Basic income versus fairness: redistribution with inactive agents

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Abstract

Philosophers diverge on whether redistributive transfers to able-bodied inactives would be fair. This paper evaluates their claims. Labor markets feature multidimensional heterogeneity in leisure preferences, disutilities of participation, wages and home production. The social objective champions the ethics of equality of opportunity while upholding the Pareto principle. In the Mirrleesian second-best, it turns out that welfare analysis is reduced to a sufficient statistic. Its empirical application suggests that an inactivity benefit would not be welfare-improving in most high-income countries. Overall, the equity gains of introducing a basic income with respect to equality of opportunity are tenuous, whatever its efficiency costs.

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1 Introduction

Across developed countries, a flagship feature of safety net programs is that able-bodied inactive agents are not eligible because transfers are conditioned on labor market participation[1]. Typically, cash transfers are granted either to active job-seekers through social assistance and unemployment insurance, or to low-income earners via in-work benefits.

However, in recent years, this standard scheme has been criticized by those advocating for the introduction of a universal basic income, which is a social benefit granted on an individual basis without a means test nor any work requirements (Van Parijs & Vanderborght, 2017). In the labor market, this tax-benefit reform would amount to grant some positive transfers to able-bodied inactives[2].

On the one hand, introducing a basic income may improve equity by reducing the welfare inequality between inactive and active agents. On the other hand, granting some subsidy to inactive individuals comes at the cost of disincentivizing job-seeking efforts of unemployed agents as well as work effort provided by employed individuals. This tension echoes a familiar discussion[3] on the trade-off between the equity gains and the efficiency costs of welfare benefits. While the former have been scarcely explored, the latter are subject to considerable disagreement in the literature: labor supply elasticities and the associated efficiency costs of transfers are large in Conesa et al. (2023), Daruich and Fernández (2024), and Golosov et al. (2024) but small in Cesarini et al. (2017).

In this paper, I measure the equity gains of introducing a basic income *whatever the size of its efficiency costs*. In order to do so, I build a parsimonious model that rationalizes the choice of voluntarily inactive agents. The model displays multidimensional heterogeneity in both preferences and productive skills which allows to capture relevant features of the redistribution problem at hand like disutility of participation and home production.

Yet, as agents are arbitrarily heterogeneous along their ordinal preferences, there are multiple ways to aggregate (cardinally) these heterogeneous preferences in a single social objective. Therefore, the government must gauge the desirability of any tax-benefit system by taking an ethical stance on how individual welfare should be measured, compared interpersonally, and aggregated into a social objective.

In this paper, I will study the case of a government that seeks to equalize oppor-

[1]This is the case for all social assistance programs for the 29 developed economies studied in this paper, with the exception of Spain and its recent *Ingreso Minimo Vital* (MISSOC, 2021). This allows me to evaluate the Spanish case separately in section 5.

[2]Because of this, the paper uses the term 'basic income' and 'inactivity benefit' interchangeably. Footnote 22 proves the formal equivalence in the model.

[3]This tradeoff is the cornerstone of the theory of optimal taxation *à la* Mirrlees (1971).

tunities in the economy while respecting the celebrated Pareto principle. In particular, the social objective will be axiomatically constructed under the premise that inequalities in productive skills should be compensated for, whereas inequalities spawned by different preferences should be respected. This compensation (for one's skills)-responsibility (for one's preferences) approach has been pioneered by Fleurbaey and Maniquet (2006, 2007, 2011b, 2018) for the standard income tax problem.

Studying this social objective with respect to basic income is particularly relevant for several reasons[4]. First, recent surveys have suggested that this ethical standpoint has received some public support (Saez & Stantcheva, 2016; Stantcheva, 2021; Weinzierl, 2017). Second, these axioms are rooted in a long tradition in political philosophy (Dworkin, 1981; Fleurbaey, 2008; Rawls, 1971; Van Parijs, 1995, 2021). Third and most importantly, philosophers sharing closely related ethical standpoints disagree on the policy recommendations that it entails[5]. Rawls (1988) argued that his difference principle does not justify that *Malibu surfers should be fed* as they enjoy so much leisure that they are not among the worst-off. Van Parijs (1991) countered that one should not take a stance on what a good life is, and granting a basic income would allow anyone to enjoy as much leisure as one wishes, including the worst-off, thereby providing Rawlsian justification to basic income. The present paper settles this philosophical dispute by using economics to link an ethical standpoint with its policy consequences.

These fairness axioms endogenize a measure of individual well-being as well as an aggregation rule, thereby defining the social objective. It is then transposed in a second-best Mirrleesian environment where I allow the government to collect distortive (non-linear) taxes on employed agents in order to finance transfers that may be decomposed into social assistance (e.g. TANF), in-work benefits (e.g. EITC), and an inactivity benefit. The exercise yields two key analytical results.

First, I characterize the optimal inactivity benefit. Despite the multidimensional heterogeneity of the model, it follows a simple additive formula from which one can derive qualitative properties and perform comparative statics. In particular, whenever the public finance constraint is marginally relaxed, the inactivity benefit covaries positively with the traditional social assistance, suggesting that basic income should supplement rather than crowd out existing transfers programs.

