

Cash Transfers to the Poor and the Labor Market*

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Abstract

This paper studies the effects of cash transfers to the poor on the labor market. We investigate this issue by building an equilibrium matching model of the labor market with endogenous job destruction in which agents can be in three states: employed, unemployed, or out of the labor force (home production). Workers are heterogeneous in their labor market productivity and face an idiosyncratic productivity shock that arrives at constant instantaneous rate. Depending on this shock, workers might want to stay in the job, become unemployed, or leave the labor market; in addition, workers out of the labor force might decide to look for a job. We introduce cash transfers to all agents with income below some threshold level. Our analysis has implications for policy. We found two qualitative results: (i) The size of cash transfers has a negative effect on the employment rate, but an ambiguous effect on the unemployment rate; and (ii) the coverage of this welfare program has a positive effect on the employment rate, and an ambiguous effect on the unemployment rate. The numerical simulations also show that: (i) if the government target is to reduce inequality and poverty, the more efficient policy is to increase the level of benefits instead of increase the eligibility of the program; (ii) compared to a welfare program that condition eligibility to labor market participation, the “unconditional” cash transfer program has a stronger impact on inequality and poverty, but with a reduction in labor market participation and output.

JEL Classification: E60; H20; J20

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1 Introduction

In his study about the growth of social spending in the last three centuries, Peter Lindert posits that: “*The first kind of social spending to exceed 1 percent of national product was, and still is, the most controversial kind: direct assistance to the poor*” (Lindert (2004, p. 39)). Some of these assistance to the poor are in kind, but there are also transfers in cash.¹

Recently, many developing countries have adopted some type of conditional cash transfers to the poor as a mechanism to fight poverty, malnutrition, and inequality. Two examples are the *Bolsa Família* in Brazil and *Progressa* in Mexico, but similar programs are widespread around the world, including one in the city of New York (see Currie and Gahvari (2008)).² Under *Bolsa Família*, for instance, families with income less than R\$ 60 (roughly US\$ 38) per capita receive R\$ 62, plus R\$20 per child (aged 15 and lower) up to three children, and R\$ 30 per adolescent (aged 16 and 17) up to two children. Therefore, poor families can receive up to R\$ 182, which is about 40 percent a minimum wage in Brazil. The conditionalities of these transfers are the beneficiary families compliance with requirements such as school attendance, vaccine, and pre-natal visits (see Brazilian Ministry of Social Development). The total coverage is large: Roughly 11.1 million families or about 44 million people. In the poorest Brazilian region, i.e., in the Brazilian Northeast, about 49 percent of all families is enrolled in this program.³

There are a number of studies that evaluates the effects of these cash transfers program to the poor on food consumption, nutrition, school attendance, child labor, and labor supply.⁴ In fact, the focus of the previous studies on these issues is explained by the

¹In his book *Capitalism and Freedom*, Milton Friedman (1962) also advocates cash transfers to the poor as a social measure to alleviate poverty.

²There are also a number of welfare programs that give some income assistance to the poor in developed countries. Some examples are: Food Stamps, Temporary Assistance for Needy Families (TANF), and Earned Income Tax Credit in the United State; and Working Family Tax Credit, and the Income Support program in the United Kingdom (see Blundell and Meghir (2002), Currie and Gahvari (2008), Pavoni and Violante (2007), and Saez (2002)).

³In some very poor cities, such as Manari in the state of Pernambuco, 90 percent of all families participates in the program. Estimates show that government spending on this program accounts by only 0.3 percent of total GDP.

⁴See, for instance, Attanasio, Meghir, and Santiago (2005), Attanasio, Battistin, Fitzsimons, Mesnard, and Vera-Hernandez (2005), Bourguignon, Ferreira, and Leite (2003), Eissa and Liebman (1996), and Hodinott and Skoufias (2004).

goals of these cash transfers programs. They are: (i) reduce poverty and inequality; and (ii) break the inter-generational transmission of poverty by conditioning these transfers on beneficiary compliance with, for instance, school attendance and health check ups. However, it is important to investigate how these poverty alleviating programs affect the labor market and whether or not there are more efficient alternative policies that can fight poverty and inequality.

This is the goal of this paper. We focus on the impacts of cash transfers to the poor on the labor market. In particular, we address the following questions: What are the effects of cash transfers to the poor on the unemployment rate, employment rate, and participation rate? Is there any alternative policy that can fight poverty and inequality and might have a more efficient labor market outcome? In order to address these questions, we build a matching model of the labor market based on Diamond (1982), Mortensen (1982), and Pissarides (1990) where workers can be in three states: employed, unemployed, or out of the labor force, producing the consumption good at home.⁵ The model is related to a recent contribution by Garibaldi and Wasmer (2005).⁶ There is a matching technology, which makes the number of successful matches at any moment in time a function of the aggregate measures of unemployed workers and vacant jobs. As in Mortensen and Pissarides (1994), job destruction is endogenous. Workers are heterogeneous in their labor market productivity. A new productivity level arrives at constant instantaneous rate. Depending on the shock of their productivity level, workers might want to leave their job and workers out of the labor force might decide to search for a job.

We introduce cash transfers to the poor in this framework. The government provides benefits, $b > 0$, to all workers with income less than a threshold value, \underline{w} . It is important to highlight that differently from unemployment insurance, workers in this welfare program receive cash transfers independently whether they are working, unemployed, or out of the labor force - working in home production. The only requirement to be entitled

⁵Search and matching models are the main tool used in macroeconomics to evaluate the effects of policies on the labor market. See Mortensen and Pissarides (1999) and Rogerson, Shimer, and Wright (2005) for a review of the literature on search and matching models.

⁶They analyze the effect of payroll taxes and unemployment benefits on participation decisions.

to this program is to have income less than w . This is similar to a negative income tax, as advocated by Friedman (1962) and Mirrlees (1971). The difference is that benefits do not vary with income for those that are eligible to receive benefits.⁷ We also, as in Saez (2002), condition transfers on earned income only, and not on other observable information. Therefore, we will also call this cash transfer mechanism as an “Unconditional” Cash Transfer (UCT) program.⁸ We investigate the effects of the size and the coverage of cash transfers on the labor market. We show the following qualitative results:

1. the size of cash transfers has a negative effect on the employment rate, but an ambiguous effect on the unemployment rate. Participation rate is affected negatively; and
2. the coverage of the program has a positive effect on the employment rate, and an ambiguous effect on the unemployment rate.

We also calibrate the model to mimic key features of the United States labor market and provide some numerical simulations, which allow us to investigate numerically the effects of cash transfers on the labor market and inequality. The calibration for the United States is explained by data availability. It is important to emphasize that the point of these simulations is to investigate how the model changes numerically since analytically we do not have a clear cut of the effects of cash transfers on the labor market. Our goal in these simulations is not to provide a quantitative analysis of cash transfers in a particular labor market,⁹ but to identify numerically what are the stronger effects of cash transfers

⁷Benefits in the *Bolsa Familia* program vary with the number of dependent children. In addition, there are two threshold values of income, but below these threshold values benefits are lump-sum payments. In Appendix D we consider a model in which benefits vary with the income of the household.

⁸The term “unconditional” is used here because in this cash transfer program, workers with income less than a threshold value receive benefits independently whether they are participating or not in the labor market. However, it is important to highlight that most of this cash transfer program, as we discussed previously, are conditional on families compliance with requirements such as children’s school attendance and vaccination, and mother’s pre-natal visits. We implicitly assume compliance with those requirements. Since our goal is not to evaluate the effects of welfare programs on human capital accumulation or health status, but rather on labor market outcomes, this is not a problematic assumption for our study.

