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# Three essays on the economics of aid
# An analysis of social labelling
# and in-kind transfers


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## Introduction

This work proposes a theoretical analysis of two specific forms of aid to developing countries, social labelling and in-kind transfers. Social labels have developed rapidly over the recent years. In 2006, consumers worldwide bought 1,6 billion Euros worth of fair-trade certified products, 42 % more than the year before. Labels are particularly attractive as an instrument for concerned consumers in the North to compensate Southern producers for the cost of complying with some minimum labour requirements. In-kind transfers are one of the most common form of aid and account for a large part of the total Official Development Assistance given.

In the first essay, a model is developed to investigate the impact of a label certifying the absence of child labour in the export production of the South. When most eligible producers in the South can obtain the label, its impact is considerably reduced by a displacement effect whereby adult workers replace children in the export sector while children replace adults in the domestic sector. The label is then unable to create a price differential between goods produced under the label and those produced without it. When only a small fraction of eligible producers have access to the label, so that the South exports both labelled and unlabelled production to the North, labelled producers generally gain while those without a label generally loose from the introduction of the label. Ex ante welfare may thus fall in the South if the probability of getting a label when one qualifies is small. The impact on child labour is in general ambiguous.

The second essay investigates the impact of a label certifying high labour standards in the export production of the South. When the price premium from the North just covers the cost of adopting high labour standards in the South, it is shown that the welfare of Northern consumers increases iff the welfare of Southern producers decreases. Moreover, a label is also not Pareto-improving when only a small fraction of producers have access to the label, so that the South exports both labelled and unlabelled production to the North. When adopting high labour standards is not costly for producers, so that the label resembles to label certifying a wage premium, a label that rises the demand for Southern products is Pareto-improving.

In the third essay, it is shown that one-side altruism can provide a rationale for over-providing in-kind transfers. In the model, a selfish recipient has an incentive to under supply effort and capital in order to manipulate the post-production transfers made by an altruistic donor. When effort is not enforceable by the donor, the donor's best response to this Samaritan's dilemma is to over-provide the recipient with a capital transfer in the pre-production period. This allows the donor to mitigate the dilemma, but it automatically creates an inefficiency since too much capital is invested. In the case the donor cannot tax the recipient, so that at equilibrium the donor pre-commits not to make a post-production transfer by over-providing the recipient with a pre-production transfer, transfers given fully in-cash would lead to an efficient outcome. A capital transfer is however chosen by the donor as it allows to reduce the total amount transferred to the recipient.

# Are labels effective against child labor?*

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# 1 Introduction

Child labor is a widespread phenomenon of particular social importance (ILO (2002), Basu and Van (1998), Baland and Robinson (2000), Dessy (2000)). Numerous proposals have therefore been put forward to promote the welfare of working children and reduce the incidence of child labor or its consequences. While, at the national level, various policies ranging from child labor prohibition to food-for-education programs are available, the set of instruments at the international level is much more limited. Labeling programs have been developed recently as an alternative to import taxes or import prohibition. Labels are particularly attractive as they do not rely on coercion. They instead inform consumers on the absence of child labour in the production process of a particular good. The consumer is then free to choose whether to support or not those practices, giving rise to a form of 'democracy by the consumers' (as advertised by Oxfam in a recent campaign).

Several child labor-free labeling programs have emerged over the last decade, chiefly Rugmark (India), Kaleen (India), Step (Switzerland), Care & Fair (Germany), Abrinq (Brazil), Pro-Child institute (Brazil), and Double Income Project (Switzerland). They are mostly active in the hand-knotted carpet industry, the leather footwear industry, and the hand-stitched soccer ball industry. All have in common to be based on producers, manufacturers, or exporters committing to a code of conduct which excludes child labor. This code in general requires not to employ young workers below 14, but it may also include initiatives to promote health and education of children. Depending on the program, compliance with this code is ensured through regular site inspections, or completely relies on a moral commitment of the licensees. However, it is not clear that these labels have an important impact on child labor in the South. Thus, a ILO report concludes that "the impact of labeling on child labor in India's carpet industry does not seem to be substantial" (ILO, 2000).

In this paper, we investigate the conditions under which labels can be effective against child labor. It is generally expected that labels will trigger a change in demand patterns away from the unlabeled goods towards those with a label.[1] As the demand for unlabeled products falls, one expects a fall

[1] Many examples support the preference in the North for child-labor free products. One such example is the recent fear by Walmart that the discovery that some of its suppliers used child labor would significantly affect their sales in the US and Canada. Walmart immediately and quite publicly cut all links with these suppliers. The french retailer Carrefour, and Reebook and Baden Sports in the hand-stitched soccer ball industry also followed the same marketing strategy.

in child wages, which should lead to an overall decline in child labor.[2] We show that these mechanisms are not likely to be very effective in practice. This is due to the fact that, as long as enough (Southern) consumers are not sensitive to the label, and adult workers can easily replace child workers in the exporting industry, the label generates a *displacement effect*, whereby adult production is redirected towards label demanding Northern consumers, while children now produce exclusively for the Southern consumers. If, by contrast, only a few qualifying producers in the South can obtain the label so that some exports to the North incorporate child labor, the label, as expected, creates winners (the labeled producers) and losers (the unlabeled producers). The impact on child labor is however indeterminate, as it depends on (1) the reaction of child labor to higher or lower wages (which itself depends on the strength of income and substitution effects) and (2) the proportion of labeled producers.

In the literature, some authors have already raised doubts about the beneficial impact of trade sanctions on child labor. This is due to the fact that trade sanctions reduce income in the exporting country, which may increase the incidence of child labor (see e.g. Ranjan (2001), Jafarey and Lahiri (2002), Basu (2003), and Edmonds and Pavcnik (2003)). Closest to our results on the displacement effect is the analysis of a ban on child labor by Basu and Van (1998) who show that a ban on a small subset of producers is ineffective as long as there are enough adult producers available. Also related is the analysis of discrimination by Becker (1959). Becker introduces a 'discrimination coefficient', whereby a consumer prefers one unit of a good made by worker Y to one unit of the same good produced by worker X. In equilibrium, a price differential may arise, which corresponds to the discrimination coefficient of the marginal consumer.

The literature on 'child labor-free' labels has mostly focused on the supply side. Basu and Zarghamee (2005) show that a boycott of child labor-tainted products can cause child labor to increase if children work because of extreme poverty. Davies (2005) shows that in a Bertrand competition framework with heterogenous consumers, labeling is unlikely to eliminate child labor since the creation of a profitable niche for adult-labor firms often creates comparable niches for child-labor firms, as it is standard in the product differentiation literature. Brown (1999) and Basu et al. (2006) focus on the impact of labeling when certification is costly (either through a fee or

[2] The overall effect on the welfare of the formerly-employed children, however, is left uncertain. As working opportunities are reduced, the living conditions of these children may, in fact, become worse. It can also be argued that, with labeling, governments and industry associations may be induced to take pro-active initiatives, to avoid embarrassing inspections.

through readjustment cost) and discuss the case of imperfect monitoring. This paper is different from the existing literature as it analyzes the demand-based factors that determine the impact of child labor-free labeling. To this end, we simplify the model's supply side by assuming that the label is costless and perfect, and that children can be costlessly replaced by adults in the production process. The aim is to question the impact of labeling programs in a 'favorable' framework, in which large positive impacts are expected.

The paper proceeds as follows. The fundamentals of the model are presented in Section 2. In Section 3, we analyze the impact of a label when most firms employing adult workers can obtain the label, and provide necessary and sufficient conditions for the label to increase welfare in the South and to decrease child labor. The effects of a restricted label, where access to the label is limited to a small subset of producers, are analyzed in section 4. Section 5 concludes.

# 2 The fundamentals and the pre-label equilibrium

Consider an economy with two countries, North and South, denoted by $N$ and $S$ respectively. In each country, there are $L$ identical households made up of one parent and one child. Both parent and child have one unit of time each. In the North, children do not work, and spend all their time on leisure, while in the South households have to choose how much time a child works and how much time he spends on leisure. We let $l_S$, with $l_S \in [0, 1]$, represent the amount of time a child works in the South, so that $(1 - l_S)$ represents the amount of time he allocates to leisure.

Each country produces one type of good, with the North producing clothes and the South producing food. Parents in both countries supply their unit of time inelastically on the labor market.[3] The technology of production in each country is linear, with labor as the only input. Productivity in the North is equal to $\gamma_N$. We let clothing be the numeraire so that its price is normalized to 1. The income of a Northern household, $w_N$, is then equal to $\gamma_N$. In the South, adult labor and child labor are perfect substitutes in production, with one unit of adult labor producing $\gamma_S$ units of food while one unit of child labor produces 1 unit of food. Full income in the South, $w_S$, is composed of adult and full-time child wage.[4]

[3] This restriction allows us to focus our attention on child labour only. Our main results can be rewritten allowing for adult labour to vary, at the expense of notational simplicity.

[4] For more information on the full-income approach, see Becker (1965).

Northern households, as consumers, care about consumption goods and use of child labor in the production of the goods from the South that they consume. The utility function of a Northern consumer is given by:

$$U_N\left(c_N, f_N^l, f_N^u\right)$$

where $c_N$ represents the amount of clothing, $f_N^l$, the amount of labelled food and $f_N^u$, the amount of unlabelled food that he consumes.

Labelled food, denoted by a superscript $l$, is certified to be exclusively produced by adult workers, while unlabelled food, denoted by a superscript $u$, is not certified and may thus have been produced by children.[5] There is no uncertainty associated with the quality of the label. Moreover, the label is free and costless. For expositional convenience, we also assume that a Northern consumer in equilibrium consumes only one type of food so that either $f_N^l = 0$ or $f_N^u = 0$.[6] Northern consumers prefer children not to be involved in the production process of the goods they consume. We therefore require that, at any $p^l = p^u$, the North consumes only labelled food. We also define $p^l = \mathrm{P}(p^u)$ as the price of labelled food which leaves Northern consumers indifferent between the two types of food:

$$\underset{f_N^l}{Max} U_N\left(\gamma_N - \mathrm{P}(p^u).f_N^l, f_N^l, 0\right) = \underset{f_N^u}{Max} U_N\left(\gamma_N - p^u.f_N^u, 0, f_N^u\right) \quad (1)$$

Since Northern consumers prefer units of food certified without child labor, we have $\mathrm{P}(p^u) > p^u$. Moreover, $f_N^u = 0$ if $p^l < \mathrm{P}(p^u)$ and $f_N^l = 0$ if $p^l > \mathrm{P}(p^u)$.

Southern households, as consumers, are not concerned about the presence of child labor in the units of food they consume.[7] Accordingly, their utility function is given by:

$$U_S\left(c_S, f_S^l + f_S^u, 1 - l_S\right) \quad (2)$$

where $c_S$, $f_S^j$, and $1 - l_S$ represent respectively the amount of clothes, food of type $j$, $j = l, u$, and child leisure consumed. The two types of food are perfect

[5] Under this assumption, Northern consumers do not care about the probability of being produced by children, but only care about whether children are possibly involved or not. This assumption is made to make the introduction of a label effective.

[6] This assumption is not restrictive if labelled and unlabelled food are perfect substitutes. If they are imperfect substitutes, the assumption imposes upper bounds on the marginal utility of both types of food.

[7] This assumption is by no way necessary for the validity of the results. It simply allows us to distinguish between concerned and unconcerned consumers without additional notations.

substitutes in a one-for-one basis, so that Southern consumers purchase the least costly variety.

We assume that $U_S$ is twice continuously differentiable, increasing and concave in all arguments: $U_{S,j} > 0$ and $U_{S,jj} < 0$, $j = 1, 2, 3$.[8] We assume all goods to be normal. We also assume Inada end-point conditions to ensure the existence of an interior equilibrium: $\lim_{c_S \to 0} U_{S,1} = \lim_{f_S^l + f_S^u \to 0} U_{S,2} = \lim_{1-l_S \to 0} U_{S,3} = +\infty$ and $\lim_{c_S \to +\infty} U_{S,1} = \lim_{f_S^l + f_S^u \to +\infty} U_{S,2} = \lim_{1-l_S \to 1} U_{S,3} = 0$. Similarly, for a Northern consumer of food of type $j$, $j = l, u$, we assume that $U_N$ is twice continuously differentiable, increasing and concave in $c_N$ and $f_N^j$. Inada end-point conditions and normality of goods are also assumed.

Maximizing utility given the budget constraints yields the demands of a Northern consumer, $c_N\left(p^l, p^u, \gamma_N\right)$, $f_N^l\left(p^l, p^u, \gamma_N\right)$ and $f_N^u\left(p^l, p^u, \gamma_N\right)$ as functions of food prices and income. The corresponding demands in the South are given by $c_S\left(p^l, p^u, w_S\right)$, $f_S^l\left(p^l, p^u, w_S\right)$, $f_S^u\left(p^l, p^u, w_S\right)$ and $l_S\left(p^l, p^u, w_S\right)$.

We first describe the equilibrium that prevails before labels are introduced. In the absence of labeling, there is no certified type of food available in the market, and accordingly no pre-label equilibrium price exists for certified food. At a pre-label equilibrium, the price for non-certified food, $p^0$, is given by the equality between supply and demand for food:

$$L f_N^u\left(\cdot, p^0, \gamma_N\right) + L f_S^u\left(\cdot, p^0, w_S^0\right) = L\gamma_S + L l_S\left(\cdot, p^0, w_S^0\right) \tag{3}$$

where $w_S^0 = p^0\left(\gamma_S + 1\right)$ represents the pre-label equilibrium (full) income in the South. By the budget constraints, the equilibrium price $p^0$ also constitutes an equilibrium for the clothing market, and we therefore have:

$$L c_N\left(\cdot, p^0, \gamma_N\right) + L c_S\left(\cdot, p^0, w_S^0\right) = L\gamma_N \tag{4}$$

We now discuss the assumptions necessary for our analysis of an equilibrium with label. The normality of all goods implies that, in the North, $f_N^j$, if positive, is decreasing in $p^j$, $j = u, l$. At $p^l = p^u = p$, we also assume that the aggregate demand for clothing is strictly increasing in food prices: $\frac{dc_N(p,p,\gamma_N)}{dp} + \frac{dc_S(p,p,(\gamma_S+1)p)}{dp} > 0$, where $\frac{dc_S}{dp} = \frac{\partial c_S}{\partial p} + \frac{\partial c_S}{\partial w_S}\frac{\partial w_S}{\partial p}$ represents the total derivative of the demand for clothes with respect of food prices, taking into account the resulting changes in adult and child wages.

It is worth noting at this stage that the impact of a rise in food prices on the supply of child labor is ambiguous, as it depends on the relative strength of the wage effect (being richer, the household demands more child

[8] $U_{i,j}$ represents the partial derivative of utility in country $i = N, S$ with respect to the $j^{th}$ argument, while $U_{i,jj}$ represents the second partial derivative.

leisure) and the substitution effect (as the opportunity cost of leisure rises, the household demands less child leisure): $\frac{dl_S}{dp} \gtrless 0$ (where $\frac{dl_S}{dp}$ represents the total derivative of child labor to food prices and wages: $\frac{dl_S(p,p,(\gamma_S+1)p)}{dp}$). As a result, the supply of food can be increasing or decreasing in food prices. For the same reason, we have $\frac{df_S}{dp} \gtrless 0$, where $f_S = f_S^u + f_S^l$. We however require that, at all price levels, an increase in food prices leads to a higher total net supply of food from the South: $\frac{df_S}{dp} - \frac{dl_S}{dp} < 0$. This assumption implies that the slope of the Southern demand for food is smaller than the slope of the supply of food. Note that, under these assumptions, the equilibrium defined by equations (3) and (4) is stable and unique.

# 3 The impact of unrestricted labeling

We now investigate the impact of the introduction of a label. The label sector is accessible to a fraction $\zeta$ of adult workers in the South, with $0 \leq \zeta \leq 1$. We define a label as *unrestricted* if, in equilibrium, the Northern demand for labeled food at a post-label equilibrium does not exhaust the production capacities of the labelled workers. More formally, an *unrestricted* labelling equilibrium $\left(p^l, p^u\right)$ exists if $\zeta$ is such that:

$$(i) \qquad p^l = p^u$$

$$(ii) \qquad Lf_N^l\left(p^l, p^u, \gamma_N\right) \leq L\zeta\gamma_S$$

$$\text{and} \qquad (iii) \qquad Lf_N^l\left(p^l, p^u, \gamma_N\right) + Lf_S^u\left(p^l, p^u, w_S\right) = L\gamma_S + Ll_S\left(p^l, p^u, w_S\right)$$

We also define a *restricted* equilibrium as a pair $\left(p^l, p^u\right)$ such that the total amount of labeled food falls below the potential demand by Northern consumers: in equilibrium, the latter consume both types of food. A *restricted* equilibrium $\left(p^l, p^u\right)$ exists if $\zeta$ is such that:

$$(i) \qquad p^l = \mathrm{P}(p^u) > p^u$$

$$(ii) \qquad Lf_N^l\left(p^l, p^u, \gamma_N\right) = L\zeta\gamma_S$$

$$\text{and} \qquad (iii) \qquad Lf_N^l\left(p^l, p^u, \gamma_N\right) + Lf_N^u\left(p^l, p^u, \gamma_N\right) + Lf_S^u\left(p^l, p^u, w_S\right) = L\gamma_S + Ll_S\left(p^l, p^u, w_S\right)$$

Our assumptions guarantee that, for given parameter values, only one type of equilibrium exists, and that this equilibrium is unique. Moreover, one can show that a restricted equilibrium always exists for small values of $\zeta$ while the unrestricted equilibrium arises for large enough values of $\zeta$. [9]

In this section, we focus on the analysis of an unrestricted label. Since, in this regime, all eligible adults in the South can costlessly reallocate themselves between the labeled and the unlabeled sectors, the wages must be identical across the two occupations. We therefore have:

**Proposition 1** *Under an unrestricted label, the equilibrium price of labeled food, $p^{l*}$, is equal to the equilibrium price of unlabeled food, $p^{u*}$.*

**Proof.** Let $F^i$ represents the total supply of food of type $i, i = l, u$. Three situations can potentially arise:

(i)If $p^{l*} < p^{u*}$, then $f_N^l > 0$, $f_S^l > 0$ and $F^l = 0$, since all workers in the South strictly prefer to produce the unlabeled variety. There is an excess demand for the labeled variety, and this cannot constitute an equilibrium.