Second, I derive a sufficient statistic for the desirability of any tax-benefit reform,

[4]Let me note that I do not aim to defend a single view of social welfare but rather to link a practical policy recommendation with transparent ethical underpinnings.

[5]Notoriously, neither Rawls nor Dworkin endorsed themselves the view that an inactivity benefit would be justified by their theories of justice. As Dworkin (2000) puts it "*forced transfers from the ant to the grasshopper are inherently unfair*" (p.329).

even in a suboptimal world[6]. Because the model does not impose any structural assumptions on primitive preferences and abilities, this sufficient statistic holds for any empirical correlations between them. The central component of this sufficient statistic turns out to be $\tilde{h}-\tilde{w}$, i.e. the difference between the inactives' average home production surpluses and the actives' average wage. As this is the key driver of the results[7], I now provide an illustrative example to spell out the intuition behind them.

Imagine the simple and extreme case where the economy is composed of two pairs of agents defined by their preferences, say R_a and R_b. Among each pair, there is an agent who is ability-rich in both the home sector and the labour market $(2\tilde{h}, 2\tilde{w})$ as well as an agent who is unable to produce in any sector $(0, 0)$. In short, the economy is described by $e = \{(R_a, 0, 0); (R_a, 2\tilde{h}, 2\tilde{w}); (R_b, 0, 0); (R_b, 2\tilde{h}, 2\tilde{w})\}$.

Because it wishes to fight inequalities in skills, the first-best planner will try to set transfers among agents such that every inactive gets $\tilde{h}$ and every active gets $\tilde{w}$. That can be done *within each pair* by transferring $(\tilde{h}, \tilde{w})$ away from the ability-rich to the ability-poor. After these transfers, all agents have to decide in which sector to produce depending on their preferences.

Now, because the government does not fight inequalities in preferences, it will not take a stance on which sector it is better to produce in and will not try to redistribute further, even if $\tilde{w}$ and $\tilde{h}$ are unequal. In turn, cancelling the within-sector inequality is enough to pursue equality of opportunity: there is no need to further redistribute *between* sectors. Hence, the difference of transfers between sectors is pinned down by the difference of average resources between sectors, $\tilde{h} - \tilde{w}$. In particular, the larger $\tilde{w}$, the lower should be transfers towards inactives, *ceteris paribus*.

That the desirable inactivity benefit decreases with the average wage in the labour market would seem natural for efficiency reasons. What is peculiar, unexpected and new here is that it holds only for equity reasons, independently of efficiency considerations. The main sections of the paper show that the mechanism at play in this simple example holds even if the set of agents is large, preferences are fully heterogeneous, and the skills distributions are arbitrary.

Whether introducing a positive inactivity benefit in our economies is welfare-improving or not is ultimately an empirical question. While values for average wages $\tilde{w}$ are readily available statistics, estimating the inactives' average home production surplus $\tilde{h}$ is a

[6] Second-best optimum might be unreachable for real-world tax-benefit systems because of political economy constraints (Bierbrauer et al., 2021) or more generally because actual governments do not behave like the Mirrleesian planner (Stantcheva, 2016). Hence, policy recommendations of practical use are more likely to emerge from the study of welfare-improving reforms.

[7] Incidentally, it is also the main methodological finding of the paper. I relate this finding to the literature on axiomatic well-being measurement in Appendix A.2.

challenging task. I elicit conservative bounds on $\tilde{h}$ by exploiting recent data from the *Global Survey on Working Arrangements* (G-SWA) on time savings when working from home (Aksoy et al., 2023). I combine these estimates with data on current tax-benefit systems on childless singles and lone parents (OECD, 2020) to compute the sufficient statistics for 29 developed economies.

Even under a series of conservative assumptions, the empirical application finds that $\tilde{h} - \tilde{w}$ is largely negative, leading the gap between the desirable inactivity benefit and the labour market transfers to be sizable. In particular, all 29 governments should first increase transfers to actives before any dollar spent on inactivity benefit constitutes a welfare improvement.

Next, I quantify lower bounds on these increases in labor market transfers to justify any dollar of basic income. I find that their magnitude are almost always unrealistically large: on average, governments should at least triple the safety net before any dollar of basic income is welfare-improving. In sum, the inquiry shows that either the overall amount of social transfers is much too low in all developed economies, or granting an inactivity benefit cannot be welfare-improving.

Overall, this paper suggests that the equity gains of granting some benefits to voluntarily inactive agents are tenuous. This holds against a series of conservative assumptions: the social objective has most extreme inequality-averse assumptions and the government does not have a preference for labor market production over home production.

This demonstrates a normative tension between the allowance of basic income[8] and equality of opportunity. Hence, the present analysis suggests that a government wishing to fight unequal opportunities outside of the labor market should do so by providing better opportunities within the labor market, under the proviso that the aggregate technology in that sector is productive enough.