⁹This is important, since as Shimer (2005) has shown, standard matching models cannot replicate some key features of the labor market and we should be careful to use them to make quantitative analysis.

on some variables that are ambiguously affected by these transfers. From these numerical exercises we found the following:

1. this cash transfer program has a negligible impact on unemployment;
2. the extended unemployment rate, which include the marginally attached workers - those that has a job, but if they loose their jobs they decide to stay out of the labor force, is positively affected by this social program;
3. if the government target is to fight inequality and poverty, the more efficient policy is to increase the level of benefits instead of increasing the eligibility of the program;
4. (iv) such policy comes with a negative impact on efficiency (unless the majority of workers receive transfers), due to a decrease in the employment rate, and on government finances.

Alternatively, we also investigate the effects of a welfare program that provides benefits only for those workers that are looking for a job and those with income less than a threshold value. Therefore, this alternative program restricts the eligibility of benefits to labor market participation and penalize home production. Notice that this is not identical to the Earned Income Tax Credit (EITC) program of the United States. As in the EITC program, those agents that are out of the labor force do not receive benefits, but contrary to the EITC program unemployed workers do receive benefits. Analytically, we found that contrary to the UCT program this Labor Market Participation (LMP) program has a positive effect on employment and participation rates, and an ambiguous effect on the unemployment rate. Quantitatively, we show that comparing to the UCT program, the LMP income transfers generate more efficiency at the cost of more inequality and less reduction on poverty. Therefore, if the government goal is to reduce inequality and poverty, the unconditional cash transfer program is more efficient than the LMP income transfer. Notice, however, that if we interpret the home production sector as the informal sector, this LMP program might be an effective mechanism to reduce informality and tax evasion

if benefits are conditioned on working in the formal sector. This might be particularly important in developing countries with economies that present a large informal sector and tax evasion¹⁰

There is a long tradition in economics to analyze analytically and empirically the effects of social programs on labor supply and participation (see, for instance, Eissa and Liebman (1996), Heckman (1993), and Hoynes (1996)). There is also a large literature in economics on the optimal design of welfare programs (see Mirrlees (1971), Pavoni and Violante (2007), Saez (2002), Shavell and Weiss (1979), among others), and on the effects of unemployment benefits, Welfare-to-Work policies and firing costs on the labor market.¹¹ Observe that although related, unemployment benefits and Welfare-to-Work policies are different from the cash transfers that we investigate. From our knowledge, however, there are no study that analyze the impact of cash transfers to the poor on the labor market in an equilibrium model of the labor market with endogenous job destruction and labor market participation.¹² We believe that this paper fills this gap in the literature and provide far-reaching implications for policy.

Besides this introduction, this paper has five more sections: In section 2 we develop the matching model with cash transfer and labor market participation. Section 3 defines the equilibrium of the model and derives some analytical results. Section 4 presents the alternative policy that condition eligibility to labor market participation and shows how such policy affects unemployment, employment and participation rates. Section 5 calibrates the model and provides some numerical simulations. Section 6 contains the con-

¹⁰For the size of the informal sector across countries, see Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2002) and Schneider and Enste (2000). For a model in which the informal sector arises endogenously and how policies affect the size of this sector, see Antunes and Cavalcanti (2007) and Rauch (1991), among others. For the effects of the informal sector on optimal policies, see Cavalcanti and Villamil (2003).

¹¹For the effects of unemployment insurance and Welfare-to-Work policies on the labor market, see Pissarides (1990), Ljungqvist and Sargent (1998), Pavoni and Violante (2007), among others. For the effects of firing costs, see, for instance, Blanchard and Portugal (2001), Bertola and Rogerson (1997), Cavalcanti (2004), and Ljungqvist (2002).

¹²See Ngai and Pissarides (2008) for an interesting model of how taxes and welfare programs affect the employment rate. The model used by Ngai and Pissarides (2008) is different from ours. Their focus is on the sectoral allocation of labor supply and on home production. They use a consumer problem with a leisure-labor choice without matching frictions in which agents choose the allocation of their time endowment in leisure, market hours, and home production. We see our work complementary to theirs. See also Ngai and Pissarides (2009).

cluding remarks.

2 The model

2.1 Set up

Time is continuous and there are two commodities in this economy: one consumption good and one labor input. The economy is inhabited by a continuum of infinitely lived agents of measure one who are heterogenous with respect to their labor market productivity, x . There is also a continuum of measure one of firms. Each firm has access to a production technology that exhibits constant returns to scale with labor as the only input. Without loss of generality, we assume that each firm employs at most one worker. When employed, a worker produces yx units of the consumption good. Both workers and firms are neutral to risks and discount the future at a constant exogenous rate r .

As in Garibaldi and Wasmer (2005), workers can be in three states: Employed and receiving the market wage $w(x)$ in units of the consumption good; unemployed and searching for a job; or working at home producing h units of the consumption good.¹³ Worker's productivity in the market is stochastic and is determined by a general distribution $G(x)$, with support in the unit interval. Productivity x changes over time according to a Poisson process with arrival rate ψ . In this way, workers productivity can move, with probability ψ to a new productivity value that can be bigger or lower then the previous value.¹⁴ Note that workers productivity can be hit by a shock moving workers to a situation of program coverage. Before starting a productive activity, workers and firms are involved in a search process for a productive partner, where c equals search cost for the

¹³We could also have assumed that agents searching for a job can also produce sh with $s \in (0, 1)$ in home production. Such assumption would not change any of the qualitative results.

¹⁴Observe that our productivity process implies that conditional on the arrival of a shock, workers' new productivity is independent of the workers' current productivity. This implies that, once a shock arrives, a worker with a high productivity value has the same probability of facing a very low productivity shock than a worker that has already a low productivity value. Notice, however, that *ex-ante* all workers are the same, so our analysis focuses in a particular fraction of the labor market in which workers might be entitled to cash transfers. We therefore believe that our analysis is appropriated to investigate the effects of cash transfers on the labor market of unskilled workers.

firm. The number of job matches formed per period is given by a non-negative, concave and homogeneous of degree one function, $m(v, u)$, which is crescent in its two arguments, where v equals vacancy rate and u denotes the fraction of unemployed workers. By the homogeneity assumption, we can write the probability rate of filling a vacancy as: $q(\theta) = \frac{m(u, v)}{v} = m(\frac{1}{\theta}, 1)$, where $\theta = \frac{v}{u}$ denotes the tightness of the labor market. In addition, the rate at which an unemployed worker moves to employment is $\theta q(\theta) = \frac{m(u, v)}{u}$.

2.2 Government sector

There is a government that provides income transfers, $b > 0$, to all workers with income less than \underline{w} . Workers receive income transfers independently whether they are working, unemployed, or out of the labor force, i.e., working in home production. As in Acemoglu (2001), we assume that cash transfers are financed through lump-sum taxes.¹⁵

2.3 Workers

Let $W^{NB}(x)$ and $W^B(x)$ be the asset value for a worker with productivity x of being employed receiving or not benefits, respectively. Let $U(x)$ be the asset value of being unemployed. The following Bellman equations describe the problem of a worker with productivity x :

$$(r + \psi)W^{NB}(x) = w(x) + \psi \int_0^M \max\{W^B(z), U(z)\}dG(z) + \psi \int_M^1 \max\{W^{NB}(z), U(z)\}dG(z). \quad (1)$$

$$(r + \psi)W^B(x) = w(x) + b + \psi \int_0^M \max\{W^B(z), U(z)\}dG(z) + \psi \int_M^1 \max\{W^{NB}(z), U(z)\}dG(z). \quad (2)$$

¹⁵We can also assume that this cash transfer program corresponds to a small fraction of government spending and raising revenues to finance small changes in this program does not have any strong impact on taxes.

$$(r + \psi)U(x) = b + \max\{h, \theta q(\theta)G(M)[W^B(x) - U(x)] + \theta q(\theta)(1 - G(M))[W^{NB}(x) - U(x)]\} \quad (3)$$

$$+ \psi \int_0^1 U(z)dG(z).$$

Equation (1) implies that employed workers without government benefits receive $w(x)$ flow units of the consumption good in wages, and at instantaneous rate ψ obtain a new value for their productivity, which may lead them to leave the job. Equation (2) is analogous to equation (1). It implies that employed workers with income less than \underline{w} receive flow income $w(x)$ plus benefits b , and at rate ψ obtain a new value for their productivity, which might lead them to change their employment status. Observe that $M = w^{-1}(\underline{w})$ corresponds to the productivity level such that if $x < M$ workers receives cash transfer b , and if $x > M$, workers do not receive government benefits.¹⁶ Equation (3) suggests that workers without a job receive b and they might choose between home activities receiving h from home production or they might choose to search for a job.¹⁷ We could also interpret the home production sector as an informal sector in which it is hard for official institutions to verify income and therefore workers in this sector are still entitled to cash transfers.¹⁸ At rate ψ , workers draw a new productivity level, x , reevaluating their choice between seeking for a job or remaining in home production. Notice that once a job match is formed, it can only be destroyed endogenously, due to variations related to market productivity.