(ii) If $p^{l*} > p^{u*}$, then $f_S^l = 0$. Under an unrestricted label, $Lf_N^l\left(p^{l*}, p^{u*}, \gamma_N\right) < L\zeta\gamma_S$ and there is an excess supply of labeled food as all eligible adult workers strictly prefer to produce the labeled variety.

(iii) The only possibility is thus that $p^{l*} = p^{u*}$. ■

In a situation in which the Northern demand for food does not exhaust production capacities, the label cannot create a price differential between labeled and unlabeled units of food. Indeed, as long as some eligible adult workers are perfectly mobile across the labeled and the unlabeled sectors, a difference in prices between the two varieties of food in the South attracts all eligible adult workers in the sector with the highest price. This automatically leads to an excess supply of the variety with the highest price. As a result, the only possible equilibrium is such that the labeled and the unlabeled variety sell at the same price. Under a label, the equilibrium is such that all units of food sold to Northern consumers are certified to be produced by adult workers only, while the production made with child labour is consumed in the South.

An unrestricted label fails as an instrument to discriminate between labeled and unlabeled production. It may however trigger a change in demand patterns in the North. Though one may think that shifting market demands shoud not be the primary purpose of a label, the only channel through which

[9] This last statement invites two remarks. First, to be precise, for intermediate values of $\zeta$, there exists another type of equilibrium, in which only labelled food is consumed in the North and $\mathrm{P}(p^u) > p^l > p^u$. The analysis of this particular regime follows that of a restricted equilibrium, with no further insights, and is therefore omitted. Second, while a restricted equilibrium always exists, an unrestricted equilibrium may fail to appear if the demand from Northern consumers is 'large' compared to the supply of all adult workers.

an unrestricted label may have a favourable impact in the South is by distorting the relative marginal utilities of goods in the North in favour of food consumption and at the detriment of clothes consumption.

At the same prices, the Northern demand for labeled food may indeed be equal or different from the demand for unlabeled food in the pre-label situation. When, at the initial prices, a label increases the Northern demand for food, food prices (labeled and unlabeled) increase. In the South, the rise in food prices necessarily increases the utility of the households, as they are net suppliers of food. (The relative price of clothing falls, and they are net demanders of clothing). The converse is true when the introduction of a label decreases the demand for food from the North. As a result, the impact on welfare in the South crucially depends on how demands in the North are affected by the introduction of a label. We thus have:

**Proposition 2** *Food prices and welfare in the South increase iff* $f_N^l\left(p^0, p^0, \gamma_N\right)$*, the Northern demand for labeled food at* $p^0$*, is larger than* $f_N^u\left(\cdot, p^0, \gamma_N\right)$*, the pre-label demand for unlabeled food at* $p^0$*. They do not change if the demand from the North remains unchanged at the initial (pre-label) prices. Child labor increases with food prices iff* $\frac{dl_S}{dp} > 0$ *.*

**Proof.** The impact on food prices of a change in demands trivially follows our stability assumptions. By the envelope theorem, it is easy to show that the utility of a Southern household increases (falls) if food prices increase (fall). The last statement follows from the definition of $\frac{dl_S}{dp}$. ■

As indicated at the end of the proposition, even if food prices rise, the level of child labor may rise or fall depending on the elasticity of the demand for child leisure to food prices. There is a large body of empirical studies investigating the link between household income and child labor, but with no consensus.[10] Negative income effects, whereby a low family income leads to more child labor, are thus found in Patrinos and Psacharopoulos (1995), Cartwright (1999), Grootaert (1999), and Edmonds (2005). This supports Basu and Van's 'luxury axiom' according to which children are sent to work when family income falls below a given subsistence target. Other studies tend to show that rises in parental income may have no effect on child labor, possibly because child labor is not a bad in parental preferences (see e.g. Bhatty (1998), Canagarajah and Nielsen (1999), Ray (2000), and Deb and Rosati (2002)). Lastly, some studies have stressed the fact that rises in household income may also imply better earnings opportunities for children (in the model, this corresponds to a simultaneous increase of both $p^l$

[10] Surveys of this literature include Dar et al. (2002), Brown et al (2003), Basu and Tzannatos (2003), Bhalotra and Tzannatos (2003), and Edmonds (2005).

and $p^u$). In this case, child labor may increase with a rise in household income, over some income range (see Psacharopoulos (1997), Canagarajah and Coulombe (1997) and Bhalotra and Heady (2003)).

# 4 The impact of restricted labeling

In this section, we explore the impact of labeling when only a small fraction $\zeta$ of adults in the South can obtain the label (e.g. owing to limited monitoring capacities). As said above, at an equilibrium under restricted access, both types of food are consumed in the North. When this holds, the prices of labeled and unlabeled food are such as to leave the Northern consumer indifferent: $p^{l**} = \mathrm{P}(p^{u**})$, where a double asterisk denotes the equilibrium levels under restricted access.

The introduction of a restricted label creates two types of households in the South: the labeled households in which the adult is working in the labeled sector (and the child in the unlabeled sector), and the unlabeled households in which both the adult and the child are employed in the unlabeled sector. We assume that the post label equilibrium is stable and unique, which requires in addition to the stability conditions made in Section 2 that the net supply of food from a labeled household is increasing in food prices: $\frac{df_S^u(\mathrm{P}(p),p,\mathrm{P}(p)\gamma_S+p)}{dp} \leq \frac{dl_S(\mathrm{P}(p),p,\mathrm{P}(p)\gamma_S+p)}{dp}$.

Note first that as Northern consumers in equilibrium are indifferent between the two types of food, the welfare of a household consuming labeled food must be identical to that of a household consuming unlabeled food. A Northern consumer is therefore better off with the introduction of a label if and only if the price of unlabeled food, $p^{u**}$, is smaller than the initial price, $p^0$. Thus, if $p^{u**} < p^0$, the Northern consumer is unambiguously better off (his budget set is strictly larger). However, this is exactly the condition under which the welfare of an unlabeled household in the South falls with the introduction of the label. We therefore have:

**Proposition 3** *Under a restricted label, Northern households are better off iff unlabelled households are worse off.*

(Proof omitted)

With the introduction of a label, the price of unlabeled food and the welfare of unlabeled households rise if and only if an excess demand for food arises at $p^u = p^0$ and $p^l = \mathrm{P}(p^0)$. As we show in the Appendix, this is more likely to occur when (i) the Northern demand for labeled food is price inelastic so that, compared to the pre-label price $p^0$, the demand does not fall much at the higher price $\mathrm{P}(p^0)$, (ii) the shift towards labeled units of food increases the demand for food in the North, and (iii) the income elasticity of the Southern demand for food and child leisure is high, so that, when labeled households earn a higher income, it translates into a lower net supply of unlabeled food.

The conditions under which the welfare of a labeled household falls are much more demanding, since labeled households in the South generally benefit from the price differential which makes the food they themselves consume relatively cheaper. For labeled households to be worse off, it must be that (i) their real income in terms of clothing falls (which requires $\gamma_S p^{l**} + p^{u**} < p^0(\gamma_S + 1)$), and (ii) their real income in terms of unlabeled food does not increase much (which requires the price differential between the two types of food to be small enough). Though unlikely, it is thus possible that the introduction of a restricted label reduces the welfare of all households in the South.

The impact of a restricted label on child labor remains however ambiguous. The aggregate impact depends on the relative proportion of labelled households among Southern producers. Among unlabeled households, child labor increases if the price of unlabeled food rises and $\frac{dl_S}{dp} > 0$, or if the price of unlabeled food falls and $\frac{dl_S}{dp} < 0$. Among labeled households, child labor unambiguously falls if household income rises ($\gamma_S p^{l**} + p^{u**} > p^0(\gamma_S + 1)$) and child wages fall ($p^{u**} < p^0$).

As an illustration, consider the following utility functions for Northern and Southern households respectively: $U_N\left(c_N, f_N^l, f_N^u\right) = c_N^\alpha . \left(\lambda f_N^l + f_N^u\right)^{1-\alpha}$ and $U_S\left(c_S, f_S^l + f_S^u, 1 - l_S\right) = c_S^\eta . \left(f_S^l + f_S^u\right)^\kappa .(1-l_S)^{1-\eta-\kappa}$. Under these utility functions, labeled and unlabeled food are perfect substitutes in a one-for-one basis in the South, while in the North $\lambda > 1$. Under restricted access, it is easy to show that $p^{l**} > p^0 > p^{u**}$. Indeed, given that the shares of total income spent on food, clothing and leisure are constant, there is no equilibrium at $p^{l**} > p^{u**} > p^0$ or at $p^0 > p^{l**} > p^{u**}$. The introduction of the label therefore increases the welfare of Northern consumers and labeled households, but reduces that of unlabeled households. Child labor within labeled households decreases while it remains constant within unlabeled households, so that child labor overall falls.

With the same utility functions, the impact of an unrestricted label is simple since it does not change food prices: $f_N^l\left(p^0, p^0, \gamma_N\right) = f_N^u\left(\cdot, p^0, \gamma_N\right)$. Labeled food in the North is sold at the same price as food was sold before the label was introduced: $p^{l*} = p^{u*} = p^0$. The creation of the label thus causes a pure displacement effect, whereby adult production fully replaces children production for Northern consumers.

Finally, suppose now that access to the label is random and uniform across Southern households: ex ante, each adult in the South has the same probability $\zeta$ to be hired in the labeled sector. Clearly, the expected utility of a household in the South rises if the utility of both labeled and unlabeled households rises. However, if unlabeled households are worse off, the expected utility of a household in the South may fall, provided access to the labeled sector is restricted to an adequately small number of households. Actually, there always exists a value $\zeta^* > 0$ such that, if $\zeta < \zeta^*$, the expected utility of a household in the South falls while the utility of a household in the North rises. This discussion is summarized in the following proposition:

**Proposition 4** *Consider a situation under which all adults in the South face the same probability $\zeta$ of obtaining a label. If $p^{u**} < p^0$ and if $\zeta$ is small enough, the introduction of a restricted label reduces welfare in the South.*

(Proof omitted)

# 5 Concluding comments

Over the last decade, several social labeling programs have been launched with the hope of promoting improved labor rights in developing economies. In particular, they are expected to play an important role in the struggle against child labor. In this paper, we proposed a systematic analysis of 'child labor free' labels, and their impact on welfare and child labor.

We developed a model where the South exports goods produced with child labor to Northern consumers, who prefer goods produced without child labor. We studied the impact of a label which certifies that exports from the South are made exclusively with adult labor. We distinguished between two situations. In one situation, the label is unrestricted: the demand for labeled goods in the North is not too large, so there is enough eligible adult labor in the South to produce the amounts required. The label then causes a *displacement* effect, that is a reallocation of labor whereby adults replace children in the export sector in the South, while children replace adult workers in the production for the interior market. In this case, the label is unable to create a price differential between labeled and unlabeled production, as otherwise adult workers would produce exclusively the highest priced good. However, the label increases the welfare of all Southern households if and only if, at the initial prices, the demand from Northern consumers increases with the label. The impact on child labor is in general ambiguous, as the reaction of child labor to higher or lower adult and children wages depends on the strength of income and substitution effects.

In the other situation, the label is restricted, in the sense that the demand for labeled goods in the North at the initial prices exceeds the production possibilities of a subset of eligible adult workers in the South. Export producers in the South thereby get differentiated according to their access to the label. While the welfare of labeled households in the South generally rises, we also showed that the welfare of unlabelled producers fall if and only if welfare in the North rises. This happens if the price elasticity of the demand for food is high in the North, and the income elasticities of the demand for food and child leisure in the South are low. Under these conditions, if labels are given randomly to a small number of qualifying producers, the expected welfare of Southern households is reduced by the introduction of a label. To increase welfare, the label should in general be accessible to a large proportion of households and not to a small minority of privileged producers. This result runs against the current practice by many NGOs of selecting a few well-known producers to provide them with a label and ignore the others. Finally, the impact on the amount of labor provided by children in the South is generally ambiguous since child labor may rise or fall with unlabeled food prices, which also corresponds to their wage.

An important assumption made in the model is that, in the pre-label situation, Northern consumers are fully informed about children employed in the export sector. If instead Northern consumers are not informed and wrongly believe that food units are produced only by adult workers in the pre-label situation, the introduction of the label informs Northern consumers about the presence of child labor in the food they consume. If the label is unrestricted, it has no impact on food prices, nor on welfare and child labor, since the introduction of a label induces no change in the Northern demand for food. However, if the label is restricted, the welfare of Southern households, particularly those who do not get access to the label, is much more likely to fall. When the initial information of consumers is bad, a label is more likely to have negative consequences in the South. The scandals which developed around the coffee industry or the textile industry in the recent years support the idea that consumers are not always aware of extremely low labor standards in those sectors. The current campaigns led by the ILO and many NGOs also attest the lack of awareness of consumers in the North.

We have also assumed that there is no cost in obtaining the label. However, it is clear that if labeled producers have to pay a fixed cost to obtain the label, their welfare will be reduced accordingly. As a result, the conditions under which the label will have positive consequences will be even more demanding. A similar conclusion can be reached if adult and child labor are not perfectly substitutable, but the analysis gets considerably more complex. Finally, it is important to realize that we considered here a labeling program which targets a fixed characteristic of the workers. The arguments can thus be extended to other fixed characteristics of the workers, such as gender, religion, cast or race. They do not however immediately extend to labeling which involves a costly action by producers in the South, as would occur with improved labor standards (higher wages, improved working conditions,...). We intend to explore this alternative in our future research.

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# Appendix

In this appendix, we provide a condition for an excess demand (supply) to arise on the post-label market for food at $p^u = p^0$ and $p^l = \mathrm{P}(p^0)$. At these price levels, the aggregate demand for food may be larger or lower than the aggregate supply:

$$\begin{aligned} &\alpha L f_N^l\left(\mathrm{P}(p^0), p^0, \gamma_N\right) + (1-\alpha) L f_N^u\left(\mathrm{P}(p^0), p^0, \gamma_N\right) \\ &+ \zeta L f_S^u(\mathrm{P}(p^0), p^0, \gamma_S \mathrm{P}(p^0) + p^0) + (1-\zeta) L f_S^u(\mathrm{P}(p^0), p^0, (\gamma_S + 1)p^0) \\ &\lesseqgtr L\gamma_S + \zeta L l_S(\mathrm{P}(p^0), p^0, \gamma_S \mathrm{P}(p^0) + p^0) + (1-\zeta) L l_S(\mathrm{P}(p^0), p^0, (\gamma_S + 1)p^0) \end{aligned} \tag{5}$$

where $\alpha$, $\alpha \in [0, 1]$, represents the fraction of Northern households purchasing labeled units of food, the remainder purchasing unlabeled units of food. The change in the market for food, obtained by susbtracting the pre-label equilibrium market condition defined at Equation (3) to the post-label condition given at (5), is proportional to:

$$\begin{aligned} &\alpha f_N^l\left(\mathrm{P}(p^0), p^0, \gamma_N\right) - \alpha f_N^u\left(\cdot, p^0, \gamma_N\right) + \zeta f_S^u(\mathrm{P}(p^0), p^0, \gamma_S \mathrm{P}(p^0) + p^0) - \zeta f_S^u\left(\cdot, p^0, (\gamma_S + 1)p^0\right) \\ &\quad - \zeta l_S(\mathrm{P}(p^0), p^0, \gamma_S \mathrm{P}(p^0) + p^0) + \zeta l_S\left(\cdot, p^0, (\gamma_S + 1)p^0\right) \lesseqgtr 0 \end{aligned} \tag{6}$$

Letting $x_S(p^l, p^u, w_S) = \gamma_S + l_S(p^l, p^u, w_S) - f_S^u(p^l, p^u, w_S)$ represent the net supply of food from a Southern household, this can be rewritten as:

$$\alpha f_N^l\left(\mathrm{P}(p^0), p^0, \gamma_N\right) - \alpha f_N^u\left(\cdot, p^0, \gamma_N\right) + \zeta x_S\left(\cdot, p^0, (\gamma_S + 1)p^0\right) - \zeta x_S(\mathrm{P}(p^0), p^0, \gamma_S \mathrm{P}(p^0) + p^0) \lesseqgtr 0.$$

This equation defines the change in the worldwide net aggregate demand for food. Using the equilibrium condition on the market for labeled food, $\alpha L f_N^l\left(\mathrm{P}(p^0),\ p^0, \gamma_N\right) = \zeta L \gamma_S$, the sign of the change in net aggregate demand depends on the sign of:

$$\left\{1 - \frac{f_N^u\left(\cdot, p^0, \gamma_N\right)}{f_N^l\left(\mathrm{P}(p^0), p^0, \gamma_N\right)}\right\}\gamma_S + x_S\left(\cdot, p^0, (\gamma_S + 1)p^0\right) - x_S(\mathrm{P}(p^0), p^0, \gamma_S \mathrm{P}(p^0) + p^0) \lesseqgtr 0 \tag{7}$$

If the expression (7) is positive, then $p^{u*} > p^0$ and $p^{l*} > \mathrm{P}(p^0)$: the introduction of a restricted label increases welfare of all households in the

South and decreases welfare in the North. If it is negative, then $p^{u*} < p^0$ and $p^{l*} < \mathrm{P}(p^0)$: the welfare of unlabeled households in the South falls, while welfare in the North rises. The expression (7) is more likely positive when $f_N^l\left(\mathrm{P}(p^0), p^0, \gamma_N\right)$ is high with respect to $f_N^u\left(\cdot, p^0, \gamma_N\right)$ and $x_S\left(\cdot, p^0, (\gamma_S + 1)p^0\right)$ is high with respect to $x_S(\mathrm{P}(p^0), p^0, \gamma_S \mathrm{P}(p^0) + p^0)$.

