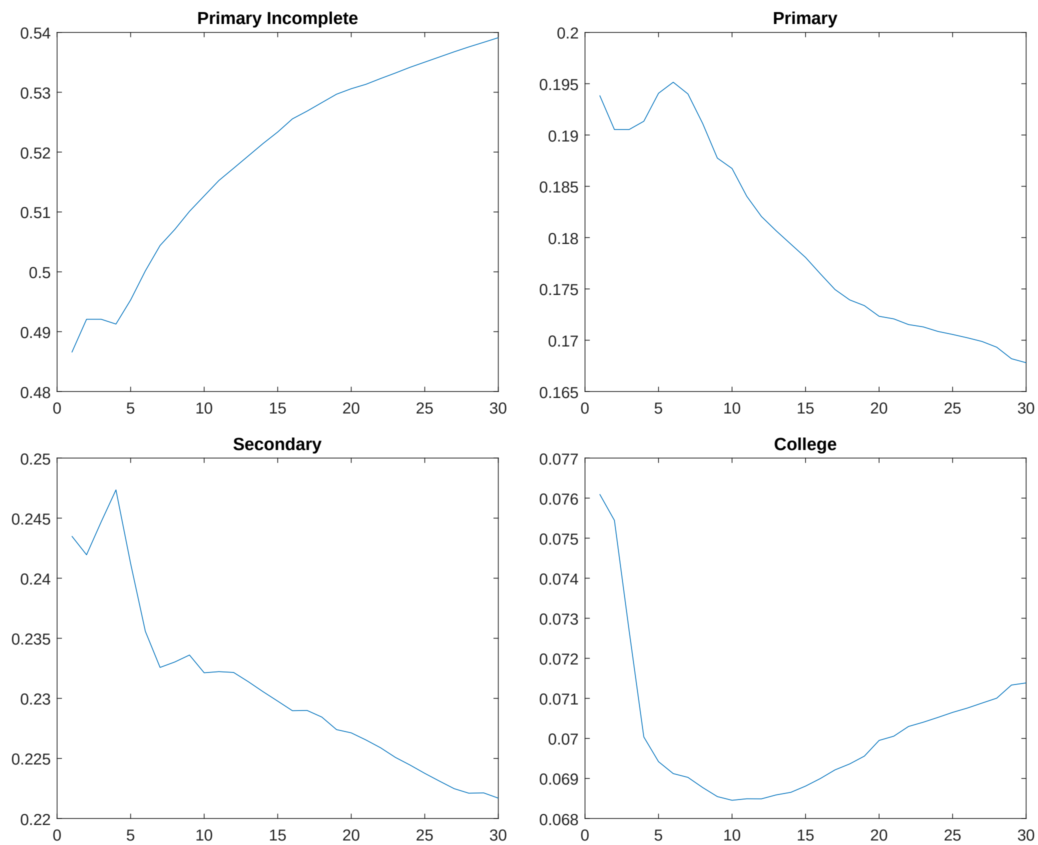

Figure C1: Schooling dynamic along the transition between the baseline steady-state and the UBI steady-state.