¹⁶As we will show, wages are a function of the labor market productivity.

¹⁷Alternatively, we could have added a Bellman equation for being out of the labor force, such that:

$$H = h + b + \psi \int_0^1 \max\{H(z), U(z)\}dG(z).$$

Equation (3) contains already this state.

¹⁸For matching models of the labor market with an explicit informal sector, see Albrecht, Navarro, and Vroman (2009), El Badaoui, Strobl, and Walsh (2010), and Satchi and Temple (2010).

2.4 Firms

Let V and $J(x)$ describes the asset values for a firm of a vacant and a filled job with a worker with productivity x , respectively. They are described by the following Bellman equations:

$$rV = -c + q(\theta)[J^e(x) - V]. \quad (4)$$

$$(r + \psi)J(x) = yx - w(x) + \psi \int_0^1 \max\{J(z), V\}dG(z). \quad (5)$$

A firm with a vacant position spends flow c in searching for a worker and at rate $q(\theta)$ the firm fills this vacancy. Observe that, before a position is filled firms do not know the productivity of the worker or the quality of the match. $J^e(x)$ therefore represents the expected value of filling a vacant position. In addition, a firm with a filled job produces flow yx of the consumption good, paying $w(x)$ in wage. At rate ψ , the worker that fills this vacancy obtains a new productivity level, which allows the firm to reevaluate their decision to continue producing with this worker or destroy the match to search for a new one.

Free entry in the labor market implies that no economic rents can be gained from vacancy, i.e., $V = 0$. Therefore, from (4) we have that:

$$J^e(x) = \frac{c}{q(\theta)}. \quad (6)$$

There is job creation up to the point where the expected value of a new job match equalizes the cost of occupying a vacancy, expressed in terms of the rate that this position becomes occupied.

2.5 Reservation productivity

Once a job match is formed, there is an economic surplus that must be divided between the worker and the firm. As standard in the literature, we assume that this surplus is divided according to the Generalized Nash Bargaining between firms and workers:

$$\beta[J(x) - V] = (1 - \beta)[W^j(x) - U(x)], \quad j = NB, B, \quad (7)$$

where β denotes workers' bargaining power.

It is important to define the reservation productivity that makes workers indifferent between working in the market or in home production, E , and also the productivity level that makes workers indifferent between searching for a job or working at home, R . The surplus generated by a match is:

$$S^j(x) = J(x) + W^j(x) - U(x), \quad j = NB, B. \quad (8)$$

Using equations (1), (2), (3) and (5), evaluating $S^j(x)$ for $j = NB$ and B at $x = E$, and subtracting $S^j(E)$ from $S^j(x)$, we have that:

$$\beta S^j(x) = \frac{\beta y(x - E^j)}{r + \psi}, \quad j = NB, B. \quad (9)$$

The surplus for both cases have the same structure because b affects uniformly the outside option of all workers.

Equation (3) implies that when workers are indifferent between searching for a job or engaging in home activities, then:

$$\frac{h}{\theta q(\theta)} = \beta y \left(\frac{R^j - E^j}{r + \psi} \right), \quad j = NB, B. \quad (10)$$

The left hand side of (10) represents workers' expected opportunity search cost. The right hand side stands for the benefits obtained with market participation. Since $h > 0$, then

the left hand side of (10) is always positive, and $R^j > E^j$. Moreover, since the left hand side of (10) is the same whether the worker receive or not benefits, then $R^{NB} - E^{NB} = R^B - E^B$.

Following Garibaldi and Wasmer (2005), the market exit dynamics is determined by:

$$E^{NB} = \frac{b + h + \frac{\psi y}{r+\psi} \int_{E^{NB}}^1 G(x) dx}{y}, \quad (11)$$

$$E^B = \frac{h + \frac{\psi y}{r+\psi} \int_{E^B}^1 G(x) dx}{y}. \quad (12)$$

Proposition 1 *If $b > 0$, then $E^{NB} > E^B$ and $R^{NB} > R^B$.*

Proof: See appendix A.

Expressions (11) and (12) determine the level of productivity resulting from indifference between working in the market or engaging in home activities. The left hand side of both equations gives the level of productivity that makes workers indifferent between leaving or not the job to home production. The right hand side represents the gain obtained by being employed. Observe that the higher income transfers, b , the higher will be the exit rate, since the value of being at home increases. However, the levels of reservation productivity $(E^j, R^j)_{j=NB,B}$ do not depend on productivity level $M = w^{-1}(\underline{w})$ and some of these threshold values might not be binding depending on the coverage of the program. In an economy without the cash transfer program (e.g., $M = w^{-1}(\underline{w}) = 0$), workers without a job and with productivity in the interval (E^{NB}, R^{NB}) are marginally attached to the labor market. If they had a job, they would be working in the labor market, but they are not willing to pay the searching cost (see Garibaldi and Wasmer (2005) and Jones and Riddell (1999)). Employed workers with productivity in this interval at some point in time had productivity above R^{NB} but if they loose their job they will be out of the labor force. When there is a cash transfer program, the measure of marginally attached workers change. We will discuss more about this shortly.

2.6 Job creation

Using equations (6) and (9) yields:¹⁹

$$\frac{c}{q(\theta)} = \frac{(1 - \beta)y(R^j - E^j)}{r + \psi}, \quad (13)$$

which determines the dynamics for new job creation. The right hand side of (13) describes the firm benefit of filling a vacant position. The left hand side represents the expected cost related to filling this vacancy. The larger the difference $(R^j - E^j)$, the higher will be θ , thus the higher will be the new job creation dynamics.

2.7 Wage determination

Using equations (1)-(7), we obtain four wage functions. Firstly, if $x > M$, then:

$$w_1^{NB}(x) = \beta yx + (1 - \beta)(b + h), \text{ for } x < R^{NB} \quad (14)$$

$$w_2^{NB}(x) = \beta(yx + c\theta) + (1 - \beta)b, \text{ for } x > R^{NB}. \quad (15)$$

Moreover, if $x < M$, then:

$$w_1^B(x) = \beta yx + (1 - \beta)h, \text{ for } x < R^B \quad (16)$$

$$w_2^B(x) = \beta(yx + c\theta), \text{ for } x > R^B. \quad (17)$$

Observe that the four previous equations give us the wage rates considering that once unemployed, the worker either migrates to home production or returns to the labor market to look for a new job opportunity. The wage rates are composed by two terms: one related to workers' job match productivity and the other to workers' outside option. The outside option varies whether workers receive or not benefits and whether his productivity is larger than reservation productivity R^j , $j = NB, B$. It is important to observe that some

¹⁹We can write $(1 - \beta)S(x) = J^e(x) = \frac{c}{q(\theta)}$.

of these wages might not be binding, depending on the productivity level M associated with income \underline{w} . Recall that all workers with productivity $x < E^B$ will be out of the labor force.