# ‘Made in Dignity’: the redistributive impact of social labeling*

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# 1 Introduction

The improvement of labour standards is increasingly a major concern for consumers.[1] While this expresses a genuine concern about working conditions particularly in developing countries, it can also be partly motivated by protectionist motives against what is thought as unfair competition by countries applying low labour standards.[2] In many instances consumers do not however have information on the social environment surrounding the production of goods. Labeling is an increasingly popular way to deal with this asymmetric information problem.[3]

Besides their informative role, labels also allow consumers to make transfers to complying producers.[4] Labels can therefore be used by Southern countries as a tool to discriminate between various customers according to their preference for labour standards, as a discriminating monopolist would. With appropriate redistribution mechanism, such labels should improve welfare in the South.

Social labeling programs have developed rapidly over the recent years. The sales of Fairtrade certified products have been growing on an average of 40% per year in the last five years. In 2007, Fairtrade certified sales amounted to approximately €2.3 billion worldwide, a 47% year-to-year increase. By the end of 2007, there were 632 Fairtrade certified producer organizations in 58 producing countries, representing 1.5 million farmers and workers.[5] Besides their commercial success, most labeling programs are advocated by some international organizations such as ILO, UNICEF and NGO's (Oxfam, Max Havelaar,...).

One expects labeling to improve labour standards in the South. This should be beneficial for both workers and concerned consumers. The aim of

[1] Various studies show that consumers have a preference for 'fair' products (Prasad et al., 2004, Hiscox and Smyth, 2005, De Pelsmacker et al, 2005; Loureiro and Lotade, 2005; Poelman et al 2008, Tagbata and Sirieix, 2008). These studies conclude that premium willingness to pay may exist for fair trade products, but note that different consumer segments may react differently to information on fair trade.

[2] Numerous proposals have been put forward to incorporate minimum labour standards into international trade rules. See Rodrik (1996), Freeman (1998) and Bhagwati (1995) for a discussion on the pertinence of imposing labour standards, in line with the debates on the WTO. See also Maskus (1997), Fung et al. (2001), and Brown (2001) for more details on labour standards and international trade.

[3] Since Akerlof (1970), market failures due to the lack of information on product quality are well known.

[4] Compared to a tax scheme, a label allows transfers from concerned agents even when the median voter is unconcerned. In addition, a label allows unconcerned agents not to participate to transfers.

[5] See www.fairtrade.net (january 2009).

this paper is to question this assertion. To this purpose, we have built a very simple North-South trade model to analyze a label in the export production of the South. In the model, it is assumed that (a) all consumers in the North are willing to pay a price premium for labeled goods, and (b) the label is perfectly and costlessly monitored. Taken altogether, these two assumptions tend to bias the results of the model in favour of a large positive impact of labelling.

We however show that, when the price premium the North is willing to pay for labeled products just covers the cost of adopting high labour standards in the South, welfare of Northern consumers increases iff welfare of Southern producers decreases. Moreover, we show that a label is again not Pareto improving when only a small fraction of producers have access to the label, so that the South exports both labeled and unlabeled production to the North. The intuition behind this result is straightforward. When the unlabeled price rises, so that Southern workers in the unlabeled sector are better off, consumers in the North are indeed worse off as they purchase units of goods produced under low labour standards at a higher price. The reverse holds when the unlabeled price falls. Finally, when adopting high labour standards is not costly for producers, so that the label resembles to a label certifying a wage premium, we show that a label that rises the Northern demand for Southern products is generally Pareto-improving.[6]

To our knowledge, the literature on social labeling is so far very limited. Fisher and Serra (2000) stress the protectionist role of production standards. In a related literature, some authors have already raised doubts about the beneficial impact of a label certifying the absence of child labour.[7] Our analysis however differs from child labor labeling as bad working conditions are not a fixed characteristic of workers and can anyway be improved. This paper therefore investigates the impact of labelling when the mode of production can be improved provided a cost is paid. Compared to Baland and Duprez (2007) to which our model is related, the possibility of shifting production towards good practices at a cost creates two opposite effects. First it dissipates a part of the price premium from the North. Second, it creates a supply effect as production in the labelled sector falls.

Labour standards in the production process is an hidden characteristic of goods which is not revealed to consumers even after consumption. In

[6]A label rising the demand for labelled goods can be viewed as a form of informative advertising. There is a large literature investigating the optimal amount of advertisement (see e.g. Kotowitz and Mathewson, 1979, Grossman and Shapiro, 1984, Becker and Murphy, 1993).

[7]Edmonds (2007) provides a survey of this literature. See e.g. Brown (1999), Davies (2005), and Basu et al. (2006).

the literature, this is referred to as a credence characteristic.[8] Other types of credence attributes include for instance environment-friendly production, food quality and safety, etc. This literature in general concludes that perfect labeling improves welfare.[9]

The paper proceeds as follows. Section 2 investigates the welfare impact of a label certifying a wage premium. In Section 2.2, we analyze the case of unrestricted labelling where any producer in the South is free to enter the labelled sector, while in Section 2.3 we analyze the case of restricted labelling where only a small number of producers have access to the label. Section 3 investigates the welfare impact of a label certifying high labour standards, where adopting high labour standards is costly for producers, under unrestricted access in Section 3.1 and under restricted access in Section 3.2. Section 4 concludes.

# 2 Wage premium

Our model is built upon Baland and Duprez (2007). We consider an economy with two countries, North and South, denoted by $N$ and $S$ respectively. In each country, there are $L$ identical individuals, each of whom has one unit of time that he supplies inelastically on the labour market. We assume complete specialization in production, with the North producing clothes and the South producing food. The production functions are linear, with labour as the only input. Productivity in the North is equal to $\gamma$, each worker producing $\gamma$ units of clothes. We let clothing be the numeraire so that its price is normalized to 1. The income of a worker in the North is then equal to $\gamma$.

As consumers, Northern individuals care about consumption goods and the wage conditions prevailing in the production unit of the goods from the South that they consume. The utility function of a Northern consumer is given by:

$$U_N\left(c_N, f_N^l, f_N^u\right) \tag{1}$$

where $c_N$ represents the amount of clothing, $f_N^l$, the amount of labelled food and $f_N^u$, the amount of unlabeled food that he consumes. A label on a unit of food certifies that wages in the production unit are higher than $\tilde{w}$, where $\tilde{w}$ is the minimum wage requirement in the labelled sector. Monitoring is perfect

[8] The classification into credence goods follows Nelson (1970), and Darby and Karni (1973).

[9] See e.g. Zago and Pick (2004), Baksi and Bose (2007), Roe and Sheldon (2007), and Bonroy and Constantatos (2008).

so that there is no uncertainty associated with the quality of the label.

For expositional convenience, we assume that a Northern consumer consumes only one type of food so that either $f_N^l = 0$ or $f_N^u = 0$.[10] Northern consumers prefer labelled units of food to unlabeled ones. We therefore require that, at any $p^l = p^u$, the North consumes only labelled food. We also define $p^l = \mathrm{P}(p^u)$ as the price of labelled food which leaves Northern consumers indifferent between the two types of food:

$$\underset{f_N^l}{Max} U_N \left(\gamma - \mathrm{P}(p^u).f_N^l, f_N^l, 0\right) = \underset{f_N^u}{Max} U_N \left(\gamma - p^u.f_N^u, 0, f_N^u\right) \tag{2}$$

Equation (2) defines all pairs of food prices $(\mathrm{P}(p^u), p^u)$ which leave Northern consumers indifferent between consuming labelled food and consuming unlabeled food. Since Northern consumers prefer labelled units of food, we have $\mathrm{P}(p^u) > p^u$. Moreover, $f_N^u = 0$ if $p^l < \mathrm{P}(p^u)$ and $f_N^l = 0$ if $p^l > \mathrm{P}(p^u)$.

Southern individuals, as consumers, are not concerned about the wage conditions prevailing in the production unit of the goods that they consume.[11] Accordingly, their utility function is given by:

$$U_S = U_S \left(c_S, f_S^l + f_S^u\right)$$

where $c_S$ and $f_S^j$ represent respectively the amount of clothes and food of type $j$, $j = l, u$, consumed. The two types of food are perfect substitutes in a one-for-one basis, so that Southern consumers purchase the least costly variety.

Productivity in the South is equal to 1, each worker producing one unit of food. The wage of a Southern worker in the sector $j$, $j = l, u$, referred to as $w^j$, is then equal to $p^j$.

We assume that $U_S$ is twice continuously differentiable, increasing and concave in all arguments: $U_{S,j} > 0$ and $U_{S,jj} < 0$, $j = 1, 2$.[12] We assume all goods to be normal. We also assume Inada end-point conditions to en-

[10] This assumption is not restrictive if labelled and unlabelled food are perfect substitutes. If they are imperfect substitutes, the assumption imposes upper bounds on the marginal utility of both types of food.

[11] This assumption is by no way necessary for the validity of the results. It simply allows us to distinguish between concerned and unconcerned consumers without additional notations. This however makes sense since most labelling programs concern export to rich countries.

[12] $U_{S,j}$ represents the partial derivative of Southern utility with respect to the $j^{th}$ argument, while $U_{S,jj}$ represents the second partial derivative.

sure the existence of an interior equilibrium: $\lim_{c_S \to 0} U_{S,1} = \lim_{f_S^l + f_S^u \to 0} U_{S,2} = +\infty$ and $\lim_{c_S \to +\infty} U_{S,1} = \lim_{f_S^l + f_S^u \to +\infty} U_{S,2} = 0$. Similarly, for a Northern consumer of food of type $j$, $j = l, u$, we assume that $U_N$ is twice continuously differentiable, increasing and concave in $c_N$ and $f_N^j$. Inada end-point conditions and normality of goods are also assumed.

Maximizing utility given the budget constraint yields the demands of a Northern consumer, $c_N\left(p^l, p^u, \gamma\right)$, $f_N^l\left(p^l, p^u, \gamma\right)$ and $f_N^u\left(p^l, p^u, \gamma\right)$ as functions of food prices and income. The corresponding demands for a Southern individual working in the food sector $j$, $j = l, u$, are given by $c_S\left(p^l, p^u, w^j\right)$, $f_S^l\left(p^l, p^u, w^j\right)$, $f_S^u\left(p^l, p^u, w^j\right)$.

## 2.1 Pre-label

We first describe the equilibrium that prevails before labels are introduced. In the absence of labeling, there is no labelled food available in the market. Accordingly, the pre-label equilibrium price for labelled food is not defined. At a pre-label equilibrium, the price for unlabeled food, $p^*$, is given by the equality between supply and demand for food:

$$L f_N^u\left(\cdot, p^*, \gamma\right) + L f_S^u\left(\cdot, p^*, w^*\right) = L \tag{3}$$

where $w^* = p^*$. By the budget constraints, the equilibrium price $p^*$ also constitutes an equilibrium for the clothing market, and we therefore have:

$$L c_N\left(\cdot, p^*, \gamma\right) + L c_S\left(\cdot, p^*, w^*\right) = L\gamma \tag{4}$$

We now discuss the assumptions necessary for our comparative statics to be meaningful. The normality of all goods implies that, in the North, $f_N^j$, if positive, is decreasing in $p^j$, $j = u, l$, and, in the South, $c_S(p, p, p)$ is increasing in $p$: $\frac{dc_S(p,p,p)}{dp} > 0$, where $\frac{dc_S(p,p,p)}{dp} = \frac{\partial c_S}{\partial p} + \frac{\partial c_S}{\partial w}$ represents the total derivative of the demand for clothes with respect to food prices, taking into account the resulting changes in wage. At $p^l = p^u = p$, we assume that the aggregate demand for clothing is strictly increasing in food prices: $\frac{dc_N(p,p,\gamma)}{dp} + \frac{dc_S(p,p,p)}{dp} > 0$.

In the food market, it is worth noting that the impact of a rise in food prices on the demand in the South is ambiguous, as it depends on the relative strength of the wage effect (being richer, the individual demands more food) and the substitution effect (as the opportunity cost of food rises, the individual demands less food). As a result, the demand for food can be increasing or decreasing in food prices. We however require that, at $p^l = p^u = p$, an increase in $p$ leads to a lower demand for food in the South: $\frac{df_S(p,p,p)}{dp} \leqslant 0$ (where $f_S = f_S^u + f_S^l$ represents the total amount of food consumed). This assumption implies that the wage effect does not dominate the substitution effect. Note that, under these assumptions, the equilibrium defined by equations (3) and (4) is stable and unique.

## 2.2 The impact of unrestricted labeling

We now investigate the impact of introducing a label. We assume that the minimum wage requirement in the labelled sector, $\tilde{w}$, is strictly higher than the pre-label equilibrium wage in the South, $w^*$. This ensures that, compared to the pre-label situation, workers earn a wage premium. Moreover, we assume that the label is costless.

Before going further with the analysis, we impose some restrictions on the demand for food in the North:

**Assumption 1** $f_N^l(p, p, \gamma) > f_N^u(\cdot, p, \gamma)$

**Assumption 2** $f_N^l(\mathrm{P}(p), \mathrm{P}(p), \gamma) \leqslant f_N^u(\cdot, p, \gamma)$

Assumption 1 requires that the label triggers an increase in demand in the North, so that the demand for labelled food is higher than the pre-label demand for unlabeled food at identical food prices.[13] Under Assumption 2, this increase in demand is however bounded. More precisely, we assume that the Northern demand for labelled food at the price $\mathrm{P}(p) > p$ does not exceed the Northern pre-label demand for unlabeled food at price $p$, where food prices are such that the North is indifferent between the two types of food[14] We now have our first result:

**Proposition 1** *Under A1, there exists $\tilde{w} > w^*$ such that an equilibrium with a wage premium label exists.*

**Proof.** Let $F^i$ represents the total supply of food of type $i, i = l, u$.

(i) We first show that $p^{l*} \geqslant p^{u*}$. If $p^u > p^l$, then $f_N^l > 0$ and $F^l = 0$, since all workers in the South strictly prefer to produce the unlabeled variety as

[13] More specifically, Assumption 1 means that the label increases the Northern demand for food by distorting the relative marginal uilities of goods in favour of food consumption and at the detriment of clothes consumption.

[14] Note that this assumption is satisfied if labelled and unlabelled food are perfect substitute.

wages are higher in this sector. There is an excess demand for labelled food and this cannot constitute an equilibrium.

(ii) We now show that an excess demand for food necessarily arises at $p^* \geqslant p^l \geqslant p^u$. If $p^* \geqslant p^l \geqslant p^u$, then the demand for food in the North increases compared to its pre-label level: $L_N^l f_N^l \left(p^l, p^u, \gamma\right) + \left(L - L_N^l\right) f_N^u \left(p^l, p^u, \gamma\right) > L f_N^u \left(\cdot, p^*, \gamma\right)$ by A1 and $\frac{df_N^j}{dp^j} \leqslant 0$, where $L_N^l$ represents the number of consumer in the North purchasing labeled food ($0 \leqslant L_N^l \leqslant L$). Moreover, the demand for food in the South increases: $L_S^l f_S \left(p^l, p^u, p^l\right) + \left(L - L_S^l\right) f_S \left(p^l, p^u, p^u\right) > L f_S^u \left(\cdot, p^*, w^*\right)$ by normality of food and $\frac{df_S(p,p,p)}{dp} \leqslant 0$, where $L_S^l$ represents the number of individuals in the South working in the labelled sector ($0 \leqslant L_S^l \leqslant L$). Given the pre-label equilibrium condition on the food market given at (3), there is an excess demand for food. Following our stability assumptions, food prices must then rise in order to restore an equilibrium on the food market.