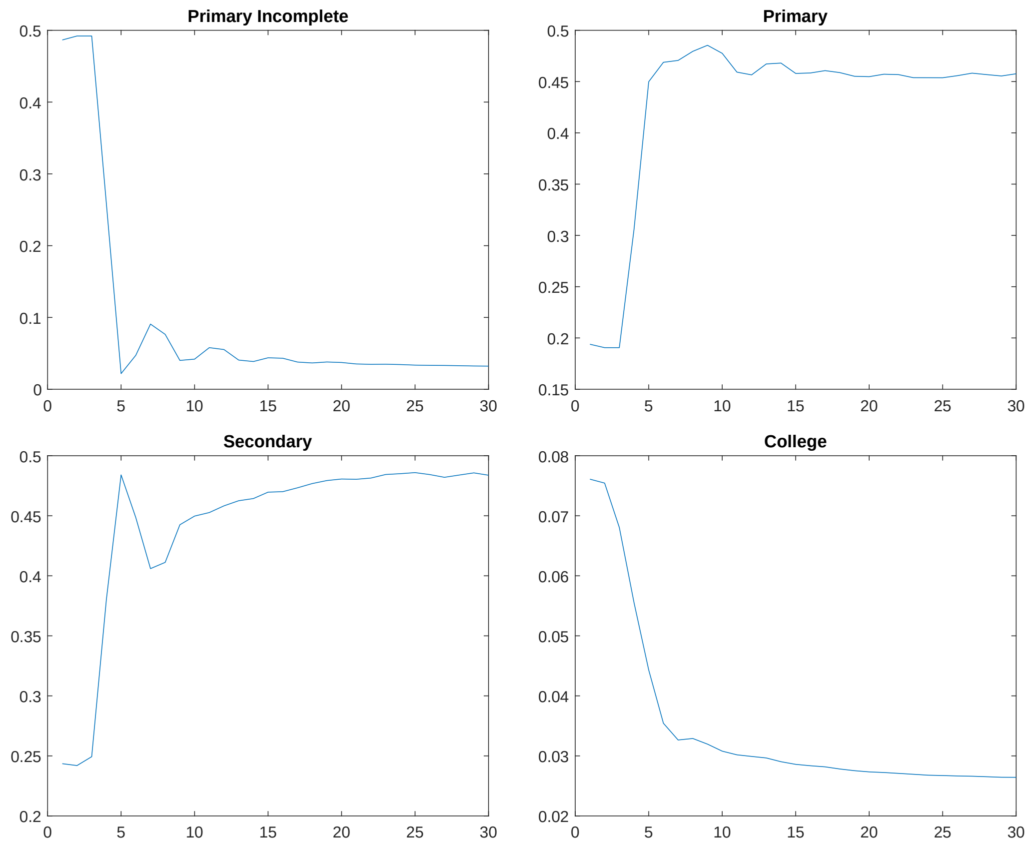

Figure C2: Schooling dynamic along the transition between the baseline steady-state and the CCT steady-state.

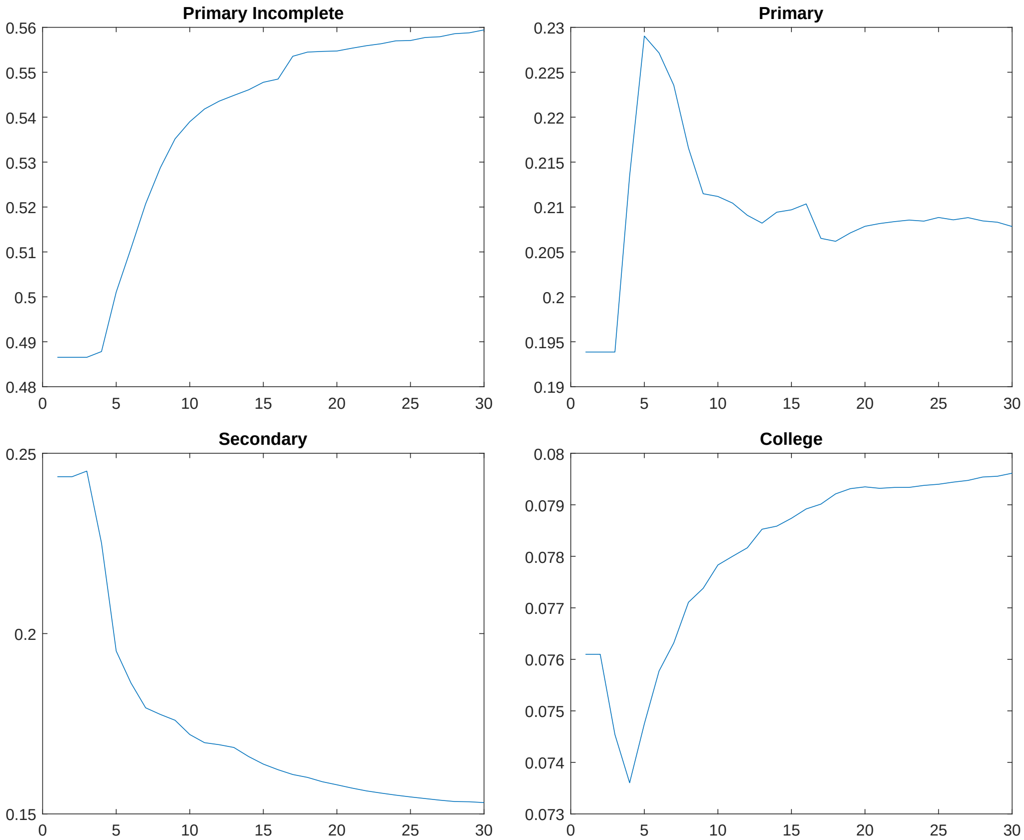

Figure C3: Schooling dynamic along the transition between the baseline steady-state and the CCT without schooling requirements steady-state.