Five cases are possible and we study them below:

Case 1: If $M = w^{-1}(\underline{w}) < E^B$, then only unemployed workers and those out of the labor force will receive government income transfer b . In this case, equations (16) and (17) will not be binding. Workers with productivity $x < E^{NB}$ will be out of the labor force. Marginally attached workers are those with productivity in the interval $[E^{NB}, R^{NB}]$.

Case 2: If $E^B < M = w^{-1}(\underline{w}) < R^B$, then only workers unemployed, out of the labor force and those with productivity $x \in [E^B, M)$ will receive government benefits. Equation (17) will not bind. Interestingly, agents with productivity $x \in [M, E^{NB}]$ will be out of the labor force, despite the fact that workers with lower productivity, $x \in [E^B, M)$, might be working in the market. This is because if workers with productivity $x \in [M, E^{NB}]$ have a job, they will not receive cash transfers. The measure of marginally attached workers is given by: $x \in [E^B, M] \cup [E^{NB}, R^{NB}]$.

Case 3: If $R^B < M = w^{-1}(\underline{w}) < E^{NB}$, then all equations will bind. Similarly to case 2, agents with productivity $x \in [0, E^B] \cup [M, E^{NB}]$ will be out of the labor force. The measure of marginally attached workers is: $x \in [E^B, \min\{M, R^B\}] \cup [E^{NB}, R^{NB}]$.

Case 4: If $E^{NB} < M = w^{-1}(\underline{w}) < R^{NB}$, then all equations will bind. Only workers with productivity less than E^B will be out of the labor force. Marginally attached workers are those with productivity x in the interval $[E^B, \min\{M, R^B\}] \cup [M, R^{NB}]$.

Case 5: If $R^{NB} < M = w^{-1}(\underline{w})$, then all equations will bind, except equation (14). Agents out of the labor force are those with productivity less than E^B . The measure of marginally attached workers is given by: $x \in [E^B, R^B]$.

Notice that case 1 does not have any effect on the labor market, since there will be no employed worker receiving benefit. Cash transfers will, however, have distributional

and welfare effects. Cases 4 and 5 are those in which most of the workers receive cash transfers. Cases 2 and 3, in our point of view, are the two most interesting ones. In these two cases, some workers will decide to leave the labor force (if they work, they will not receive benefits), despite the fact that some workers with lower productivity are actively working in the market.

Figure 1 displays the effects of cash transfers on income for different levels of productivity.²⁰ The blue solid line corresponds to the income of each household, who are heterogeneous in the labor market productivity, in the case without the cash transfer program. Notice that there is a threshold value of productivity, such that if agents' productivity is below this level, they prefer to stay out of the labor force. When we introduce the cash transfer program²¹ (black solid line) labor market participation decreases, and some workers with productivity between M and E^{NB} decide to leave the labor force. They choose to do so because they will loose benefits in case they find a job. There are, however, workers with lower productivity that are actively working in the labor market. Notice that as we increase the size of transfers further (black dotted line), labor market participation decreases more.

3 Equilibrium and analytical results

The equations that describe employment and unemployment dynamics are given by:

$$\dot{e} = [\theta q(\theta)u - \psi G(E^B)e]G(M) + [\theta q(\theta)u - \psi G(E^{NB})e][1 - G(M)], \quad (18)$$

$$\begin{aligned} \dot{u} = & \{-[\theta q(\theta) + \psi G(R^B)]u + \psi[1 - G(R^B)](1 - e - u)\}G(M) + \dots \quad (19) \\ & \{-[\theta q(\theta) + \psi G(R^{NB})]u + \psi[1 - G(R^{NB})](1 - e - u)\}[1 - G(M)]. \end{aligned}$$

Notice that in both equations we separate the flow of workers that receive or not benefits. In the employment equation, there are two flows: the first one represents the rate at

²⁰In Figure 1 we are abstracting from unemployed workers.

²¹This is the case in which $E^B < M < E^{NB}$.

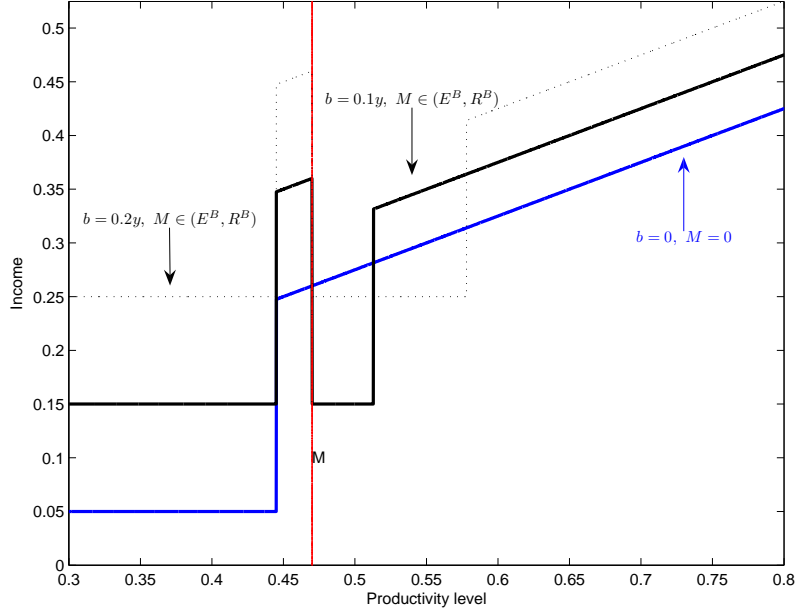


Figure 1: The effects of cash transfers on income. Blue solid line: case without cash transfer. Black solid line: case with cash transfer $b = 0.1y$ and $M \in (E^B, R^B)$. Black dotted line: case with cash transfer $b = 0.2y$ and $M \in (E^B, R^B)$

which unemployed workers migrate to employment ($\theta q(\theta)u$), while the second one equals the rate in which workers move from employment to home production ($-\psi G(E^j)e$). In the unemployment equation there are three flows: the flow of unemployed workers who find a job in the market ($-\theta q(\theta)u$); the flow of unemployed workers who move to home production ($-\psi G(R^j)u$); and the flow of agents who move from home production to unemployment ($\psi[1 - G(R^j)](1 - e - u)$).

In the steady-state $\dot{e} = \dot{u} = 0$ and therefore:

$$e = \frac{\theta q(\theta)u}{\psi\{G(E^B)G(M) + G(E^{NB})[1 - G(M)]\}}, \quad (20)$$

$$u = \frac{(1 - e)\psi\{[1 - G(R^B)]G(M) + [1 - G(R^{NB})][1 - G(M)]\}}{\theta q(\theta) + \psi}. \quad (21)$$

Now, we can define the equilibrium for this economy.

Definition: Given government policies (b, \underline{w}) , a steady-state equilibrium for this economy is a seven-tuple:

$(\theta, R^j, E^j, w_1^j(x), w_2^j(x), u, e)_{j=NB,B}$ such that equations (14)-(17), (10)-(13), (20) and (21) are satisfied.

The equilibrium has a block recursive structure. From equations (11) and (12), we can find E^{NB} and E^B . Using equations (10) and (13) we obtain:

$$\theta = \frac{(1 - \beta)h}{\beta c}.$$

Given θ and E^j , we can use (10) to find R^j . Then, using equations (14)-(17) we can find the wage rates. Finally, we can use (20) and (21) to find the equilibrium employment and unemployment rate. Notice that equation (20) defines a positive relationship between (e, u) , while (21) implies in a negative relationship between these two variables and we can show that the locus (20) crosses the (21) locus in only one point. Figure 2 shows the two equations in the (e, u) space for a particular parametrization of the model (see subsection 5.1).

The following proposition establishes the analytical effects of government policies $(b, M = w^{-1}(\underline{w}))$ on the steady-state level of employment and unemployment.

Proposition 2 *Consider a steady-state equilibrium. Then, for given government policies $(b, M = w^{-1}(\underline{w})) \gg 0$, we have that:*

- i. b affects e negatively; and b affects u ambiguously;*
- ii. M affects e non-negatively; and M affects u ambiguously.*

Proof: See appendix B.