As result, any $\tilde{w}$ s. t. $p^{l*} \geqslant \tilde{w} > p^*$ constitutes an equilibrium with label. ■

Under Assumption 1, a label triggers an increase in demand for food in the North. This increase in demand pushes the price of labelled food upwards and allows workers in the labelled sector to earn a wage premium.

We are now able to investigate the impact of labelling. Let's first investigate the case of unrestricted labelling, in the sense that any worker in the South can freely reallocate himself between the labeled and the unlabeled sector. Under unrestricted labelling, we have:

**Proposition 2** *Under an unrestricted wage premium label, the equilibrium price of labeled food, $p^{l*}$, is equal to the equilibrium price of unlabeled food, $p^{u*}$.*

**Proof.** We show that $p^{l*} = p^{u*}$ is the only possibility at equilibrium.

(i) $p^l < p^u$ cannot constitute an equilibrium. See (i) in proof of Proposition 1.

(ii) If $p^l > p^u$, then $f_S^u > 0$, and $F^u = 0$ since wages are lower in the unlabeled sector. Once again, this cannot constitute an equilibrium. ■

As long as labour is perfectly mobile across sectors, a price differential between the two types of food attracts all Southern workers in the highest priced sector, while consumers in the South demand the less costly variety of food. This automatically leads to an excess demand in the lowest priced sector. Under an unrestricted label, labelled and unlabeled units of food sell at the same price. At an equilibrium, consumers in the North purchase labelled food only. Our next Proposition deals with the welfare impact of labelling:

**Proposition 3** *Under A1 and A2, an unrestricted wage premium label increases both the welfare in the South and in the North.*

**Proof.** Following Propositions 1 and 2, we have $p^{l*} = p^{u*} > p^*$ at an equilibrium with label. By the envelope theorem, it is easy to show that the utility of a Southern individual increases when food prices increase.

We now show that $p^{l*} \leqslant \mathrm{P}(p^*)$ at equilibrium. If $p^l = p^u = p > \mathrm{P}(p^*)$, then the demand for food in the North decreases compared to its pre-label level: $Lf_N^l(p, p, \gamma) < Lf_N^u(\cdot, p^*, \gamma)$ by A2 and $\frac{df_N^l}{dp^l} < 0$. Moreover, the demand for food in the South decreases: $Lf_S(p, p, p) \leqslant Lf_S^u(\cdot, p^*, w^*)$ by $\frac{df_S(p,p,p)}{dp} \leqslant 0$. Given the pre-label equilibrium on the food market given at (3), there is an excess supply of food and this cannot constitute an equilibrium. Under our stability assumptions, food prices must fall to restore an equilibrium in the food market.

By the envelope theorem and by definition of $\mathrm{P}(p^*)$, it is easy to show that the utility of a Northern individual increases if $p^{l*} \leqslant \mathrm{P}(p^*)$. ■

As, under Assumption 1, a label increases the Northern demand for food, food prices (labeled and unlabeled) increase. In the South, the rise in food prices necessarily increases the utility of individuals, as they are net suppliers of food. (The relative price of clothing falls, and they are net demanders of clothing). A label is also beneficial in the North. Indeed, the increase in Northern demand for food is bounded so that, at a post-label equilibrium, the labelled price is necessarily lower than $\mathrm{P}(p^*)$, the labelled price which would leave the welfare in the North unaffected compared to the pre-label situation.

## 2.3 The impact of restricted labelling

In the previous section, we have assumed perfect mobility of workers across sectors, and argued that the possibility for workers to reallocate themselves freely towards the highest priced sector does not allow the emergence of a price differential between the labeled and the unlabeled type of food. In this section, we explore the impact of labeling when only a small number $\bar{L}$ of workers in the South can obtain the label (e.g. owing to limited monitoring capacities).

When $\bar{L}$ is small enough, the supply of labelled food is so low that both types of food are consumed in the North. At an equilibrium, the prices of labeled and unlabeled food are such as to leave Northern consumers indifferent between the two types of food: $p^{l**} = \mathrm{P}(p^{u**})$, where a double asterisk denotes the equilibrium variables under restricted access. If $p^l > \mathrm{P}(p^u)$, all eligible individuals in the South strictly prefer to produce the labelled variety of food, while consumers in the North and in the South demand unlabeled food. This leads to an excess supply of labelled food. If $p^l < \mathrm{P}(p^u)$, the supply of labelled food is at most equal to $\bar{L}$, while all consumers in the North demand the labelled variety of food. When $\bar{L}$ is small enough, this leads to an excess demand for labelled food.

More formally, we define a *restricted* equilibrium as a pair $\left(p^l, p^u\right)$ such that:

$$(i) \qquad p^l = \mathrm{P}(p^u),$$

$$(ii) \qquad L_N^l f_N^l\left(p^l, p^u, \gamma\right) = \bar{L}, \qquad and$$

$$(iii) \qquad \left(L - L_N^l\right) f_N^u\left(p^l, p^u, \gamma\right) + \bar{L} f_S^u\left(p^l, p^u, p^l\right) + \left(L - \bar{L}\right) f_S^u\left(p^l, p^u, p^u\right) = L - \bar{L}$$

where $L_N^l$ and $L - L_N^l$ respectively stand for the number of Northern consumers purchasing labeled food and unlabeled food in equilibrium ($0 < L_N^l \leqslant L$). One can show that a restricted equilibrium always exists for small values of $\bar{L}$ while the unrestricted equilibrium described in Section 2.2 always exists for large enough values of $\bar{L}$. In addition to the stability conditions made in Section 2.1, we require that the demand for food from a labeled worker is decreasing in food prices: $\frac{df_S^u(\mathrm{P}(p),p,\mathrm{P}(p))}{dp} \leq 0$. Our stability assumptions guarantee that, for given parameter values, only one type of equilibrium exists, and that this equilibrium is stable and unique.[15]

The introduction of a restricted label creates a price differential between the two types of food and, accordingly, two types of workers in the South: the labeled workers employed in the labeled sector and the unlabeled workers employed in the unlabeled sector.

In the North, consumers are indifferent between the two types of food at an equilibrium, and the welfare of those consuming labeled food is identical to that of those consuming unlabeled food. A Northern consumer is better off with the introduction of a label if and only if the price of unlabeled food, $p^{u**}$, is smaller than the initial price, $p^*$ (his budget set is strictly larger). Thus, if $p^{u**} < p^*$, Northern consumers are unambiguously better off . However, this is exactly the condition under which the welfare of unlabeled workers in the South falls with the introduction of the label. We therefore have:

**Proposition 4** *Under a restricted wage premium label, the North is better off iff unlabeled workers are worse off.*

[15]Note that, for intermediate values of $\bar{L}$, there exists a third type of equilibrium in which $\mathrm{P}(p^{u*}) > p^{l*} > p^{u*}$ and only labelled food is consumed in the North. The analysis of this particular regime follows that of a restricted equilibrium, with no further insights, and is therefore omitted.

**Proof.** Proof omitted. ■

With the introduction of a restricted label, the price of unlabeled food and the welfare of unlabeled individuals fall if and only if an excess supply of food arises at $p^u = p^*$ and $p^l = \mathrm{P}(p^*)$. As shown in Appendix A, this is more likely to occur when (i) the Northern demand for labeled food is price elastic so that, compared to the pre-label price $p^*$, the demand falls at the higher price $\mathrm{P}(p^*)$, (ii) the shift towards labeled units of food does not increase much the demand for food in the North, and (iii) the income elasticity of the Southern demand for food is low, so that, when labeled individuals earn a higher income, it does not translate into a higher demand for food.[16]

Turning to the welfare impact on labeled workers, we have:

**Proposition 5** *Under a restricted wage premium label, the welfare of labeled workers increases.*

**Proof.** Proof omitted. ■

This result is a direct consequence of Proposition 1: the impact on labeled workers is unambiguously beneficial since, in equilibrium, $p^{l**} > p^*$. Suppose now that access to the label is random and uniform across Southern individuals: ex ante, each adult in the South has the same probability $\frac{\bar{L}}{L}$ to be hired in the labeled sector. Clearly, the expected utility of an individual in the South rises if the utility of unlabeled workers rises. However, if unlabeled workers are worse off, the expected utility of a individual in the South may fall, provided access to the labeled sector is restricted to an adequately small number of individuals. Actually, there always exists a value $\bar{L}^* > 0$ such that, if $\bar{L} < \bar{L}^*$, the expected utility of an individual in the South falls while the utility of a individual in the North rises. This discussion is summarized in the following proposition:

**Proposition 6** *Consider a situation under which all workers in the South face the same probability $\frac{\bar{L}}{L}$ of obtaining a label. If $p^{u**} < p^*$ and if $\bar{L}$ is small enough, the introduction of a wage premium label reduces welfare in the South.*

**Proof.** Proof omitted. ■

[16] More formally, unlabelled workers are worse off iff Expression (7) in Appendix A is negative. For example, unlabelled workers are worse off when $U_N = \left(\left(\lambda f_N^l + f_N^u\right)^\rho + c_N^\rho\right)^{\frac{1}{\rho}}$ and $U_S = \left(\left(f_S^l + f_S^u\right)^\rho + c_S^\rho\right)^{\frac{1}{\rho}}$, and when $U_N = c_N + v_N\left(\lambda f_N^l + f_N^u\right)$ and $U_S = c_S + v_S\left(f_S^l + f_S^u\right)$. When $U_N = \lambda f_N^l + f_N^u + v_N(c_N)$ and $U_S = f_S^l + f_S^u + v_S(c_S)$, the welfare of unlabelled workers is unaffected by the introduction of a label.

# 3 Working conditions

In this Section, we investigate a label certifying high labour standards in the South. We assume that adopting high labour standards is costly for producers, which makes the crucial difference with a label certifying a wage premium. Utility in the South is slightly modified. Southern individuals now care also about the working conditions in the production unit in which they work. Accordingly, their utility function can be written as:

$$U_S = U_S\left(c_S, f_S^l + f_S^u, \theta\right)$$

The additional argument, $\theta$, is a dummy variable which takes the value 1 when working under high labour standards, and 0 otherwise. We assume that Southern workers prefer working under high labour standards.

To obtain high labour standards, one has however to spend $\zeta \geqslant 0$ units of labour per unit of food produced and $\zeta_c \geqslant 0$ units of clothes. The first type of cost can reflect the fact that improved labour standards imply higher production costs, by resorting to less exploitative modes of production or spending more resources on workers' health and education. The second type of cost, $\zeta_c$, may reflect the fact that Northern equipment and expertise are involved in the adoption of improved labour standards, and must be compensated at the going wage rate in the North.

The budget constraint of a Southern individual working in the sector $j$, $j = u, l$, is as follows:

$$c_S + f_S^l p^l + f_S^u p^u + \theta\left(\zeta w^j - \zeta_c\right) = w^j$$

where $w^j = p^j$. We restrict ourselves to the case the costs of improved labour standards are higher than the utility gains they create. Under this assumption, unlabeled units of food are produced under low labour standards. Moreover, a price differential between labelled and unlabeled food is necessary to induce individuals in the South to work in the labelled sector. More formally, Southern individuals have no preference between working under high labour standards in the labelled sector and working under low labour standards in the unlabeled sector if and only if $p^l = \mathrm{W}(p^u) > p^u$ such that:

$$\underset{f_S^u}{Max} U_S\left((1-\zeta)\,\mathrm{W}(p^u) - \zeta_c - p^u.f_S^u, f_S^u, 1\right) = \underset{f_S^u}{Max} U_S\left(p^u - p^u.f_S^u, f_S^u, 0\right) \quad (5)$$

Equation (5) defines all pairs of food prices $(\mathrm{W}(p^u), p^u)$ which leave Southern workers indifferent between working in either sector. Note that the net wage of a labelled worker, that is, the wage net of the cost of adopting high labour standards, is strictly lower than the wage in the unlabeled sector: $(1-\zeta)\text{W}(p^u) - \zeta_c < p^u$. Otherwise, Southern individuals would strictly prefer to work in the labelled sector.

In the North, each of the $L$ workers earns a wage $\gamma$ which corresponds to the amount of clothing produced. As consumers, they maximize the utility function given at (1). Once again, it is assumed that a Northern consumer purchases only one type of food. They are indifferent between the two types of food only when $p^l = \text{P}(p^u) > p^u$ where $\text{P}(p^u)$ is implicitly defined in Equation (2).

The demands in the North are given by $c_N\left(p^l, p^u, \gamma\right)$, $f_N^l\left(p^l, p^u, \gamma\right)$ and $f_N^u\left(p^l, p^u, \gamma\right)$. In the South, the demands of a worker in the sector $j$ are given by $c_S\left(p^l, p^u, w^j, \theta\right)$, $f_S^l\left(p^l, p^u, w^j, \theta\right)$, $f_S^u\left(p^l, p^u, w^j, \theta\right)$ as function of food prices, wage and working conditions.

We first briefly describe the equilibrium that prevails before labels are introduced. In their absence, labour standards are low so that $\theta = 0$. This is indeed the case given our assumption on a net cost of improved labour standards. The pre-label equilibrium (unlabeled) price, denoted by $p^*$, is such that demand equals supply on each market:

$$\begin{aligned} Lf_N^u(\cdot, p^*, \gamma) + Lf_S^u(\cdot, p^*, w^*, 0) &= L \\ Lc_N(\cdot, p^*, \gamma) + Lc_S(\cdot, p^*, w^*, 0) &= L\gamma \end{aligned}$$

To guarantee a stable and unique equilibrium, we make stability assumptions similar to those stated in Section 2.1.

## 3.1 The impact of unrestricted labelling

We are now able to analyze the impact of introducing a label. An equilibrium with label exists iff $\text{P}(p^{u*}) \geqslant \text{W}(p^{u*})$. Indeed, a failure of this condition automatically leads to an equilibrium with no labeled food: to make Southern workers indifferent between the two types of production, the price of labeled food must be so high compared to the price of unlabeled food that Northern consumers prefer unlabeled food. At the contrary, when the price premium the North is willing to pay for labelled food is higher than the net cost of adopting high labour standards, the market for labelled food can open.

We once again make assumptions 1 and 2 on the demands for labelled food in the North. In addition, we require that, at identical food price and "net" wage, working under high or low labour standards does not affect the demands of a Southern individual:

**Assumption 3** $f_S(p, p, (1-\zeta)w - \zeta_c, 0) = f_S(p, p, w, 1)$

When Assumption 3 fails, the introduction of a label creates an additional effect by triggering a change in demand patterns in the South. In fact, if improved labour standards distorts the relative marginal utility of goods in favour of food consumption and at the detriment of clothes consumption, the label is more likely to be beneficial in the South and detrimental in the North, as this demand effect drives food prices upwards. Exactly the contrary happens if improving labour standards triggers a change in demand patterns in the South towards clothes and away from food.

We assume that the label sector is accessible to a number $\bar{L}$ of workers in the South, with $0 < \bar{L} \leq L$. We define a label as *unrestricted* if, in equilibrium, the Northern demand for labeled food at a post-label equilibrium does not exhaust the production capacities of the labelled workers. More formally, an *unrestricted* labelling equilibrium $(p^l, p^u)$ exists if $\bar{L}$ is such that:

$$(i) \qquad p^l = \mathrm{W}(p^u),$$

$$(ii) \qquad Lf_N^l(p^l, p^u, \gamma) \leq \bar{L}(1-\zeta), \; and$$

$$(iii) \qquad Lf_N^l(p^l, p^u, \gamma) + \bar{L}f_S^u(p^l, p^u, w^l, 1) + (L-\bar{L})f_S^u(p^l, p^u, w^u, 0) = L - \zeta\bar{L}$$

where $w^j = p^j$, $j = l, u$. We also define a *restricted* equilibrium as a pair $(p^l, p^u)$ such that the total amount of labeled food falls below the potential demand by Northern consumers: in equilibrium, the latter consume both types of food. A *restricted* equilibrium $(p^l, p^u)$ exists if $\bar{L}$ is such that:

$$(i) \qquad p^l = \mathrm{P}(p^u),$$

$$(ii) \qquad L_N^l f_N^l(p^l, p^u, \gamma) = \bar{L}(1-\zeta), \; and$$

$$(iii) \qquad (L - L_N^l) f_N^u(p^l, p^u, \gamma) + \bar{L}f_S^u(p^l, p^u, w^l, 1) + (L-\bar{L})f_S^u(p^l, p^u, w^u, 0) = L - \bar{L}$$

Our assumptions guarantee that, for given parameter values, only one type of equilibrium exists, and that this equilibrium is unique. Moreover, one can show that a restricted equilibrium always exists for small values of $\bar{L}$ while the unrestricted equilibrium arises for large enough values of $\bar{L}$.[17] To guarantee a unique and stable equilibrium with label, we assume that the demand for food from a labeled worker is decreasing in food prices: $\frac{df_S^u(\text{W}(p),p,\text{W}(p),\theta)}{dp} \leq 0$ and $\frac{df_S^u(\text{P}(p),p,\text{P}(p),\theta)}{dp} \leq 0$ in addition to the stability assumptions made previously.