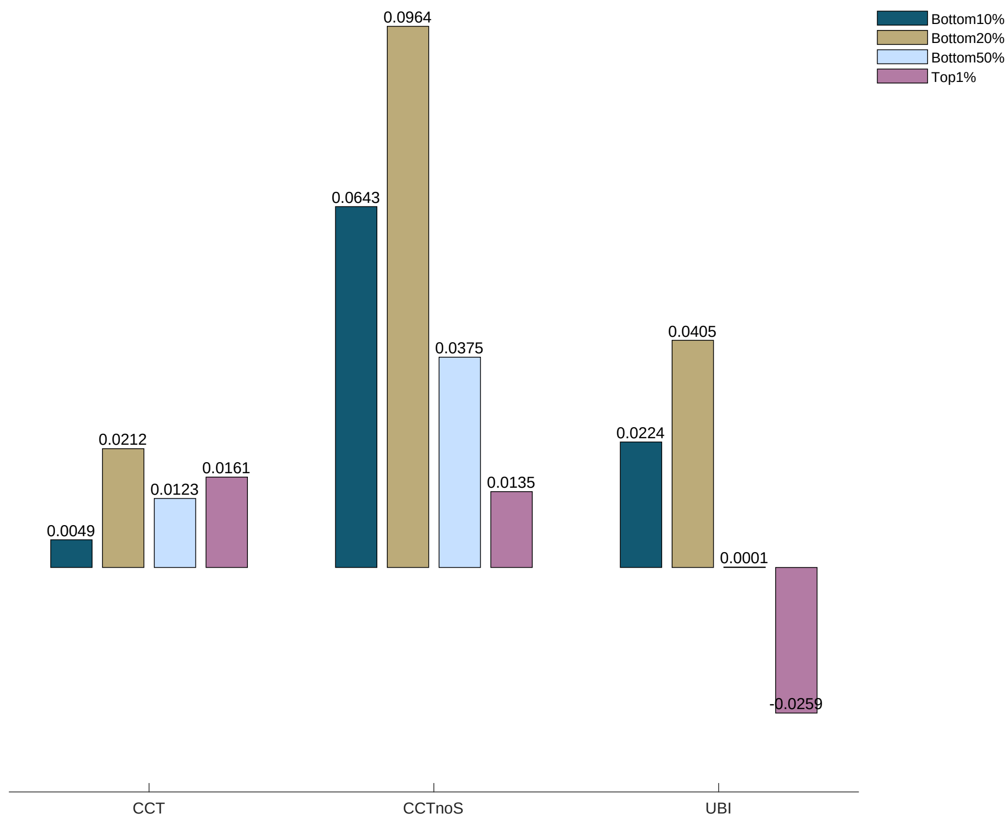

Figure C4: Welfare variation, in CE units, across asset holdings relative to baseline scenario without transfers. By CCTnoS we mean a CCT transfer without schooling requirements.