When cash transfer, b , increases there are two opposing effects on unemployment: First, for relative high productive workers (i.e., workers with productivity level higher than R^{NB}) the opportunity cost of searching increases - because if they get a job they will loose benefits, therefore some of them choose to leave the labor market, which decreases unemployment. However, for less productive workers (i.e., with productivity slightly

higher than E^{NB}) the opportunity cost of being employed increases, and some of them choose to leave their job to home production. This decreases employment (and the labor force) and consequently increases the unemployment rate. Figure 2 illustrates the effects of cash transfer b on the unemployment and employment rates. It shows that while the unemployment rate is almost unchanged, the employment rate decreases as the level of benefits increases.

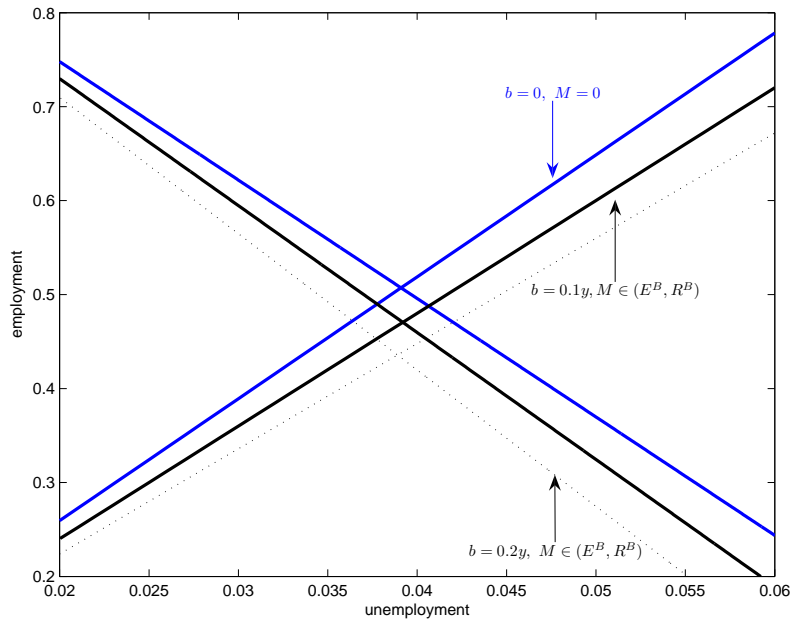


Figure 2: The effects of cash transfers on the employment and unemployment rate.

The productivity levels E^i and R^i for $i = B$ and NB are independent of the coverage of the program M . When the coverage of the program increases then there might be an increase in the fraction of workers that might work only because they receive benefits $x \in [E^B, \min\{M, R^B\}]$. This would increase the number of employed workers without increasing the number of workers searching for a job. In this case, the employment rate increases and the unemployment rate might decrease. However, if M increases further such that $M > R^B$, then there might be some workers $x \in [R^B, M]$ that might look for a job only because if they find one they would still receive benefits. The unemployment rate will increase.

In Appendix D we consider the cash transfer program that guarantees a minimum income w^* for all workers. In this policy, instead of having a fixed transfer $b > 0$ to all workers with income less than \underline{w} , the government provides a variable transfer:

$$b(x) = \max\{w^* - w(x), 0\}.$$

In this case, the coverage of the program varies directly with benefits $b(x)$. As a result, the effects of this minimum income program on the employment and unemployment rate are similar to the effects of the coverage of the cash transfer studied previously. See Proposition 4 in Appendix D. This program, however, suffers from a strong accountability problem since it is difficult to measure household income - in particular of very poor households - in developing countries with large informal sectors. This does not suggest that the cash transfer program with fixed benefits does not also suffer from accountability problems. However, in this case, it is only necessary to verify if the household's income is below or above a given threshold value of income, which minimizes such problems. Below, we consider an alternative welfare program.

4 Alternative policy: Labor Market Participation (LMP) program

Under this alternative welfare program, which we call a Labor Market Participation (LMP) cash transfer program, poor workers (with wage income lower than the threshold value \underline{w}) receives transfer b only if they are working or if they are searching for a job. Workers out of the labor force are not entitled to this program. In this case, the value functions representing the different states of workers are:

$$(r + \psi)W^{NB}(x) = w(x) + \psi \int_0^M \max\{W^B(z), U(z)\}dG(z) + \psi \int_M^1 \max\{W^{NB}(z), U(z)\}dG(z). \quad (22)$$

$$(r + \psi)W^B(x) = w(x) + b + \psi \int_0^M \max\{W^B(z), U(z)\}dG(z) + \psi \int_M^1 \max\{W^{NB}(z), U(z)\}dG(z). \quad (23)$$

$$(r + \psi)U(x) = \max\{h, b + \theta q(\theta)G(M)[W^B(x) - U(x)] + \theta q(\theta)(1 - G(M))[W^{NB}(x) - U(x)]\} + \psi \int_0^1 U(z)dG(z). \quad (24)$$

Once again, the value functions describing a vacant and a filled job for firms are unchanged and are still represented by (4) and (5), respectively.

The wage rates are determined as before. In this case, if $x > M$, we have that:

$$w_1^{NB}(x) = \beta yx + (1 - \beta)h, \text{ for } x < R^{NB}, \quad (25)$$

$$w_2^{NB}(x) = \beta(yx + c\theta) + (1 - \beta)b, \text{ for } x > R^{NB}. \quad (26)$$

Moreover, if $x < M$, then:

$$w_1^B(x) = \beta yx + (1 - \beta)(h - b), \text{ for } x < R^B, \quad (27)$$

$$w_2^B(x) = \beta(yx + c\theta), \text{ for } x > R^B. \quad (28)$$

Compared to the wage rates (14)-(17), notice that only the wages for $x \in [M, R^{NB}]$ and $x < [E^B, \min\{R^B, M\}]$ are different. Observe that compared to the original cash transfer program, this LMP program penalizes home production. For instance, for those agents with $x \in [M, R^{NB}]$, the firm does not need to compensate them for the cash transfer, since if they loose a job, they will be out of the labor force without the cash transfer.

Equation (24) implies that when workers are indifferent between searching for a job or engaging in home activities, then:

$$\frac{h - b}{\theta q(\theta)} = \beta y \left(\frac{R^j - E^j}{r + \psi} \right), \quad j = NB, B, \quad (29)$$

which is different from (10). Now, the opportunity cost of searching is lower, since agents receive transfer only if they are employed with a low wage or if they are looking for a job. The higher the benefit b , the lower is the reservation productivity R^j that makes workers indifferent between searching or not for a job. Equation (13) is unaltered. However, the reservation productivity that define the exit of a job are:

$$E^{NB} = \frac{h + \frac{\psi y}{r+\psi} \int_{E^{NB}}^1 G(x) dx}{y}, \quad (30)$$

$$E^B = \frac{h - b + \frac{\psi y}{r+\psi} \int_{E^B}^1 G(x) dx}{y}. \quad (31)$$

Proposition 1 also holds for this case. We can show the following:

Proposition 3 *Consider a steady-state equilibrium. Then, for given government policies ($b, M = w^{-1}(\underline{w}) \gg 0$), we have that:*

- i. b affects e non-negatively; and b affects u ambiguously;*
- ii. M affects e non-negatively; and M affects u ambiguously.*

Proof: See appendix C.

5 Numerical exercises

5.1 Calibration

In order to numerically investigate the main results derived previously, we first have to define the value of the parameters of the model. We calibrate a standard matching model economy without government benefits, $b = 0$, such that this economy is consistent to some empirical observations of the United States. Here is how we set parameters values. We assume that distribution $G(x)$ is Uniform with support in the unit interval. We normalize output y to one. We let the model period be a month and set the discount rate

Table 1: Parameter values, baseline economy.