In this section, we focus on the analysis of unrestricted labeling. Under an unrestricted label, the equilibrium pair of food prices must leave Southern individuals indifferent between working in either sector: $p^{l*} = \text{W}(p^{u*})$. Indeed, as long as labour is perfectly mobile across sectors, a welfare differential attracts all Southern workers in the more beneficial sector, which automatically leads to an excess demand in the other sector. We therefore have:

**Proposition 7** *Under an unrestricted working conditions label, the welfare of labeled workers is equal to the welfare of unlabeled workers.*

**Proof.** We show that $p^{l*} = \text{W}(p^{u*})$ is the only possibility at an equilibrium.

(i) $p^l > \text{W}(p^u)$, then $f_S^u > 0$ and $F^u = 0$, which cannot constitute an equilibrium.

(ii) $p^l < \text{W}(p^u)$, then $f_N^l > 0$ and $F^l = 0$, which cannot constitute an equilibrium. ■

At a post-label equilibrium, unlabeled food is sold exclusively in the South while labeled food is sold exclusively in the North. We can now turn to the welfare impact of unrestricted labelling. Introducing an unrestricted label generates changes in the food market which, as we shall see, will determinate the welfare impact of labelling. These changes are (i) a demand effect as the label increases the Northern demand for food, (ii) a supply effect as productivity in the labelled sector falls by an amount $\zeta$, and (iii) a cost effect as part of the premium from the North is dissipated to pay the cost of improved labour standards. The demand effect, formalized in Assumption 1, constitutes the driving mechanism leading to an increase in food prices under

[17] This last statement invites two remarks. First, for intermediate values of $\bar{L}$, there exists a third type of equilibrium in which only labelled food is consumed in the North and $\text{P}(p^{u*}) > p^{l*} > p^{u*}$. The analysis of this particular regime follows that of a restricted equilibrium, with no further insights, and is therefore omitted. Second, while a restricted equilibrium always exists, an unrestricted equilibrium may fail to appear if $\zeta$ is so large that the labelled supply by all Southern workers falls short of the potential labelled demand from Northern consumers.

wage premium labelling. The supply effect and the cost effect are specific to working conditions labelling. These two effects go in opposite directions, the supply effect pushing food prices upwards while the cost effect pushes food prices downwards.

The redistributive impact of unrestricted labeling depends on the relative strength of the three effects. When post-label equilibrium food prices are low, i.e. $p^{l*} < \mathrm{W}(p^*)$ and $p^{u*} < p^*$, the South is worse off, while the North is better off. As shown in Appendix B, this is more likely to occur when (i) the Northern demand for labeled food is price elastic, (ii) the shift towards labeled units of food does not increase much the demand for food in the North, and (iii) the income elasticity of the Southern demand for food is high, so that, when labeled individuals earn a lower net wage, it translates into a lower demand for food. Note that an increase in $\zeta$ has an ambiguous effect as it simultaneously creates a cost effect and a supply effect. The former dominates the latter iff the price elasticity of the demand for labelled food in the North is below $-1$, in which case increasing $\zeta$ reduces food prices and is detrimental for the South.

As expected, under the reverse conditions, post-label food prices are high. When $p^{l*} > \mathrm{P}(p^*)$ and $p^{u*} > \mathrm{W}^{-1}(\mathrm{P}(p^*))$, the North is worse off while the South is better off.[18]

Interestingly, a label is Pareto-improving when food prices are intermediate, i.e. $p^* < p^{u*} < \mathrm{W}^{-1}(\mathrm{P}(p^*))$ and $\mathrm{W}(p^*) < p^{l*} < \mathrm{P}(p^*)$. The existence of this price interval stems from the differential between the price premium the North is willing to pay for labelled food and the net cost of adopting improved labour standards. The lower this differential, the narrower the Pareto-improving price interval. At the limit, when the price premium exactly covers the net cost, an unrestricted label is never Pareto-improving. We therefore have:

**Proposition 8** *Suppose that $\mathrm{P}(p^*) = \mathrm{W}(p^*)$. Under an unrestricted working conditions label, the North is better off iff the South is worse off. Moreover, the South is worse off when $\zeta$ is small enough.*

[18] More formally, the South is better off iff Expression (11) in Appendix B is positive. For example, the South is better off when $U_N = \left(\left(\lambda f_N^l + f_N^u\right)^\rho + c_N^\rho\right)^{\frac{1}{\rho}}$ and $U_S = \left(\left(f_S^l + f_S^u\right)^\rho + c_S^\rho\right)^{\frac{1}{\rho}}(1+\theta)$, and when $U_N = \lambda f_N^l + f_N^u + v_N(c_N)$ and $U_S = f_S^l + f_S^u + v_S(c_S) + \theta$. When $U_N = c_N + v_N\left(\lambda f_N^l + f_N^u\right)$ and $U_S = c_S + v_S\left(f_S^l + f_S^u\right) + \theta$, the South is better off for some parameters values only. In the North, the welfare goes up iff Expression (10) in Appendix B is negative at $p^l = \mathrm{P}(p^*)$ and $p^u = \mathrm{W}^{-1}(\mathrm{P}(p^*))$. The North is better off with any of the three combinations of utility functions for some parameters values only.

**Proof.** The proof of the first statement is omitted. As for the second statement, welfare in the South decreases iff $p^{l*} < \text{W}(p^*)$ and $p^{u*} < p^*$. This arises iff Expression (11) given in Appendix B is negative. The second term in (11) is always negative. If $\text{P}(p^*) = \text{W}(p^*)$, the first term is negative when $\zeta \to 0$ by A2, while it can possibly be positive with a high $\zeta$. Accordingly, if $\text{P}(p^*) = \text{W}(p^*)$, Expression (11) is unambiguously negative when $\zeta$ is small enough. ∎

If $p^{l*} < \text{P}(p^*)$, the North is better off as the equilibrium labelled price is lower than the price which would leave their welfare unaffected. If $p^{l*} > \text{W}(p^*)$, workers in the South are better off as the equilibrium wages are higher than the wages which would leave their welfare unaffected. Both conditions are however incompatible when $\text{P}(p^*) = \text{W}(p^*)$, so that a label is never Pareto-improving.

The welfare impact of labelling is ambiguous and depends on the changes on the food market created by the introduction of the label. However, when the cost of improved labour standards is essentially in terms of units of clothes, the South is unambiguously worse off. When $\zeta$ is low, the supply effect on the food market is indeed low and the premium from the North is dissipated on the clothes market. As a result, a low $\zeta$ makes labelling detrimental in the South and beneficial in the North.

## 3.2 The impact of restricted labelling

In this section, we explore the impact of labeling when only a small number $\bar{L}$ of workers in the South can obtain the label (e.g. owing to limited monitoring capacities). As said above, at an equilibrium under restricted access, both types of food are consumed in the North. When this holds, the prices of labeled and unlabeled food are such as to leave Northern consumers indifferent: $p^{l**} = \text{P}(p^{u**})$.

The results of this Section are very similar to the results of Section 2.3 on restricted wage premium labelling. Here again, the North is better off if and only if $p^{u**} < p^*$, while the welfare of unlabeled workers in the South rises iff $p^{u**} > p^*$. We therefore have:

**Proposition 9** *Under a restricted working conditions label, the North is better off iff unlabeled workers are worse off.*

**Proof.** Proof omitted. ∎

The conditions under which the price of unlabeled food and the welfare of unlabeled individuals fall are qualitatively similar to the conditions under which the South is worse under an unrestricted working conditions label analyzed in Section 3.1.[19]

In general, the introduction of a restricted label increases the welfare of labelled workers. Interestingly, the impact on labelled workers may however be detrimental. The conditions under which this outcome arises are similar to those leading to a fall in welfare of unlabeled workers, except that the effects have to be stronger.[20] We can also give an intuitive situation in which the impact is detrimental. When $\mathrm{P}(p) = \mathrm{W}(p)$, the welfare of labelled workers is identical to the welfare of unlabeled workers. Accordingly, labelled workers are worse off when $p^{u**} < p^*$. Finally, note that, even when labelled workers are better off, the expected utility of an individual in the South may fall provided that $p^{u**} < p^*$ and access to the label is restricted to a suitably small number of workers:

**Proposition 10** *Consider a situation under which all workers in the South face the same probability $\frac{\bar{L}}{L}$ of obtaining a label. If $p^{u**} < p^*$ and if $\bar{L}$ is small enough, the introduction of a working conditions label reduces welfare in the South.*

**Proof.** Proof omitted. ■

# 4 Concluding comments

In this paper, we have investigated the redistributive impact of a label certifying high labour standards in the South. We have shown that a label may be detrimental for Southern producers. This is more likely to occur when (i) the demand for Southern products is price-elastic in the North, and (ii) the cost of adopting improved labour standards is in terms of Northern goods. We have also shown that the price interval in which a label is Pareto-improving may be small, particularly when the premium the North is willing to pay for labelled products just covers the cost of improving labour standards.

[19] More formally, unlabelled workers are worse off iff Expression (13) in Appendix B is negative. For example, unlabelled workers are worse off iff $\lambda(1-\zeta) > 1$ when $U_N = \left(\left(\lambda f_N^l + f_N^u\right)^\rho + c_N^\rho\right)^{\frac{1}{\rho}}$ and $U_S = \left(\left(f_S^l + f_S^u\right)^\rho + c_S^\rho\right)^{\frac{1}{\rho}}(1+\theta)$, and when $U_N = c_N + v_N\left(\lambda f_N^l + f_N^u\right)$ and $U_S = c_S + v_S\left(f_S^l + f_S^u\right) + \theta$. When $U_N = \lambda f_N^l + f_N^u + v_N(c_N)$ and $U_S = f_S^l + f_S^u + v_S(c_S) + \theta$, the welfare of unlabelled workers in unaffected by the introduction of a label.

[20] More formally, labelled workers are worse off iff Expression (12) in Appendix B is negative at $p^u = \tilde{p}$ and $p^l = \mathrm{P}(\tilde{p})$, where $\tilde{p} < p^*$ is implicitely defined by $\underset{f_S^u}{Max} U_S\left((1-\zeta)\mathrm{P}(\tilde{p}) - \zeta_c - \tilde{p}.f_S^u, f_S^u, 1\right) = \underset{f_S^u}{Max} U_S\left(p^* - p^*.f_S^u, f_S^u, 0\right)$.

We have also investigated a restricted label, where only a small number of producers have access to the label. Under restricted access, Northern consumers are better off when the unlabeled price falls. However, this is exactly the condition under which unlabeled producers are worse off. Even though labelled workers are in general better off, the label may thus reduce welfare in the South provided access to the labelled sector is restricted to an adequately small number of workers. A detrimental impact on unlabeled workers of a label under restricted access is consistent with Murshid et al. (2003) according to which:

> "Ethical trading in Bangladesh has both positive and negative consequences, (...). Working conditions have improved in compliant factories,but workers in non-compliant firms are worse-off."

When adopting high labour standards is not costly for producers, the label resembles to a label certifying a wage premium. We then show that an unrestricted label is beneficial in the South when it increases the demand for Southern products, while it is beneficial in the North when this increase in demand is bounded. To increase welfare, the label should however be accessible to a large proportion of producers and not to a small minority of privileged producers. This result runs against the current practice by many NGOs of selecting a few well-known producers to provide them with a label and ignore the others.

We could have build a richer model in which the South is made up of two types of agents, capitalists and workers, with the formers owning the firms and choosing the working conditions of the latter. Alternatively, we could have introduced middlemen in our basic framework. The redistributive impacts of a label would be less clear as one more type of agent is involved in the analysis. However, our main results regarding the conditions under which a label is beneficial in the South would not be qualitatively modified. In fact, the conditions for a pareto-improvement in the South will be even more demanding, as one more type of agent has to benefit from a label.

We have also assumed a representative consumer in the North willing to pay a premium to cover the net cost of improved labour standards. Alternatively, we might have two types of consumers in the North, the concerned and the unconcerned ones. The unconcerned consumers purchase unlabeled food, which is the less costly variety. Their welfare rises iff the unlabeled price falls, which is exactly the condition under which the welfare in the unlabeled sector falls. In this more general setting, a label is therefore never Pareto-improving.

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# Appendix A. Market conditions (wage premium)

We let $L_N^l$ stands for the number of Northern consumers purchasing labeled food ($0 < L_N^l \leqslant L$), such that demand equals supply on the market for labelled food at food prices $\left(p^l, p^u\right) = (\mathrm{P}(p^*), p^*)$:

$$L_N^l f_N^l (\mathrm{P}(p^*), p^*, \gamma) = \bar{L} \tag{6}$$

The aggregate net demand - defined as the total demand less the total supply - for unlabeled food is equal to:

$$\left(L - L_N^l\right) f_N^u (\mathrm{P}(p^*), p^*, \gamma) + \bar{L} f_S^u (\mathrm{P}(p^*), p^*, \mathrm{P}(p^*)) + \left(L - \bar{L}\right) f_S^u (\mathrm{P}(p^*), p^*, p^*) - \left(L - \bar{L}\right)$$

Compared to the pre-label equilibrium market condition for food given at (3), the change in net aggregate demand for (labelled and unlabeled) food is:

$$L_N^l \left[f_N^l (\mathrm{P}(p^*), p^*, \gamma) - f_N^u (\cdot, p^*, \gamma)\right] + \bar{L} \left[f_S^u (\mathrm{P}(p^*), p^*, \mathrm{P}(p^*)) - f_S^u (\cdot, p^*, p^*)\right]$$

Dividing this expression by $\bar{L}$, using (6), and rearranging yields the change in net aggregate demand for food per labeled worker which is equal to:

$$1 - \frac{f_N^u (\cdot, p^*, \gamma)}{f_N^l (\mathrm{P}(p^*), p^*, \gamma)} + f_S^u (\mathrm{P}(p^*), p^*, \mathrm{P}(p^*)) - f_S^u (\cdot, p^*, p^*) \tag{7}$$

When positive (negative), an excess demand (supply) for food arises at $p^l = \mathrm{P}(p^*)$ and $p^u = p^*$, so that $p^{l**} > \mathrm{P}(p^*)$ and $p^{u**} > p^*$ ($p^{l**} < \mathrm{P}(p^*)$ and $p^{u**} < p^*$) at an equilibrium.

# Appendix B. Market conditions (working conditions)

We let $L_N^l$ stands for the number of Northern consumers purchasing labeled food ($0 \leqslant L_N^l \leqslant L$), and $L_S^l$ stands for the number of Southern workers in the labeled sector ($0 \leqslant L_S^l \leqslant L$), such that demand equals supply on the market for labeled food at food prices $\left(p^l, p^u\right)$:

$$L_N^l f_N^l\left(p^l, p^u, \gamma\right) = (1-\zeta)\, L_S^l \tag{8}$$

The aggregate net demand - defined as the total demand less the total supply - for unlabeled food is equal to:

$$\left(L - L_N^l\right) f_N^u\left(p^l, p^u, \gamma\right) + L_S^l f_S^u\left(p^l, p^u, p^l, 1\right) + \left(L - L_S^l\right) f_S^u\left(p^l, p^u, p^u, 0\right) - \left(L - L_S^l\right)$$

Compared to the pre-label equilibrium market condition for food given at (3), the change in net aggregate demand for (labelled and unlabeled) food is:

$$\begin{aligned} &L_N^l\left[f_N^l\left(p^l, p^u, \gamma\right) - f_N^u\left(p^l, p^u, \gamma\right)\right] + L\left[f_N^u\left(p^l, p^u, \gamma\right) - f_N^u\left(\cdot, p^*, \gamma\right)\right] \\ &+ L_S^l\left[f_S^u\left(p^l, p^u, p^l, 1\right) - f_S^u\left(p^l, p^u, p^u, 0\right) + \zeta\right] + L\left[f_S^u\left(p^l, p^u, p^u, 0\right) - f_S^u\left(\cdot, p^*, p^*, 0\right)\right] \end{aligned} \tag{9}$$

Under unrestricted labelling, $L_N^l = L$. Dividing Expression (9) by $L_S^l$, using (8) and rearranging yields:

$$\begin{aligned} &1 - \frac{(1-\zeta)\, f_N^u\left(\cdot, p^*, \gamma\right)}{f_N^l\left(p^l, p^u, \gamma\right)} + f_S^u\left(p^l, p^u, p^l, 1\right) - f_S^u\left(p^l, p^u, p^u, 0\right) \\ &+ \frac{(1-\zeta)\left(f_S^u\left(p^l, p^u, p^u, 0\right) - f_S^u\left(\cdot, p^*, p^*, 0\right)\right)}{f_N^l\left(p^l, p^u, \gamma\right)} \end{aligned} \tag{10}$$

At $p^u = p^*$ and $p^l = \mathrm{W}(p^*)$, the last term disappears, and Expression (10) simplifies into:

$$\left[1 - \frac{(1-\zeta)\, f_N^u\left(\cdot, p^*, \gamma\right)}{f_N^l\left(\mathrm{W}\left(p^*\right), p^*, \gamma\right)}\right] + \left[f_S^u\left(\mathrm{W}\left(p^*\right), p^*, \mathrm{W}\left(p^*\right), 1\right) - f_S^u\left(\mathrm{W}\left(p^*\right), p^*, p^*, 0\right)\right] \tag{11}$$

Under restricted labelling, we have $L_S^l = \bar{L}$. Dividing Expression (9) by $\bar{L}$, using (8) and rearranging yields:

$$1-\frac{\left(1-\zeta\right)f_{N}^{u}\left(\cdot,p^{*},\gamma\right)}{f_{N}^{l}\left(p^{l},p^{u},\gamma\right)}+f_{S}^{u}\left(p^{l},p^{u},p^{l},1\right)-f_{S}^{u}\left(p^{l},p^{u},p^{u},0\right) \tag{12}$$
$$+\frac{L\left[f_{N}^{u}\left(p^{l},p^{u},\gamma\right)-f_{N}^{u}\left(\cdot,p^{*},\gamma\right)+f_{S}^{u}\left(p^{l},p^{u},p^{u},0\right)-f_{S}^{u}\left(\cdot,p^{*},p^{*},0\right)\right]}{\bar{L}}$$

At $p^u = p^*$ and $p^l = \mathrm{P}(p^*)$, the last term disappears, and Expression (12) simplifies into:

$$1-\frac{\left(1-\zeta\right)f_{N}^{u}\left(\cdot,p^{*},\gamma\right)}{f_{N}^{l}\left(\mathrm{P}\left(p^{*}\right),p^{*},\gamma\right)}+f_{S}^{u}\left(\mathrm{P}\left(p^{*}\right),p^{*},\mathrm{P}\left(p^{*}\right),1\right)-f_{S}^{u}\left(\mathrm{P}\left(p^{*}\right),p^{*},p^{*},0\right) \tag{13}$$

# Altruism and overprovision of in-kind transfers*

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# 1 Introduction

Altruism has focused attention of economists from several decades. While this reflects the concern of economists to better understand human behavior, incorporating altruism into economic models has also proven to have unexpected properties. Among these, the inefficiency created by the Samaritan's dilemma has often been single out.