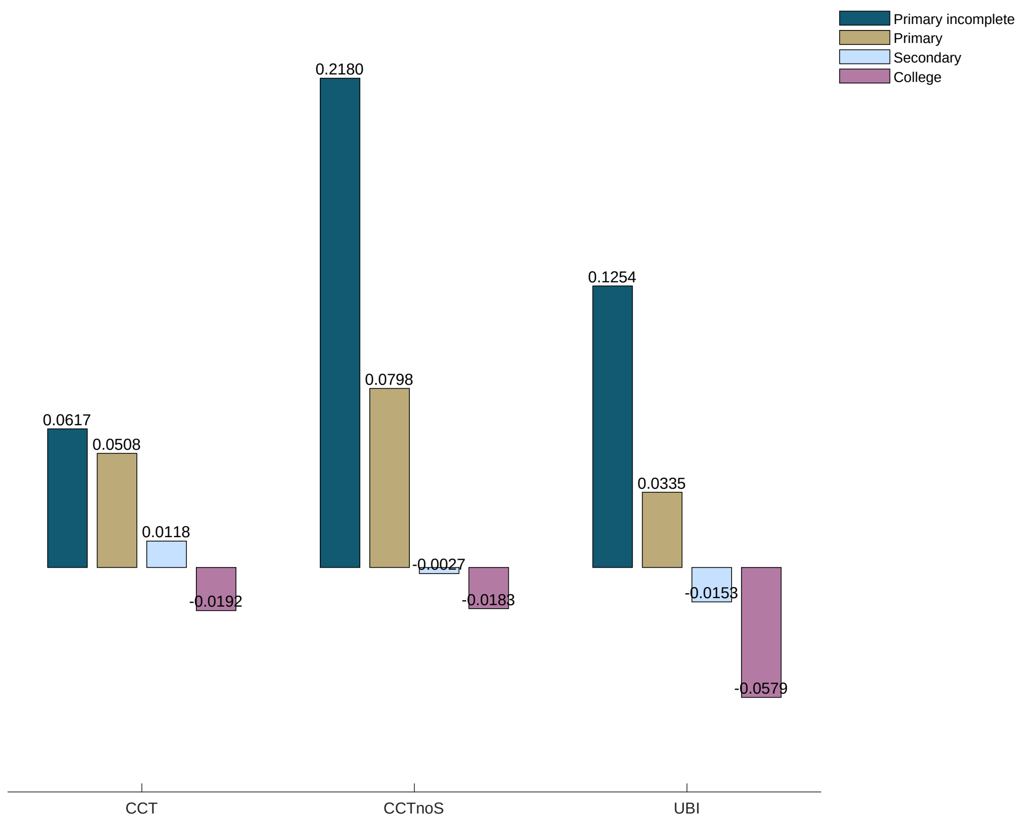

Figure C5: Welfare variation, in CE units, across educational groups relative to baseline scenario without transfers. By CCTnoS we mean a CCT transfer without schooling requirements.

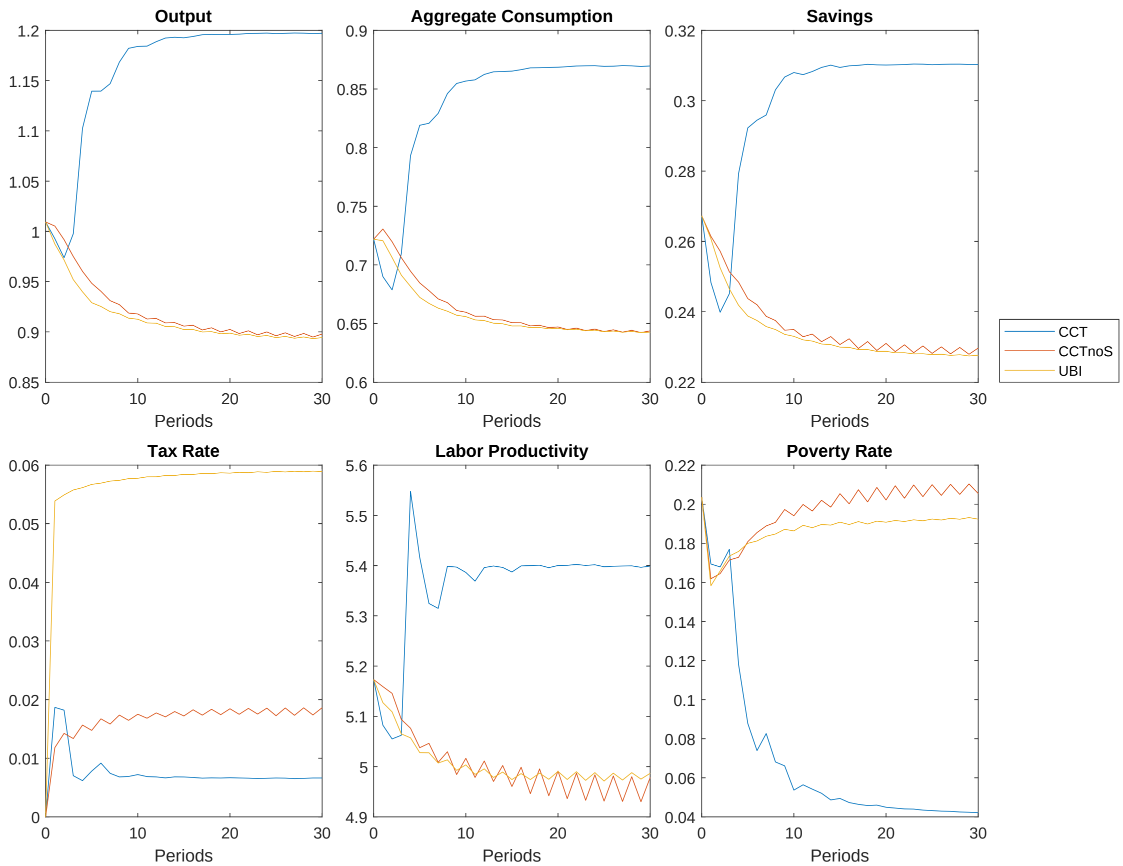

Figure C6: Dynamics of selected aggregate variables along the transition between the baseline steady-state and the policy steady-state.By CCTnoS we mean a CCT transfer without schooling requirements.