Parameters	Values	Comment/Observations
y	1	Value normalized to one
r	0.0033	Discount rate: annual interest rate of 4%
β	0.5	Worker's bargaining power
α	0.5	Parameter of the matching technology
c	0.175	Search cost: calibrated to match $\theta = 0.5$
h	0.0875	Home production: calibrated to match $u = 3.5$
ψ	0.11	Calibrated to match extended unemployment rate, $u + e^{ma}=4.9\%$

$r = 0.0033$, making the annual interest rate equal to 4 percent. Following Ljungqvist (2002), we let the matching technology be represented by a Cobb-Douglas type function:

$$m = m(u, v) = u^\alpha v^{1-\alpha}, \text{ with } \alpha \in (0, 1). \quad (32)$$

We assume the same elasticity of the matching technology with respect to each input, i.e., $\alpha = 0.5$, which was a number estimated by Blanchard and Diamond (1989). We let the worker's surplus share β to be equal to 0.5, which is a common number used in the matching literature (see Mortensen and Pissarides (1994)).

It remains to determine three parameter values: search cost, c , home production parameter, h , and the rate of arrival of a new productivity level, ψ . We choose the value of these parameters such that the unemployment rate is equal to 3.5 percent, the tightness of the labor market is equal to 0.5, and the extended unemployment rate²² is 40 percent larger than the conventional measure (see Garibaldi and Wasmer (2005)). We found the following values for these three parameters: $c = 0.175y$, $h = 0.5c$, and $\psi = 0.11$.

Table 1 lists the value of each parameter and includes a comment on how each one was selected.

²²This is the unemployed rate plus the rate of marginally attached employed workers.

5.2 Simulations: UCT program

In this section we evaluate the quantitative properties of the model and investigate how the main labor market and economic variables change with the level of benefits and the coverage of this social program. The first row of Table 2 contains for the baseline calibrated economy ($b = 0$ and $M = w^{-1}(\underline{w}) = 0$) the unemployment rate, the extended unemployment rate, employment rate, income Gini index, per capita income - normalized to 100, and government expenditures in this welfare program as a percent of output. Then, we divide Table 2 in two parts. The first part of this Table contains simulations of the UCT program, while the second part contains simulation of the LMP program.

For the case of the UCT program and when $b = 0.01y$ and $M = 0.47$ (i.e., $M \in (E^B, R^B)$), cash transfers correspond to roughly one fifth of the average wage.²³ Notice that the unemployment rate remains constant, while the extended unemployment rate increases by about 40 percent. Both the employment rate and inequality decrease, as expected. Output per capita decreases by 1.5 percent. In general, as the size of income transfers increases, employment decreases and unemployment remains roughly constant (see also figure 2), though our extended unemployment rate measure, which includes the marginally attached employed workers, increases substantially. Participation rate also decreases and income inequality decreases sharply. Notice that when we increase the coverage of the program, keeping the size of the transfer constant, both employment and participation rate increase. Output per capita also increases. The program has some effect on government finances. When $b = 0.01y$ (which corresponds to about 4 percent of the per capita income) and $M = 0.47$, total spending as a share of output²⁴ is about to 2.93 percent. In this case, the program, however, has a large coverage, since about 51 percent (unemployed agents and those with productivity $x < 0.47$) of all households receive benefits.

Figure 3 displays the effects of cash transfers on the economy (i.e, unemployment

²³Figure 3 contains the simulation results for different values of benefits and the coverage of the program.

²⁴Total spending on cash transfers is: $(1 - e)b + bG(M)e$.

Table 2: Quantitative effects: Economic impacts of cash transfer programs

	Unempl. rate, u (%)	Extended Unempl. rate, $u + e^{ma}$ (%)	Employ. rate, e (%)	Income Gini $Gini_y$ (%)	Income per capita	Govern. Expend./ GDP (%)
$b = 0$ $M = 0$	3.51	4.90	48.71	51.66	100	0
Part I: UCT program						
$b = 0.01y$ $M = 0.47$	3.51	6.20	47.96	50.22	98.50	2.93
$b = 0.02y$ $M = 0.47$	3.51	6.18	47.59	48.30	96.47	6
$b = 0.01y$ $M = 0.52$	3.51	4.86	48	50.40	99.30	2.91
$b = 0.02y$ $M = 0.52$	3.51	4.86	47.66	48.02	98.60	5.87
Part II: LMP program						
$b = 0.028y$ $M = 0.47$	3.54	5.27	49.75	52.01	107	2.93
$b = 0.059y$ $M = 0.47$	3.57	4.35	51.22	49.01	114	6
$b = 0.0265y$ $M = 0.52$	3.54	4.51	49.73	52.44	106.42	2.91
$b = 0.0535y$ $M = 0.52$	3.56	4.12	51.15	49.94	113	5.87

rate, extended unemployment rate, employment rate, Gini index, output, and government spending) for different levels of benefits and coverage of the program. The square in each graph corresponds to the baseline case without any cash transfer. The first point to observe is that the UCT program seems to have a negligible impact on the unemployment rate. In addition, when the coverage of the program is small, cash transfers decrease employment rates.²⁵ Only when the eligibility of the program increases that the employment rate starts to increase. Additional workers would receive benefits whether or not they are working.²⁶ Inequality initially decreases sharply since many workers that are in home production start to receive benefits, however, as the coverage of the program increases the rate of change in inequality decreases.²⁷ However, inequality seems to have a U-shape, since it starts to increase as more people become entitled to participate in this welfare program. Even if inequality does not decrease substantially, this program might have a sharp impact on poverty, since many households that are in home production will start to receive benefits and depending on the size of these benefits they can be lifted from the poverty line. Notice that output first decreases due to a decrease in the participation rate. However, as the employment rate increases with the coverage of the program, output starts to increase.²⁸ Government spending as a share of income is roughly constant with the coverage of the program.

Notice that as the level of benefits increases further the quantitative effects on the economy become stronger as well as on government finances. An increase in 100 percent in the level of benefits increase government spending as a share of income by roughly 2

²⁵This is consistent with empirical findings. See, for instance, Hoynes (1996) who estimate how changes in benefit levels of the program Aid to Families with Dependent Children affect labor supply in the United State.

²⁶The model therefore could explain variation in the employment rate across countries by differences in the level of benefits and in the eligibility of welfare programs. See Ngai and Pissarides (2008) for data on differences in employment rates among OECD countries and a model of how taxes and welfare programs affect such employment rate. See also Rogerson (2007). As pointed out previously, the model used by Ngai and Pissarides (2008) is completely different from ours, since they use a consumer problem with a standard leisure-labor choice without search frictions in which agents choose the allocation of their time endowment in leisure, market hours, and home production.

²⁷Notice that even if inequality does not decrease substantially, this program might have a sharp impact on poverty, since many households that are in home production will benefit from income transfers.

²⁸As in Acemoglu (2001), we are assuming that the taxes are financed by non-distortionary taxation. Results for aggregate output might be different once we introduce distortionary taxes.