The Samaritan's dilemma arises in a two-periods game involving an altruistic donor and a selfish recipient. In the first period, the recipient has to choose how much to consume and how much to save. The idea is that the donor cannot commit not to help the recipient out in the second period. The donor's transfer in the second period serves however as an implicit tax on recipient's saving. When saving an extra euro, the recipient increases his consumption in the second period. This automatically leads to a lower second-period transfer from the donor. The selfish recipient has therefore an incentive to under-save in an attempt to manipulate the magnitude of the second-period transfer.[1] This is why the Samaritan's dilemma generally leads to an inefficiency.[2]

Bruce and Waldman (1991) and Coate (1995) have shown that in-kind transfers can allow the donor to restore efficiency.[3] By tying the recipient's decision choice in the first period - such as saving in the previous example - in kind transfers can resolve the moral hazard problem created by the Samaritan's dilemma.[4] For example, a capital transfer to the recipient who would otherwise underinvest restores efficiency in Bruce and Waldman (1991). In Coate (1995), choosing the amount of insurance against a bad shock taken out by the recipient who would otherwise underinsure allows the donor to

[1] The Samaritan's dilemma was first described by Buchanan (1975). See e.g. Lindbeck and Weibull (1988), Bernheim and Stark (1988) and Lagerlof (2004) for a formal analysis of the Samaritan's dilemma. In Lindbeck and Weibull (1988), it is shown that the dilemma arises also in the case where both agents are altruistic towards each other.

[2] In the aid context, for example, the Samaritan's dilemma is now aknowledged to be a real issue (see Gibson et al., 2005, for a review).

[3] Different kinds of rationale have been suggested for the use of in-kind transfers. See Currie and Gahvari (2008) for a review. In-kind transfers may be used as a screening device allowing to target intended beneficiaries (see e.g. Blackorby and Donaldson, 1988). Also supporting the possibility of in-kind transfer is the warm glow effect, that is, the fact that donors derive utility from making a gift per se (see e.g. Andreoni, 1988).

[4] It was previously argued that in-kind transfers should only be choosen by paternalistic donor who care about the presence of some particular goods in the recipient's consumption bundle. For more details on paternalistic preferences, see Pollak (1988). In Svensson (2000), in-kind transfers are made by a donor country which cares only about consumption of the poor in the recipient's country.

restore efficiency.[5]

This paper criticizes this result. First, it is shown that in-kind transfers do not resolve the Samaritan's dilemma when moral hazard arises in a dimension which is not controllable by the donor. The framework is one in which the recipient chooses a production with two inputs, effort and capital. Before production takes place, the donor can make a pre-transfer. Part of this transfer can be given in the form of capital. Effort is however not enforceable by the donor. In the post-production period, the donor then chooses a post-transfer.

Though simple, this framework captures a number of realistic situations. In the aid context, a donor country can finance some particular projects, while it cannot in general enforce the amount of effort, care, or labour supplied by its beneficiaries. Another example is a benevolent government which can finance projects or training schemes for its citizens with very few control of their eagerness to work. In the family context, a parent can pay school fees for its children, but he can presumably not control their diligence in studying.

As we shall see, the recipient generally has an incentive to under-supply effort in order to manipulate the post-transfer. The donor's best response to this Samaritan's dilemma problem is to overprovide the recipient with a capital transfer. This induces the recipient to shift the (under-supplied) amount of effort upwards. A capital transfer is beneficial from the donor's perspective as it mitigates the Samaritan's dilemma. It however does not restore efficiency.

Matters change when the donor cannot tax the recipient, as in the aid context presumably. In this case, the donor's best response is to pre-commit not to make a post-transfer which is the source of inefficiency. She does so by overproviding the recipient with a pre-transfer. When the donor has the ability to make in-cash transfers only, the outcome is efficient. As the post-transfer is at a corner, the recipient indeed chooses to produce efficiently. It is however not optimal from the donor's perspective because the pre-transfer is too high. When the donor is able to make a capital transfer, she chooses to over-provide the recipient with a capital transfer. A capital transfer limits the scope for the recipient to manipulate the post-transfer, as capital cannot be suitably adjusted downwards. This allows the donor to reduce her excess pre-transfer. While this is beneficial from the donor's perspective, it however leads to an inefficient outcome where too much capital is invested.

The paper proceeds as follows. Section 2 sets up the model. Section 3

[5] The efficiency argument has also been used to justify or explain the existence of compulsory social insurance systems (see e.g. Veall, 1986, Hansson and stuart, 1989).

analyses the transfers of a donor who has the ability to tax the recipient in the post-production period. The case where the post-transfer cannot be negative is then analyzed in Section 4. Section 4.2 analyzes transfers when production is risky, and shows that risk in production can mitigate the Samaritan's dilemma. Section 5 concludes.

# 2 The model

Consider a framework with only two agents: a donor and a recipient. The donor is altruistic towards the recipient. The donor's and recipient's initial wealth, respectively denoted by $w_D$ and $w_R$, are such that the donor is willing to make transfers to the recipient. Transfers can occur at two different points in time. In between, the recipient has access to a production function $f(k, e)$ with two inputs: capital $(k)$ and effort $(e)$.

The timing of the game is as follows. The donor moves first by choosing the transfers $t$ and $k_D$. The transfer $t \geqslant 0$, called the pre-transfer, represents the total transfer made by the donor to the recipient at stage 1. The variable $k_D$, where $t \geqslant k_D \geqslant 0$, represents the part of this total transfer which is given in the form of capital. The remainder part, $t - k_D$, is given in-cash. At stage 2, the recipient chooses the amount of capital $k$ and the amount of effort $e$ to invest. The possibility of reselling capital is ruled out, so that $k \geqslant k_D$. At stage 3, the donor chooses the transfer $\tau$, called the post-transfer. The post-transfer $\tau$ is given in-cash. Whether $\tau$ can take a negative value or not is crucial in the analysis. The two cases are thus respectively considered in Section 3 and Section 4. The game ends with payoffs. The donor has the following utility function:

$$\mathcal{U} = u\left(c_D\right) + \delta \mathcal{V} \tag{1}$$

where $\mathcal{V}$ is the recipient's utility, and $\delta > 0$ is the altruistic factor. The donor's consumption, $c_D$, is equal to her initial wealth less the total amount transferred:

$$c_D = w_D - t - \tau \tag{2}$$

The recipient is selfish. His utility function is as follows:

$$\mathcal{V} = v\left(c_R\right) - \omega\left(e\right) \tag{3}$$

where $\omega(e)$ represents the disutility of effort. Normalizing the price of capital to 1, the recipient's consumption, $c_R$, is given by:

$$c_R = w_R + t - k + f(k,e) + \tau \tag{4}$$

The amount of capital is constrained from below by the capital transfer and from above by the resources available to the recipient at the moment of investing.[6] The lower bound and the upper bound constraint on $k$ are therefore respectively:

$$k \geqslant k_D \tag{5}$$

$$k \leqslant w_R + t \tag{6}$$

The usual assumptions on the functions $u$, $v$ and $w$ are made to guarantee a stable, unique and interior equilibrium.[7] The usual assumptions on $f(k,e)$ are also made: $f_j > 0$ and $f_{jj} < 0$, $j = k, e$. It is also assumed that inputs are gross complementary in production, $f_{ke} > 0$, which plays a key role in the analysis.[8] To ensure the global concavity of the problem, $\omega(e)$ has to be sufficiently convex, which is henceforth required. Finally, it is assumed that $f_k(w_R, e) > 1$ and $f_k(w_R + w_D, e) \leqslant 1$. The former ensures that the recipient is willing to invest a part of the pre-transfer $t$, while the latter ensures that aggregate wealth is large enough compared to the production function.

# 3 Transfers when the donor can tax

This section analyses the transfers of a donor who has the ability to tax the recipient at stage 3. In this section, the post-transfer $\tau$ can then take

[6] Implicit here is the assumption that the recipient cannot borrow funds in the capital market. It can also be argued that interest rates are so high that borrowing never arises at equilibrium.

[7] We assume both $u$ and $v$ twice differentiable, strictly increasing and strictly concave with $v'(c) \to +\infty$ and $u'(c) \to +\infty$ as $c \to 0$. We assume that $\omega(e)$ is twice continuously differentiable, increasing and convex. To ensure an interior equilibrium for $e$, it is assumed that $\lim_{e \to 0} \omega_e = 0$ and $\lim_{e \to \bar{e}} \omega_e = +\infty$, where $\bar{e}$ represents the maximum amount of effort.

[8] This assumption seems highly plausible. Any production function satisfies this property unless it exhibits diminishing return to scale together with high substitution between inputs.

a negative value. Before proceeding with the analysis, the values of the variables that are first best from the donor's perspective are first described. These values, denoted by an asterisk, are obtained by maximizing (1) subject to (2), (3), (4), and (6). These values provide a useful benchmark against which to compare the values of the variables at a subgame perfect Nash equilibrium.

The first order conditions with respect to $\tau^*$ and $e^*$ are, respectively:

$$\delta v'(c_R) - u'(c_D) = 0 \tag{7}$$

$$v'(c_R) f_e - \omega_e = 0 \tag{8}$$

Equation (7) also characterizes the optimal pre-transfer $t^*$.[9] At a donor's optimum, the pre-transfer is large enough so that the upper-bound constraint on $k$ is not binding, $k^* < w_R + t^*$. The amount of capital, $k^*$, is then such that:

**Lemma 1** *When the donor can tax the recipient, the amount of capital at the donor's first best is such that* $f_k^* = 1$

**Proof.** The Kuhn-Tucker first-order condition w.r.t. $k^*$ and $t^*$ are, respectively:

$$\delta v'(c_R)\{f_k - 1\} - \kappa = 0 \tag{9}$$

$$\delta v'(c_R)\left\{1 - (1 - f_k)\frac{dk}{dt}\right\} - u'(c_D) = 0 \tag{10}$$

where $\kappa$ is the lagrangian multiplier associated with the upper-bound constraint (6). If $f_k > 1$, then $\kappa > 0$ by (9) and, accordingly, $\frac{dk}{dt} = 1$. Given (7), Equation (10) cannot hold, so that this cannot be an equilibrium. ■

When the donor can tax the recipient, the allocation of resources at the donor's optimum is efficient. Efficiency requires effort and capital to be chosen efficiently. Capital is efficient since, by Lemma 1, the marginal productivity of capital, $f_k^*$, is equal to the marginal cost of capital, 1. Effort

[9] Note that $t^*$ and $\tau^*$ are not unique because a unit of post-transfer can be substituted by a unit of pre-transfer. However, $t^* + \tau^*$ is uniquely defined.

is efficient since, by Equation (8), the marginal benefit in utility terms of expanding effort is equal to $\omega_e$, the marginal disutility of effort.

### 3.1 Equilibrium transfers

The SPNE of the game can now be characterized. The model is resolved by backward induction. At stage 3, the donor chooses the post-transfer $\tau$ which maximizes (1) subject to (2), (3), and (4). This yields the first order condition given at (7).

At stage 2, the recipient chooses the amount of inputs $k$ and $e$, taking into account the impact of his inputs choice on the post-transfer $\tau$. Maximizing (3) subject to (4) yields the following first-order conditions for $e$:

$$v'(c_R)\left\{f_e + \frac{d\tau}{de}\right\} - \omega_e = 0 \tag{11}$$

where the term $\frac{d\tau}{de}$ represents the impact of a change in $e$ on $\tau$. This term can be obtained by differentiating (7), which yields:

$$\frac{d\tau}{de} = -\frac{\delta v''(c_R)}{\delta v''(c_R) + u''(c_D)} f_e < 0 \tag{12}$$

When increasing effort, the recipient rises production, which automatically reduces the post-transfer $\tau$ made by the donor. Compared to the optimal first-order condition from the donor's perspective (8), the presence of the term $\frac{d\tau}{de} < 0$ in (11) reduces the marginal benefit of effort. As production is partially shared with the donor, the recipient under-supplies effort from the donor's perspective. This is the way the Samaritan's dilemma arises in this model.[10]

This is important to note that the inefficiency in effort arises because production is shared between the donor and the recipient, while the recipient must bear alone the cost of effort. The way production is shared depends on the relative concavity of the utility functions. Two limit cases are worth to discuss. First, when $u''(c_D) = 0$, (12) simplifies into $\frac{d\tau}{de} = -f_e$. Given (11), the recipient makes no effort at all. This is because the donor fully

[10] As shown in Bruce and Waldman (1991) and Coate (1995), the Samaritan's dilemma disappears when the donor can commit to the transfers $t^*$ and $\tau^*$. The recipient would then consider it as independent of his inputs choices, and would choose the optimal $k^*$ and $e^*$. Under commitment, the donor therefore achieves her first best utility level.

absorbs any change in production as her utility function is linear in consumption. When the recipient rises production, it automatically decreases the post-transfer in a one-for-one basis. This leaves the recipient with no incentive to make effort. At the other extreme, $\frac{d\tau}{de} = 0$ when $v''(c_R) = 0$. The post-transfer is constant and the recipient fully absorbs any change in production. In this case, the inefficiency totally disappears as the recipient perfectly internalizes any change in the amount of effort.

The amount of capital chosen by the recipient is such that:

**Lemma 2** *When the donor can tax the recipient, the amount of capital chosen by the recipient, when interior, is such that* $f_k = 1$.

**Proof.** Maximizing (3) subject to (4), (5) and (6) yields the following Khun-Tucker first-order conditions for $k$:

$$v'(c_R)\left\{(f_k - 1) + \frac{d\tau}{dk}\right\} + \mu - \kappa = 0 \tag{13}$$

where $\mu$ and $\kappa$ are respectively the Lagrangian multiplier associated with the lower- and upper-bound constraint on $k$. The impact of a change in $k$ on $\tau$, denoted by $\frac{d\tau}{dk}$ and obtained by differentiating (7), is equal to:

$$\frac{d\tau}{dk} = -\frac{\delta v''(c_R)}{\delta v''(c_R) + u''(c_D)}(f_k - 1) \tag{14}$$

When interior, i.e. when $\mu = 0$ and $\kappa = 0$, the amount of capital chosen is such that $f_k = 1$ as, following (14), $\frac{d\tau}{dk}$ is proportional to $(f_k - 1)$. ■

Following Lemma 2, the amount of capital chosen by the recipient is efficient. The intuition is the following. When the recipient increases capital, the increase in production is partially shared with the donor. Increasing capital has however a cost in terms of foregone units of consumption. As the cost directly affects the recipient's consumption, it is shared with the donor as well. At the end of the day, when varying the amount of capital, the recipient gets a positive share of the net productivity of capital, defined as the marginal productivity less the marginal cost. This induces the recipient to choose the efficient amount of capital. Hence, when interior, $k$ is such that $f_k = 1$.[11]

The choice of the transfers made by the donor at stage 1 can now be analyzed. Two different situations are characterized. In the first situation,

[11]This result follows from the Becker's rotten-kid theorem (Becker, 1974). For analyses on the link between the rotten-kid theorem and the Samaritan's dilemma, see Bergstrom (1989) and Bruce and Waldman (1990).

the donor has the ability to make a capital transfer, so that $k_D$ can be positive. The equilibrium values of the variables are then denoted by the letter $k$. Alternatively, when the transfers must be given fully in cash, so that $k_D = 0$, the equilibrium values of the variables are denoted by the letter $c$.