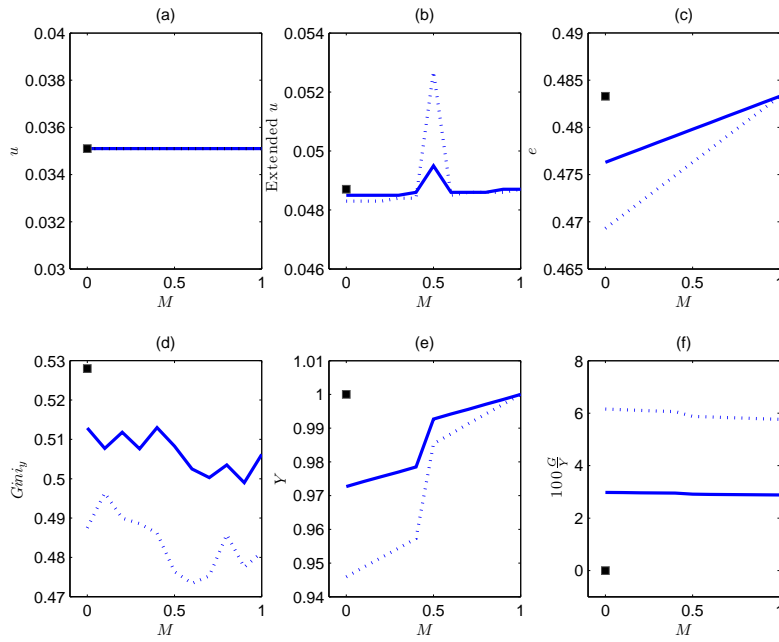


Figure 3: The effects of cash transfers on the economy. Black square: Baseline economy. Blue solid line: $b = 0.01y$ and different levels of M . Blue dotted line: $b = 0.02y$ and different levels of M .

times. When the eligibility of the program is low and benefits equal to $b = 0.02y$, the Gini index decreases by 7 percent when compared to an economy without cash transfers. Output, however, decreases by also a large amount, i.e., by about 6 percent. Although it starts to increase again as the coverage of the program increases.

From these experiments, we can conclude the following: (i) this cash transfer program has a negligible impact on unemployment; (ii) the extended unemployment rate starts to increase only when the coverage of the program affects the marginally attached workers; (iii) if the government target is to reduce inequality and poverty, the more efficient policy is to increase the level of benefits instead of increasing the eligibility of the program; and (iv) such policy comes with a negative impact on efficiency (unless the majority of workers receive transfers) and on government finances.

5.3 Simulations: LMP program

For comparison, we also consider the LMP program, which gives benefits for active workers with income less than a threshold level and for those who are looking for a job. When $M = 0$, the program is similar to a unemployment subsidy, since only unemployed workers receive benefits. As the coverage of the program increases, then not only unemployed workers receive benefits but also some low income workers. Notice, however, that workers that are in home production do not receive transfers. Table 2 part II and Figure 4 contain the simulation results for this program. In Figure 4 the blue lines correspond to the simulation of the UCT program while the red lines report the results of this LMP program. Solid and dotted lines report results for $b = 0.01y$ and $b = 0.02y$, respectively. We observe that this LMP program has also a negligible impact on the unemployment rate, which does not vary much with benefits and coverage of the program. The extended unemployment rate is, however, lower than in the baseline economy, since this program penalizes home production. Employment and participation rates are therefore larger than in the model with the UCT program and the employment rate increases with eligibility. Notice, however, that inequality first decreases with benefits, but then it starts to increase with the program's coverage and it becomes larger than in the baseline economy (without any social program) when $M = 0.25$. Per capita income increases as there are more agents participating in the labor market. Government expenditures as a share of income is much lower than in the unconditional transfer program, but it increases sharply with the program coverage.

Given the different impacts on government finances of the two social programs, it implies that the government can increase the level of benefits in the LMP program in order to keep the same level of expenditures of the UCT program - or alternatively, it can increase the coverage of the LMP program. Table 2 Part II provides simulations of this LMP program such that the level of government expenditures is similar to the experiments of the UCT program reported in Table 2 Part I. In particular, each row in Table 2 Part II reports the simulation with the same level of eligibility, M , and similar

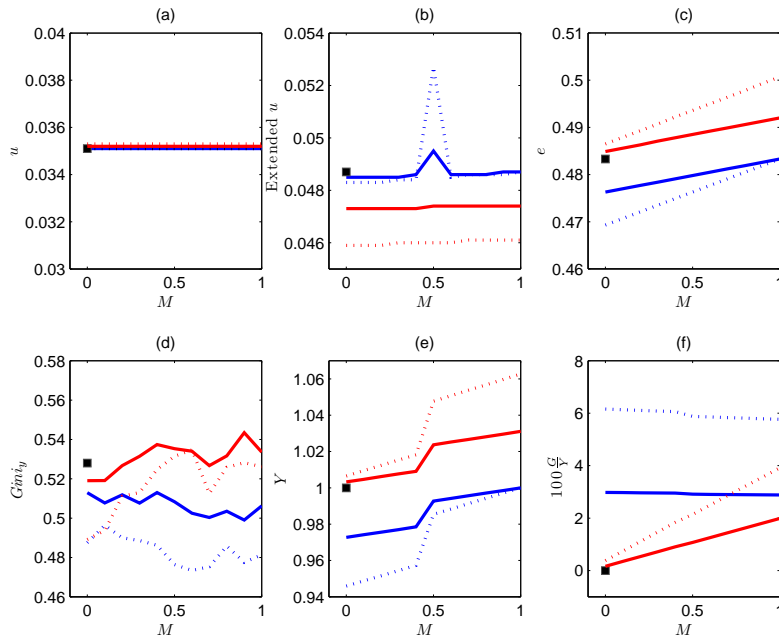


Figure 4: Labor Market Participation Program versus “unconditional” cash transfers. Black square: Baseline economy. Blue solid line: Cash transfer program with $b = 0.01y$ and different levels of M . Blue dotted line: Cash transfer program with $b = 0.02y$ and different levels of M . Red solid line: LMP program with $b = 0.01y$ and different levels of M . Red dotted line: LMP program with $b = 0.02y$ and different levels of M .

level of government expenditures as a share of income of the corresponding row in Table 2 Part I, but in which we consider the LMP program instead of the UCT one. When $M = 0.47$ and the ratio of government expenditures as a share of income is 2.93, we have that benefits are equal to $0.028y$ (instead of $0.01y$) in the LMP program. There will be less entitled workers because those at home production will not receive benefits, but each entitled worker will receive about three times more than in the unconditional cash transfers program. Notice that in this case, inequality is larger than in the baseline economy, but output is about 7 percent larger than in the economy without any social program. Unemployment is roughly identical in the two economies, but participation rate is larger in the LMP program. We can observe that similar patterns are observed for different levels of government expenditures and eligibility.

In sum, comparing to the UCT program, LMP benefits generate more efficiency at the cost of more inequality and probably less reduction on poverty.²⁹ Therefore, if the

²⁹This is expected since those more in needy do not receive benefits in the LMP program.

government goal is to reduce inequality and poverty, the UCT program is more efficient than the LMP program. Notice, however, that if we interpret the home production as an informal sector, this LMP program might be an effective way to reduce informality and tax evasion if benefits are conditioned on working in the formal sector.

6 Concluding remarks

This paper shows the effects of cash transfers to the poor on the labor market in an equilibrium matching model of the labor market with endogenous job destruction and labor market participation. In our model, the government provides cash transfers, $b > 0$, to all workers with income less than \underline{w} , independently whether they are working, unemployed, or out of the labor force, i.e., working in home production. We also discuss the role of alternative policies, such as transfers conditional to labor market participation.

Our analysis has far-reaching implications for policy and the design of cash transfers to the poor. We show the following important results: (i) The size of cash transfers has a negative effect on the employment rate, but an ambiguous effect on the unemployment rate; and (ii) the coverage of this welfare program has a positive effect on the employment rate, and an ambiguous effect on the unemployment rate. We also calibrate the model to mimic some important labor market statistics of the United States and provide numerical simulations. The quantitative analysis shows that: (i) if the government target is to reduce inequality and poverty, the more efficient policy is to increase the level of benefits instead of increase the eligibility of the program; moreover, (ii) compared to a welfare program that conditioning eligibility to labor market participation, the “unconditional” cash transfer program has a stronger impact on inequality and poverty, but with a reduction in labor market participation and output. The Labor Market Participation program might, however, be an effective way to reduce tax evasion in developing countries with large informal sectors. Therefore, a mix of the two programs can have important implications on inequality, poverty and efficiency.

There are some important extensions of this paper. First, it will be interesting, for instance, to investigate the effects of cash transfers on the labor market using an alternative model with risk aversion in which agents accumulate assets, as the equilibrium search model of Alvarez and Veracierto (1999). Risk aversion would increase the welfare effects of cash transfers to the poor when agents cannot insure against idiosyncratic shocks. It will be also interesting to check whether or not the predictions of the model are consistent to the empirical evidence. We leave such issues for future projects.