If the donor has the ability to make a cash transfer only, the recipient chooses to underinvest capital and effort compared to the donor's first best. The presence of a post-transfer induces the recipient to under-supply effort and, by gross complementarity of inputs, to adjust the amount of capital downwards. As a result, $k^c < k^*$ and $e^c < e^*$.

Allowing the donor to make a capital transfer mitigates the Samaritan's dilemma. By providing the recipient with a capital transfer above the level that the recipient would choose otherwise, the donor tries to induce the recipient to rise his (undersupplied) amount of inputs.

Denoting the utility level attained by the donor by $U$, the welfare analysis is as follows:

**Proposition 1** *When the donor can tax the recipient, the donor achieves a higher utility level with a capital transfer, but she does not achieve her first best outcome, $U^* > U^k > U^c$. Moreover, the allocation of resources is not efficient with a capital transfer, and it is not efficient either with in-cash transfers only.*

**Proof.** See Appendix. ■

A capital transfer allows the donor to rise production, $k^k > k^c$ and $e^k > e^c$. As $f_k^c = 1$, following Lemma 2, the donor has to over-provide the recipient with a capital transfer, so that the marginal productivity of capital $f_k^k$ falls short of 1. This induces the recipient to increase effort in two ways. First, this rises the marginal productivity of effort by gross complementarity of inputs. Second, as $f_k^k < 1$, it impoverishes the recipient and rises the marginal benefit in utility terms of expanding effort. The donor strictly prefers a capital transfer. Indeed, increasing marginally $k_D$ above $k^c$ has a very low cost in terms of wasted resources since $f_k^c = 1$. It is however beneficial for the donor as it induces the recipient to rise effort. As a result, the utility level the donor attains with a capital transfer is strictly higher than when she can make in-cash transfers only.

Overprovision of in-kind transfer is larger the higher the inefficiency of effort (i.e. the lower $u''$ in absolute value relative to $v''$). The magnitude of overprovision also depends on the net benefit of increasing capital above its efficient level. The benefit of increasing capital is to rise effort, which is greater the higher the complementarity between capital and effort. The cost of overprovision is low when the marginal product of capital does not fall much with higher amounts of capital. Note that a high $f_{ke}$ and a low $f_{kk}$ are more likely when the production function exhibits increasing returns to scale.[12]

When the donor can make in-cash transfers only, the allocation of resources is inefficient since $\frac{d\tau}{de} < 0$ in (11), so that the marginal benefit of expanding effort in utility terms falls short of the marginal disutility of effort. When the donor can make capital transfer, she chooses to over-provide the recipient with capital. It automatically creates an inefficiency in terms of capital, and the outcome is again inefficient.

# 4 Transfers when the donor cannot tax

In the previous Section, it is assumed that the donor has the ability to tax the recipient in the post-production period. While this could be realistic in a governement-citizen framework, it is much less plausible in the aid context for example. This section explores the situation when a non-negativity constraint is imposed on the post-transfer: $\tau \geqslant 0$.

The donor's first best values of variables are first briefly described. The Kuhn-Tucker first-order condition with respect to the post-transfer $\tau^{n*}$, where the letter $n$ refers to the situation when the donor cannot tax, is as follows:

$$\delta v'(c_R) - u'(c_D) + \lambda = 0 \tag{15}$$

where $\lambda$ is the Lagrangian multiplier associated with the non-negativity constraint on $\tau$. Once the constraint is binding, the marginal utilities are not equalized and the donor would like a transfer back from the recipient in the post-production period.

The amount of effort $e^{n*}$ is such that (8) holds. Given the non-negativity constraint on the post-transfer, the pre-transfer $t^{n*}$ and the capital $k^{n*}$ are such that:

**Lemma 3** *When the donor cannot tax the recipient, the amount of capital at the donor's first best is such that* $f_k^{n*} = 1$ *when* $w_D > \tilde{w}$*, while* $f_k^{n*} > 1$ *otherwise.*

**Proof.** The Kuhn-Tucker first-order condition w.r.t. $k^{n*}$ and $t^{n*}$ are respectively given at (9) and (10).

[12]For example, with a Cobb-Douglas production function $f(k,e) = Ak^{\alpha}e^{\beta}$, overprovision is large when $\alpha$ is close to 1 and $\beta$ is close to 0.5.

If $f_k^n > 1$, then $\kappa > 0$ by (9) and, accordingly, $\frac{dk}{dt} = 1$. Given (10), $\lambda > 0$ in (15).

If $f_k^n = 1$, then $\kappa = 0$ by (9) and, accordingly, $\frac{dk}{dt} = 0$. Given (10), $\lambda = 0$ in (15).

From (15), it is straightforward to see that $\lambda > 0$ iff $w_D$ is low enough. The existence of an interior $\tilde{w}$ is guaranteed by the assumptions on the production function. ■

The pre-transfer of a small donor is low as she cannot tax the recipient in the post-production period. Accordingly, the upper-bound constraint on the amount of capital is binding, $k^{n*} = w_R + t^{n*}$. As a low amount of capital is invested, the marginal productivity of capital exceeds the marginal cost, $f_k^{n*} > 1$. This situation corresponds to the case of a poor donor whose initial wealth does not allow for a large pre-transfer. This also concerns a not very altruistic donor who is not willing to make large transfers to the recipient.[13] Since $f_k^{n*} > 1$, the first-best allocation of a small donor is not efficient.

At the contrary, when the donor is large, the pre-transfer and the amount of capital invested are large enough. At a donor's optimum, the marginal productivity of capital is equal to the marginal cost, $f_k^{n*} = 1$, and the allocation of resources is efficient.

## 4.1 Equilibrium transfers

The SPNE when the donor cannot tax the recipient is now characterized. At stage 3, the donor chooses $\tau$ so as to satisfy (15). At stage 2, the recipient chooses inputs taking into account their impact on $\tau$. The first order condition with respect to $e$ is given at (11). Interestingly, the value of $\frac{d\tau}{de}$ depends on whether the post-transfer $\tau$ is positive or not:

$$\frac{d\tau}{de} = \begin{cases} 0 \text{ if } \tau = 0 \\ -\frac{\delta v''(c_R)}{\delta v''(c_R) + u''(c_D)} f_e \text{ if } \tau > 0 \end{cases}$$

When at a corner, the post-transfer is not influenced by marginal change in effort. In this case, the first order condition (11) coincides with the optimal first order condition from the donor's perspective (8), so that the Samaritan's dilemma disappears. The recipient chooses effort efficiently as production is not shared with the donor. Of course, when the post-transfer is positive, the Samaritan's dilemma remains and the recipient under-supplies effort in order

[13] Taking $w_D$ as fixed, and allowing for $\delta$ to vary, Lemma 3 would state that $f_k^{n*} = 1$ when $\delta > \tilde{\delta}$, while $f_k^{n*} > 1$ otherwize.

to manipulate the post-transfer.

Whether $\tau$ is positive or not does not influence the efficiency of $k$ chosen by the recipient. Capital is efficient when $\tau$ is at a corner since the Samaritan's dilemma disappears. It is also efficient when $\tau$ is positive because. As explained in Section 3.1, when varying capital, the recipient gets a positive share of the net productivity of capital. In other words:

**Lemma 4** *When the donor cannot tax the recipient, the amount of capital chosen by the recipient, when interior, is such that* $f_k = 1$.

**Proof.** Proof omitted. ■

Following the discussion on $\frac{d\tau}{de}$, the Samaritan's dilemma disappears when the post-transfer is at a corner. As the donor's wealth level determines the magnitude of transfers, whether the donor is large or not is crucial in the analysis.

Consider first the case of a large donor who is able to make in-cash transfers only. If the donor chooses to make her optimal pre-transfer $t^{n*}$, then the recipient free-rides by under-supplying effort in order to manipulate the post-transfer. Anticipating this, the donor pre-commits not to make a post-transfer which is a source of inefficiency. She does so by overproviding the recipient with a pre-transfer. As a result, $t^{nc} > t^{n*} + \tau^{n*}$ and $\tau^{nc} = 0$. Compared to the donor's optimum, the recipient receives a higher transfer from the donor. This reduces his marginal utility of consumption and, accordingly, the marginal benefit of expanding effort in utility terms. At an equilibrium, $e^{nc} < e^{n*}$. By gross complementarity of inputs, this leads to $k^{nc} < k^{n*}$.

As the donor pre-commits not to make a post-transfer, production is not shared with the donor. This induces the recipient to choose $k$ and $e$ efficiently. The allocation of resources with in-cash transfers is therefore efficient. The outcome is however not optimal from the donor's perspective. This is because the pre-transfer is too large compared to the pre-transfer $t^{n*}$.

When a large donor can make capital transfers, she tries to reduce the (excess) amount transferred in the pre-production period. This is possible because a capital transfer reduces the incentive for the recipient to manipulate the post-transfer. At stage 2, the recipient has indeed to choose between two options: a high production with no post-transfer, or a low production with a positive post-transfer.[14] A capital transfer imposes a lower-bound constraint

[14] Formally, the discontinuity in $\frac{d\tau}{de}$ when $\tau$ approaches 0 causes a discontinuity in the marginal benefit of effort in (11). This discontinuity creates two candidates for an equilibrium at stage 2. Looking at (15), it is easy to see that $\tau = 0$ when $f(k, e)$ is high, while $\tau > 0$ when $f(k, e)$ is low.

on capital. This makes the recipient's choice of a low production less attractive, as capital cannot be suitably adjusted downwards by the recipient. This allows the donor to reduce her excess pre-transfer, while still pre-commiting no to make post-transfer. At an equilibrium with capital transfer, $k^{nc} < k^{nk}$ and $e^{nc} < e^{nk}$, $\tau^{nk} = 0$ and $t^{nk}$ is such that $t^{n*} + \tau^{n*} < t^{nk} < t^{nc}$. The donor however over-provides capital, so that $f_k^k < 1$. As a result, the allocation of resources is not efficient. Moreover, the outcome is not optimal from the donor's perspective, as the pre-transfer is still too large compared to the optimal pre-transfer. The donor however enjoys a higher utility level than her utility level when she can make in-cash transfers only.

The next Proposition summarizes the main results with a large donor. More precisely, there exists a donor's wealth level $w^h$, with $w^h < \tilde{w}$, such that:[15]

**Proposition 2** *When the donor cannot tax the recipient, and when the donor is large, i.e.* $w_D > w^h$*, the donor achieves a higher utility level with a capital transfer, but she does not achieve her first best outcome,* $U^{n*} > U^{nk} > U^{nc}$*. Moreover, the allocation of resources is not efficient with a capital transfer, while it is efficient with in-cash transfers only.*

**Proof.** See Appendix. ■

When the donor can make in-cash transfers only, the outcome is efficient but not optimal. This is because the pre-transfer is too high compared to the optimal pre-transfer from the donor's perspective. It is however worthwhile to note that, while the outcome is not optimal from the donor's perspective, it may be *socially* optimal. Indeed, a social planner will choose an efficient allocation of resources, but he may choose to redistribute consumption more in favour of the recipient. For example, the outcome is optimal for a social planner with utility function $\mathcal{W} = \gamma\mathcal{U} + (1-\gamma)\,\mathcal{V}$ for some $\gamma$.

The transfers made by a small donor are now analyzed. A small donor makes a low pre-transfer as she cannot tax the recipient in the post-production period. Accordingly, a low amount of capital is invested. Suppose the donor chooses to make the pre-transfer $t^{n*}$. Given the donor is small, the post-transfer is very unreactive to a change in production. This discourages the recipient from choosing a low (not optimal) production, as this does not increase the post-transfer. As a result, $t^{nc} = t^{n*}$, $\tau^{nc} = \tau^{n*} = 0$, $k^{nc} = k^{n*}$, and $e^{nc} = e^{n*}$. Whether the donor chooses a capital transfer or not makes no difference as the pre-transfer is totally invested by the recipient. Being

[15] Although somewhat confusing, the exact definition of a large donor is not the same as in Section 4 describing the donor's first best. As $\tilde{w} > w^h$, large donors at a donor's first best are necessarily large at a SPNE.

small allows the donor to attain her optimal utility level $U^{n*}$. Formally, there exists $w^l$, with $w^l \leqslant w^h$, such that:[16]

**Proposition 3** *When the donor cannot tax the recipient, and when the donor is small, i.e.* $w_D \leqslant w^l$, *the donor achieves her first best outcome,* $U^{n*} = U^{nk} = U^{nc}$. *Moreover, the allocation of resources is not efficient.*

**Proof.** See Appendix. ■

When the donor is small, the outcome is optimal from the donor's perspective. It is however not efficient. With a small pre-transfer, the amount of capital is indeed low and $f_k^{nc} = f_k^{nk} = f_k^{n*} > 1$.

It has been shown that a large donor does not achieve her first best outcome, while a small donor does either with an in-cash transfer or with a capital transfer. There exists a third type of donor, the medium donors. A medium donor attains her utility level $U^{n*}$ with a capital transfer, while she does not with in-cash transfers only. This is because an optimal capital transfer $k_D = k^{n*}$ imposes a binding lower-bound constraint on the amount of capital should the recipient choose a low production, while it does not should the recipient choose a high production. If the transfer is given in-cash, the recipient prefers a low production and $k^{nc} < k^{n*}$ and $e^{nc} < e^{n*}$. With a capital transfer $k_D = k^{n*}$, the recipient prefers a high production and $k^{nk} = k^{n*}$ and $e^{nk} = e^{n*}$. In other words:[17]

**Proposition 4** *When the donor cannot tax the recipient, and when the donor is medium, i.e.* $w^h > w_D > w^l$, *the donor achieves her first best outcome only with a capital transfer,* $U^{n*} = U^{nk} > U^{nc}$. *Moreover, the allocation of resources is not efficient with a capital transfer, while it is efficient with in-cash transfers only.*

**Proof.** Proof omitted. ■

With a medium donor, the pre-transfer is not large enough so that $f_k^{nk} = f_k^{n*} > 1$. With a capital transfer, the outcome is optimal but inefficient.

[16] It has to be noted that a small donor does not exist for some parameters values, in which case $w^l = 0$. This arises when the production $f(k,e)$ is small enough, so that, compared to a high production, the recipient looses not much consumption with a low production choice. When $f(k,e)$ is very small, $w^h = 0$, so that donors are all large.

[17] It has to be noted that medium donors does not exist for some parameters values, in which case $w^h = w^l$. This arises iff $f_{ek}$ is low. In this case, the marginal productivity of capital remains above 1 should the recipient choose a low production at $w_D = w^l$. Compared to a high production, effort at a low production is then lower and capital is the same. As a consequence, an optimal capital transfer does not weaken the recipient's incentive to choose a low production.

Exactly the contrary happens with a cash transfer. With cash transfers, the recipient chooses production efficiently since the post-transfer is at a corner. Once again, even though the outcome is not optimal from the donor perspective, it may be socially optimal as both it is efficient, and it redistributes consumption more in favor of the recipient.

## 4.2 Introducing risk in production

This section provides a discussion when production is risky. Consider that, after the recipient's choice of inputs, nature chooses the state of nature $\sigma \in (b, g)$ where $b$ refers to the bad state, and $g$ to the good state. In the good state, production is equal to $f(k, e)$, while in the bad state it is equal to $\alpha f(k, e)$, where $0 \leqslant \alpha < 1$. The recipient's consumption, $c_R^\sigma$, depends on the state of nature $\sigma$ and is as follows:

$$c_R^b = w_R + t - k + \alpha f(k, e) + \tau^b$$

$$c_R^g = w_R + t - k + f(k, e)$$

It is assumed that the donor does not make a post-transfer if the good state of nature occurs, $\tau^g = 0$. This imposes a higher bound on the donor's wealth. Moreover, it is assumed that risk is high enough, so that the donor is induced to make a post-transfer if the bad state of nature occurs, $\tau^b > 0$. This can account for a number of different scenarios in reality, such as, for example, emergency aid from a donor's country or social security from the government.

The donor's consumption, $c_D^\sigma$, is equal to:

$$c_D^\sigma = w_D - t - \tau^\sigma$$

where $\tau^g = 0$ and $\tau^b > 0$. Assuming that the good state occurs with probability $p$, the expected utility functions of the donor and the recipient are, respectively:

$$\begin{aligned} E(\mathcal{U}) &= pu(c_D^g) + (1-p)\, u\left(c_D^b\right) + \delta E(\mathcal{V}) \\ E(\mathcal{V}) &= pv(c_R^g) + (1-p)\, v\left(c_R^b\right) - \omega(e) \end{aligned}$$

Once again, the model is resolved by backward induction. At stage 3, the donor makes no post-transfer in the good state of nature. In the bad state, she chooses $\tau^b$ so as to equalize marginal utilities of consumption.