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A Proof of Proposition 1

Using the implicit function theorem and equation (11), we can show that:

$$\frac{\partial E^{NB}}{\partial b} = \frac{\frac{1}{y}}{1 + \frac{\psi}{r+\psi}G(E^{NB})} > 0.$$

Therefore, $E^{NB} > E^B$, since $E^{NB} = E^B$ when $b = 0$. Moreover, $R^{NB} - R^B = E^{NB} - E^B$, which implies that $R^{NB} > R^B$.

B Proof of Proposition 2

Observe that, in the steady state θ , E^B , and R^B do not depend on b and M . In addition, M does not also affect E^{NB} and R^{NB} , however, from equations (11) and (10), we can show that b affects E^{NB} and R^{NB} positively, i.e., $\frac{\partial E^{NB}}{\partial b} > 0$ $\frac{\partial R^{NB}}{\partial b} > 0$.

From (20) and (21) we have that:

$$f^1(e, u, b, M) = e - \frac{\theta q(\theta)u}{\psi\{G(E^B)G(M) + G(E^{NB})[1 - G(M)]\}} = 0, \quad (33)$$

$$f^2(e, u, b, M) = u - \frac{(1 - e)\psi\{[1 - G(R^B)]G(M) + [1 - G(R^{NB})][1 - G(M)]\}}{\theta q(\theta) + \psi} = 0 \quad (34)$$

Observe that:

$$f_e^1 = 1, \quad f_u^1 = -\frac{\theta q(\theta)}{\psi\{G(E^B)G(M) + G(E^{NB})[1 - G(M)]\}} < 0,$$

$$f_u^2 = 1, \quad f_e^2 = \frac{\psi\{[1 - G(R^B)]G(M) + [1 - G(R^{NB})][1 - G(M)]\}}{\theta q(\theta) + \psi} > 0.$$

Moreover,

$$f_b^1 = \frac{u\theta q(\theta)G'(E^{NB})[1 - G(M)]\frac{\partial E^{NB}}{\partial b}}{\psi\{G(E^B)G(M) + G(E^{NB})[1 - G(M)]\}^2} > 0,$$

$$f_b^2 = \frac{(1 - e)\psi G'(R^{NB})[1 - G(M)]\frac{\partial R^{NB}}{\partial b}}{\theta q(\theta) + \psi} > 0,$$

and

$$f_M^1 = -\frac{\theta q(\theta)uG'(M)[G(E^{NB}) - G(E^B)]}{\psi\{G(E^B)G(M) + G(E^{NB})[1 - G(M)]\}^2} < 0,$$

$$f_M^2 = -\frac{(1 - e)\psi G'(M)[G(R^{NB}) - G(R^B)]}{\theta q(\theta) + \psi} < 0.$$

Since the determinant of the matrix with the derivative of functions f^1 and f^2 with respect to the endogenous variables e and u is non-singular, we can use the implicit function theorem to show that:

$$\frac{\partial e}{\partial b} < 0, \quad \text{and} \quad \frac{\partial u}{\partial b} \geq 0,$$

$$\frac{\partial e}{\partial M} > 0, \quad \text{and} \quad \frac{\partial u}{\partial M} \leq 0.$$

C Proof of Proposition 3

AS before we have that θ , E^B , E^{NB} , R^B , and R^{NB} do not depend on M . However, we can show that: $\frac{\partial E^B}{\partial b} < 0$, $\frac{\partial R^B}{\partial b} < 0$, but $\frac{\partial E^{NB}}{\partial b} = 0$, $\frac{\partial R^{NB}}{\partial b} = 0$, and $\frac{\partial \theta}{\partial b} = 0$. In equilibrium, we have that

$$f^1(e, u, b, M) = e - \frac{\theta q(\theta)u}{\psi\{G(E^B)G(M) + G(E^{NB})[1 - G(M)]\}} = 0, \quad (35)$$

$$f^2(e, u, b, M) = u - \frac{(1 - e)\psi\{[1 - G(R^B)]G(M) + [1 - G(R^{NB})][1 - G(M)]\}}{\theta q(\theta) + \psi} \quad (36)$$

as before. Therefore, using the implicit function theorem, we can show that

$$\begin{aligned} \frac{\partial e}{\partial b} > 0, & \quad \text{and} \quad \frac{\partial u}{\partial b} \begin{matrix} \geq \\ \leq \end{matrix} 0, \\ \frac{\partial e}{\partial M} > 0, & \quad \text{and} \quad \frac{\partial u}{\partial M} \begin{matrix} \geq \\ \leq \end{matrix} 0. \end{aligned}$$

D Minimum income

Let's consider an alternative policy, such that the government guarantees a minimum income w^* for all workers. In this policy, instead of having a fixed transfer $b > 0$ to all workers with income less than \underline{w} , the government provides a variable transfer:

$$b(x) = \max\{w^* - w(x), 0\}.$$

The lower the worker's wage the higher is the transfer received. In this case, the value functions for a worker with productivity x are:

$$(r + \psi)W^{NB}(x) = w(x) + \psi \int_0^M \max\{W^B(z), U(z)\}dG(z) + \psi \int_M^1 \max\{W^{NB}(z), U(z)\}dG(z). \quad (37)$$

$$(r + \psi)W^B(x) = w(x) + b(x) + \psi \int_0^M \max\{W^B(z), U(z)\}dG(z) + \psi \int_M^1 \max\{W^{NB}(z), U(z)\}dG(z). \quad (38)$$

$$\begin{aligned} (r + \psi)U(x) = w^* + \max\{h, \theta q(\theta)G(M)[W^B(x) - U(x)] + \theta q(\theta)(1 - G(M))[W^{NB}(x) - U(x)]\} \\ + \psi \int_0^1 U(z)dG(z). \end{aligned} \quad (39)$$

The value functions describing a vacant and a filled job for firms are unchanged and are still represented by (4) and (5), respectively.

Using the same procedure as before, we can determine the wages for each productivity

level. We have that if $x > M$, then:

$$w_1^{NB}(x) = \beta yx + (1 - \beta)(w^* + h), \text{ for } x < R^{NB} \quad (40)$$

$$w_2^{NB}(x) = \beta(yx + c\theta) + (1 - \beta)w^*, \text{ for } x > R^{NB}. \quad (41)$$

Moreover, if $x < M$, then:

$$w_1^B(x) = \beta yx + (1 - \beta)(w^* + h - b(x)), \text{ for } x < R^B \quad (42)$$

$$w_2^B(x) = \beta(yx + c\theta) + (1 - \beta)(w^* - b(x)), \text{ for } x > R^B. \quad (43)$$

Notice that the total income of employed workers participating in the program is w^* . The government pays the difference between the wage paid by firms and the minimum income w^* . We can show that expressions (10) and (13) are unaltered. However, the market exit dynamics are now described by:

$$E^{NB} = \frac{w^* + h + \frac{\psi y}{r+\psi} \int_{E^{NB}}^1 G(x) dx}{y}, \quad (44)$$

$$E^B = \frac{w^* + h - b(E^B) + \frac{\psi y}{r+\psi} \int_{E^B}^1 G(x) dx}{y}. \quad (45)$$

Clearly, Proposition 1 also holds for this program.

Notice that now there is only one policy w^* . The coverage of the program M varies directly with the minimum income w^* and $b(x) = \max\{w^* - w(x), 0\}$. As a result, the effects of this minimum income program on the employment and unemployment rate are similar to the effects of the coverage of the cash transfer studied previously. The following proposition establishes the results formally.

Proposition 4 *Consider a steady-state equilibrium. Then, for a given government policy $M = w^{-1}(w^*) > 0$, we have that:*

- i. M affects e non-negatively; and M affects u ambiguously.*

Proof: The proof is similar to the one of proposition 2.