Given that $\tau^b > 0$ and $\tau^g = 0$, the amount of effort and capital chosen by the recipient at stage 2 are such that:

$$pv'\left(c_R^g\right) f_e + (1-p)\, v'\left(c_R^b\right)\left\{\alpha f_e + \frac{d\tau^b}{de}\right\} - \omega_e = 0 \tag{16}$$

$$pv'\left(c_R^g\right)\{f_k - 1\} + (1-p)\, v'\left(c_R^b\right)\left\{\alpha f_k - 1 + \frac{d\tau^b}{dk}\right\} + \mu - \kappa = 0 \tag{17}$$

where one easily obtains by differentiation:

$$\frac{d\tau^b}{de} = -\frac{\delta v''\left(c_R^b\right)}{\delta v''\left(c_R^b\right) + u''\left(c_D^b\right)}\alpha f_e \tag{18}$$

$$\frac{d\tau^b}{dk} = -\frac{\delta v''\left(c_R^b\right)}{\delta v''\left(c_R^b\right) + u''\left(c_D^b\right)}\left(\alpha f_k - 1\right) \tag{19}$$

Compared to the donor's first best, it is easy to see that the presence of $\frac{d\tau^b}{de} < 0$ in the first order condition (16) reduces the marginal benefit of expanding effort. Here again, the recipient under-supplies effort. By doing so, the recipient tries to manipulate $\tau^b$ should the bad state of nature occur.

The main difference with the case without risk concerns the amount of capital. From (17), when interior, the amount of capital chosen by the recipient is such that a weighted average of the net productivity of capital is equal to 0. At an equilibrium, the net productivity is positive if the good state of nature occurs, $f_k > 1$, and negative if the bad state occurs, $\alpha f_k < 1$. Given $\alpha f_k < 1$, increasing capital decreases production if the bad state of nature occurs. This automatically rises the post-transfer $\tau^b$, so that $\frac{d\tau^b}{dk} > 0$. As the post-transfer acts as an insurance against the bad state, the recipient over-invests capital. This makes the amount of capital chosen by the recipient too high compared to the donor's first best.

Risk in investment induces the recipient to over-invest capital. The question is now whether the donor chooses to still rise the amount of capital with a capital transfer, or not. When risk is high, the answer is unambiguously no. Indeed, with a low $\alpha$, the amount of effort chosen by the recipient is close to the optimal amount from the donor's perspective. This is because production in the bad state is very low. A change in effort does not affect much production, so it does not affect much the post-transfer either. The recipient's incentive to manipulate $\tau^b$ is therefore very low. In (16), it can be seen that the second term is low with a low $\alpha$, so that the presence of $\frac{d\tau^b}{de}$ has no much effect. Moreover, as risk is high, the recipient has a high incentive to over-invest in capital. All together, the donor cannot benefit from over-providing the recipient with a capital transfer above the level of capital that the recipient would choose otherwise. More formally, denoting the equilibrium values under risk by the letter $r$, there exists $\bar{\alpha} > 0$ such that:

**Proposition 5** *When the donor cannot tax the recipient, and when risk in production is high, i.e. $\alpha < \bar{\alpha}$, the donor achieves the same utility level with a capital transfer or with in-cash transfers, $U^{rk} = U^{rc} < U^{r*}$.*

**Proof.** Proof omitted. ■

When production is risky, the allocation of resources is not efficient. Effort is indeed under-supplied and capital is over-invested. By gross complementarity between inputs, risk therefore mitigates the Samaritan's dilemma.

# 5 Concluding comments

In this paper, it is shown that in-kind transfers generally do not allow to resolve the Samaritan's dilemma. In the model, the selfish recipient has an incentive to under supply effort in order to manipulate the post-transfer made by the altruistic donor. When the donor can tax the recipient in the post-production period, a capital transfer mitigates the Samaritan's dilemma as it induces the recipient to rise his under-supplied amount of effort. It however does not restore optimality from the donor's perspective, nor efficiency.

When the donor cannot tax the recipient, the donor chooses to over-provide the recipient with a pre-transfer. She does so in order to pre-commit not to make a post-transfer which is the source of inefficiency. Over-providing the recipient with a capital transfer is then beneficial from the donor's perspective as it allows her to reduce her excess pre-transfer. It however automatically creates an inefficiency in capital. With in-cash transfers only, the pre-transfer is too high from the donor's perspective, but the outcome is efficient as the recipient perfectly internalizes the production gains.

It is important to note that the efficiency of in-cash transfer when the donor cannot tax arises because the investment made by the recipient does not directly affect the donor's consumption apart from its effect through the post-transfer. Alternatively, the donor could directly benefit from the investment made by the recipient. This would arise when some production $g(k, e)$ depending on the recipient's inputs choices enters the donor's consumption. In this setting, an in-cash transfer would never be efficient. In case the post-transfer is at a corner (i.e. when the donor cannot tax), the recipient under-invests capital and effort as he does not internalize the gains of increasing inputs on the donor's consumption. In case the post-transfer is operative (i.e. when the donor can tax), the recipient chooses to under-supply effort due to the Samaritan's dilemma. The amount of capital chosen by the recipient with an operative post-transfer is however efficient. Indeed, the recipient chooses the amount of capital which yields the higher joint production for both himself and the donor. If the recipient chooses an amount of capital which yields a higher production for himself but a lower joint production, the post-transfer would be reduced more than the increase in his own production.[18] In all cases, overprovision of capital transfer still remains the donor's best response.

[18] Making the donor's consumption depend on the recipient's investment brings the model closer to the original Becker's rotten-kid theorem where the child chooses an action that both influences his income and the income of the parent. As Becker pointed out, the child chooses an action that maximizes the joint income of the family, provided that the post-transfer is an operative one. See Bruce and Waldman (1990) for a formal approach.

It has been considered in this paper a one-donor one-recipient relationship. Compared to the one-recipient case, adding a second recipient identical to the first one reinforces the Samaritan's dilemma as an increase in production by any recipient has to be shared between three agents. The case of a poor donor when the donor cannot tax is also more likely as now twice as much capital is needed to produce efficiently. The main results of the paper, i.e. overprovision of capital transfer and efficiency of in-cash transfer in case the donor cannot tax, are however left unchanged.

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**Proof of Proposition 1.** Consider first the situation with in-cash transfers, so that $k_D = 0$. One obtains:

(i) $f_k^c = 1$. Mutatis mutandis, this follows steps by steps the proof of Lemma 1.

(ii) $e^c < e^*$. This is obtained by comparing (8) and (11).

(iii) $k^c < k^*$. This follows from (i), (ii), Lemma 1 and gross complementarity between inputs.

$U^c < U^*$ follows from (ii) and (iii)

Consider now the situation with a capital transfer. One obtains:

(iv) $U^c < U^k$. At $k_D = k^c$, increasing $k_D$ has the following impact on the donor: $\frac{dU}{dk_D} = \{v'(c_R^c) f_e^c - \omega_e^c\} \frac{de}{dk} > 0$, since $\frac{de}{dk} > 0$. $\frac{de}{dk}$, which can be obtained by differentiating (11), is indeed proportional to $f_{ek}^c$.

(v) $k^k > k^c$, $f_k^k < 1$ and $e^c < e^k$. At an equilibrium, $\frac{dU}{dk_D} = v'\left(c_R^k\right)\left\{f_k^k - 1\right\} + \left\{v'\left(c_R^k\right) f_e^k - \omega_e^k\right\} \frac{de}{dk} = 0$. From (iv), this automatically leads to $k_D^k = k^k > k^c$ and $f_k^k < 1$, and $e^c < e^k$.

$U^k < U^*$ follows from $f_k^k < 1$. ■

**Proof of Proposition 3.** Let's denote by $e^L(t, k_D)$ and $k^L(t, k_D)$ the best low production choice given $t$ and $k_D$: $e^L(t, k_D)$ and $k^L(t, k_D) \equiv Arg \max_{e,k} v\left(w_R + t - k + f(k, e) + \tau^L\right) - \omega(e)$ where $\tau^L = \tau^L(t, k_D) > 0$, and by $e^H(t, k_D)$ and $k^H(t, k_D) \equiv Arg \max_{e,k} v\left(w_R + t - k + f(k, e) + \tau^H\right) - \omega(e)$ where $\tau^H = \tau^H(t, k_D) = 0$, the best high production choice. Define $\Delta(t, k_D)$ to be the utility gain for the recipient of choosing low production, that is:

$$\Delta(t, k_D) = v\left(c_R^L(t, k_D)\right) - \omega\left(e^L(t, k_D)\right) - \left(v\left(c_R^H(t, k_D)\right) - \omega\left(e^H(t, k_D)\right)\right)$$

where $c_R^L(t, k_D) = w_R + t - k^L + f(k^L, e^L) + \tau^L$ and $c_R^H(t, k_D) = w_R + t - k^H + f(k^H, e^H)$.

Consider the situation with in-cash transfers, so that $k_D = 0$. One obtains:

(i) $\frac{d\Delta(t^{n*},0)}{dw_D} > 0$. This is because $\frac{d\Delta(t^{n*})}{dw_D} = v'\left(c_R^L(t^{n*})\right)\frac{d(t^{n*}+\tau)}{dw_D} - v'\left(c_R^H(t^{n*})\right) f_k \frac{dt^{n*}}{dw_D} > 0$ since $v'\left(c_R^L(t^{n*})\right) = \frac{u'(w_D - t^{n*} - \tau)}{\delta} > \frac{u'(w_D - t^{n*})}{\delta} = v'\left(c_R^H(t^{n*})\right) f_k$, and $\frac{d(t^{n*}+\tau)}{dw_D} > \frac{dt^{n*}}{dw_D}$.

(ii) At $w_D = \tilde{w}$, $\Delta(t^{n*}, 0) > 0$. This is the Samaritan dilemma. At $e = e^H(t^{n*})$ and $k = k^H(t^{n*})$, we have $f_e^{n*} v'\left(c_R^H(t^{n*})\right) - \omega_e^{n*} = 0$. Decreasing $e$ yields $-\left\{f_e^{n*} + \frac{d\tau}{de}\right\} v'\left(c_R^H(t^{n*})\right) + \omega_e^{n*} > 0$ since $\frac{d\tau}{de} < 0$ below $e^H(t^*)$.

(i) and (ii) imply that $\Delta(t^{n*}, 0) > 0 \Leftrightarrow w_D > w^l$. As a corolary, we have that the donor can achieve her optimal outcome with an in-cash transfer $t^{n*}$ if and only if $w_D \leqslant w^l$. ■

**Proof of Proposition 2.** Let's denote by $e^L(t, k_D)$ and $k^L(t, k_D)$

the best low production choice given $t$ and $k_D$: $e^L(t,k_D)$ and $k^L(t,k_D) \equiv \underset{e,k}{Arg\max} v\left(w_R + t - k + f(k,e) + \tau^L\right) - \omega(e)$ where $\tau^L = \tau^L(t,k_D) > 0$, and by $e^H(t,k_D)$ and $k^H(t,k_D) \equiv \underset{e,k}{Arg\max} v\left(w_R + t - k + f(k,e) + \tau^H\right) - \omega(e)$ where $\tau^H = \tau^H(t,k_D) = 0$, the best high production choice. Define $\Delta(t,k_D)$ to be the utility gain for the recipient of choosing low production, that is:

$$\Delta(t,k_D) = v\left(c_R^L(t,k_D)\right) - \omega\left(e^L(t,k_D)\right) - \left(v\left(c_R^H(t,k_D)\right) - \omega\left(e^H(t,k_D)\right)\right)$$

where $c_R^L(t,k_D) = w_R + t - k^L + f(k^L,e^L) + \tau^L$ and $c_R^H(t,k_D) = w_R + t - k^H + f(k^H,e^H)$.

Suppose that $w^l < w_D < \tilde{w}$. Consider first the situation with in-cash transfers, so that $k_D = 0$. One obtains:

(i) On the interval $t \in (t^{n*}, \bar{t}]$, where $\bar{t} = t^{n*} + \tau^L(t^{n*},0)$, $\frac{d\Delta(t,0)}{dt} = -v'\left(c_R^H(t,k_D)\right) f_k^H < 0$. This is because in case the recipient chooses a low production, an increase in the pre-transfer by the donor crowds out the post-transfer on a one-for-one basis, leaving the recipient's production and consumption levels unaffected.

(ii) $\Delta(t^{n*},0) > 0$. See Proof of Proposition 3.

(iii) $\underset{t\to\bar{t}}{\Delta(t,0)} < 0$. At $t \to \bar{t}$, $\tau^L \to 0$ and $e^L$ is such that $\left\{f_e + \frac{d\tau^L}{de}\right\} v'\left(c_R^L\right) - \omega_e = 0$. Increasing $e$ yields $f_e v'\left(c_R^L\right) - \omega_e > 0$ since $\frac{d\tau^L}{de} = 0$ above $e^L$.

(i), (ii) and (iii) all together imply that there exists $\tilde{t} \in [t^{n*}, \bar{t}]$ such that $\Delta(t,0) \leqslant 0 \Leftrightarrow t \geqslant \tilde{t}$. The recipient therefore chooses $k^L$ and $e^L$ when $t < \tilde{t}$, and $k^H$ and $e^H$ when $t \geqslant \tilde{t}$.

(iv) $U\left(\tilde{t}\right) > U(t)$ at any $t$ such that $t^{n*} < t < \tilde{t}$. On the interval $\left[t^{n*}, \tilde{t}\right[$, a change in $t$ does not affect the recipient's indirect utility(see (i)), and a change in $t$ does not affect the total transfer from the donor which is equal to $\bar{t}$, and accordingly it does not affect the donor's indirect utility. At $t = \tilde{t}$, the recipient chooses a high production. The transfer from the donor is however reduced as now $\tilde{t} < \bar{t}$ and $\tau = 0$, yielding a higher donor's consumption level and therefore a higher indirect utility level for the donor.

(v) $U\left(\tilde{t}\right) > U(t)$ at any $t$ such that $\tilde{t} < t < \bar{t}$. One obtains $\frac{dU}{dt} = -u'\left(c_D^H\right) + \delta v'\left(c_R^H\right) f_k^H < 0$ since $-u'\left(c_D^{n*}\right) + \delta v'\left(c_R^{n*}\right) f_k^{n*} = 0$ and $\tilde{t} > t^*$.

At an equilibrium, $t^c = \tilde{t}$ and $\tau^c = 0$. As a result, $t^c > t^{n*}$.

Consider now the situation with a capital transfer. The donor again chooses $t = \tilde{t}$ such that $\Delta\left(\tilde{t}, k_D\right) = 0$. The variable $\tilde{t}$ however depends on $k_D$. To see this, remember that $\tilde{t}$ is implicitely defined by $v\left(w_R + \tilde{t} - k^L + f(k^L,e^L) + \tau^L\right) - \omega\left(e^L\right) - \left[v\left(w_R + \tilde{t} - k^H + f(k^H,e^H)\right) - \omega\left(e^H\right)\right] = 0$. By differentiating this, we obtain $\frac{d\tilde{t}}{dk_D} = \frac{v'\left(c_R^L\right)\left(f_k^L - 1\right)\frac{u''}{\delta v'' + u''}\frac{dk^L}{dk_D} - v'\left(c_R^H\right)\left(f_k^H - 1\right)\frac{dk^H}{dk_D}}{v'\left(c_R^H\right)}$. The impact on the donor's utility of an increase in $k_D$ is given by $\frac{dU}{dk_D} = \left[-u'\left(c_D^H\right) + \delta v'\left(c_R^H\right) f_k^H\right] \frac{d\tilde{t}}{dk_D}$ $+\delta v'\left(c_R^H\right)\left(f_k^H - 1\right) \frac{dk^H}{dk_D}$, which after substituting for $\frac{d\tilde{t}}{dk_D}$ yields $\frac{dU}{dk_D} = \frac{-u'\left(c_D^H\right)+\delta v'\left(c_R^H\right)}{v'\left(c_R^H\right)}$ $v'\left(c_R^L\right)\left(f_k^L - 1\right) \frac{u''}{\delta v''+u''} \frac{dk^L}{dk_D} + u'\left(c_D^H\right)\left(f_k^H - 1\right) \frac{dk^H}{dk_D}$. One obtains that $\frac{dU}{dk_D} = 0$ when $\frac{dk^L}{dk_D} = 0$ and $\frac{dk^H}{dk_D} = 0$, that is, when $k_D \leqslant k^L$. But $\frac{dU}{dk_D} > 0$ when $\frac{dk^L}{dk_D} = 1$ and $\frac{dk^H}{dk_D} = 0$, that is, when $k^L < k_D \leqslant k^H$. This is because $\left(f_k^L - 1\right) < 1$ in this case. At a maximum, $\frac{dU}{dk_D} = 0$ is such that $\frac{dk^L}{dk_D} = 1$ and $\frac{dk^H}{dk_D} = 1$, a level at which $f_k^H < 1$.

As a result, $t^k < t^c$, $\tau^k = 0$ and $f_k^k < 1$.

When $w_D \geqslant \tilde{w}$, the variables $t^{n*}$ and $\tau^{n*}$ are not uniquely defined. It is imposed that $\tau^{n*} = 0$, so that $t^{n*}$ is the largest possible value. The proof when $w_D \geqslant \tilde{w}$ then exactly follows the proof when $w^l < w_D < \tilde{w}$. ■