However, this tension is not an impossibility. In particular, holding agents responsible for their preferences may be normatively questionable in light of the literature on behavioral welfare economics (Bernheim, 2009; Bernheim & Taubinsky, 2018). Hence, I conclude by exploring an empirically relevant behavioral bias: some agents suffer from a stigma whenever they endure the government's screening device that monitors job-seeking behaviors (as in Besley and Coate (1992a) and Moffitt (1983)). If the government compensates for this stigma, the main text formulas can be readily amended. In turn, the sufficient statistics now act as lower bounds on the government's willingness to

[8] I only study the desirability of the conditionality of social benefits to labor market participation, while basic income proposals additionally requires waiving conditionalities to means and to the household composition (Van Parijs, 1995). Arguably, the desirability of an inactivity benefit is a first step for the study of the desirability of a fully fledged basic income.

pay to compensate for this stigma cost of conditionality. In other words, if governments are ready to pay on average three times their current safety net in order to compensate for the welfare recipient stigma, introducing a basic income may be a welfare-improving reform.

Literature

The study of conditionality of welfare benefits has a long history in economics[9] and basic income has been recently studied by e.g. Banerjee et al. (2019), Conesa et al. (2023), Daruich and Fernández (2024), Ghatak and Maniquet (2019), Golosov et al. (2024), and Hoynes and Rothstein (2019). However, most papers consider utilitarian welfare or do not exploit heterogeneous tastes. To the best of my knowledge, no paper has combined theory and data to evaluate whether basic income can be justified by equality of opportunity[10]. This is the main contribution of the present paper.

The paper also contributes to optimal taxation theory. In the canonical Mirrlees (1971) model, agents may only react to tax-benefit reforms by decreasing their hours worked i.e. on the intensive margin. This class of models has been amended to allow for participation decisions in Choné and Laroque (2005, 2011), Diamond (1980), Jacquet et al. (2013), and Saez (2001, 2002). However in these *pure* extensive margins models, there is no difference between an unemployed and an inactive. Several papers have then added search frictions to rationalize involuntary unemployment together with endogenous participation decisions (Hungerbühler & Lehmann, 2009; Hungerbühler et al., 2006; Jacquet et al., 2014; Lehmann et al., 2011). Yet, they do not allow the government to distinguish the transfers it gives to the inactive from the one to the unemployed.

Boadway and Cuff (2018) allow the government to differentiate the transfers to nonparticipants from the transfers to the (involuntary) unemployed. Nonetheless, their model assumes homogeneous preferences, no intensive margin and a piece-wise linear income tax schedule while the present paper relaxes all these three assumptions. Kroft et al. (2020) also operates this differentiation and do not have any of the aforementioned shortcomings. Let me pinpoint three main differences with that paper. First, they model wages as endogenously determined in general equilibrium while in the present paper, wages are left exogenous. Second, they have a (Bergson-Samuelson) weighted utilitarian social welfare function whereas I consider an Arrovian social ordering function that reflects the ethics of equality of opportunity. Third, they focus on the derivation of the optimal tax system but I will also look at welfare-improving reforms, even in a

[9] See Besley and Coate (1992b, 1995), Boadway and Cuff (2014), Boadway et al. (2003), and Boone and Bovenberg (2013) among many others.

[10] On the link between the philosophical theories of equality of opportunity and the fairness axioms used in this paper, the reader can refer to Maniquet (2004) and Fleurbaey and Maniquet (2011a).

suboptimal world. As I model a home sector[11] and a formal sector, the paper is related to the Mirrleesian optimal tax derivation of Rothschild and Scheuer (2013) in the multi-sector Roy (1951) model. The important difference is that they assumed that the tax schedule is uniform across sectors while I do not. In particular, it will be assumed that outcomes from the home sector are unobservable, and that the government can only give a lump-sum amount to all inactives. Beaudry et al. (2009) also assumes that home production is unobservable but hours worked are observed and they focus on the difference between social assistance and unemployment insurance.[12] In contrast here, I focus on the difference between social assistance and inactivity and assume that gross income are observed along with the activity binary decision.

I outline two additional differences with standard optimal tax papers. First, the literature since Saez (2001, 2002) typically studies small local tax reforms. By contrast, this paper derives a sufficient statistic that can assess any tax reform, including (potentially suboptimal) large and global ones such as the introduction of a basic income. Second, this paper does not need to impose any structural assumption on preferences nor any correlation between heterogeneity dimensions, while optimal tax papers typically do so to solve the multidimensional screening problem. Both facts are possible thanks to the axiomatic derivation of a social objective as a transitive ordering between any two allocations i.e. any two tax-benefit systems. This endeavor has been inspired by the fair income tax literature (Fleurbaey & Maniquet, 2006, 2007, 2011b, 2018). The present paper also contributes to the latter by including inactive agents as well as additional dimensions of heterogeneity and deriving the axiomatic characterization in this new environment.

In section 2, I formalize the environment. In section 3, I build axiomatically the social objective in the first-best. In section 4, I introduce the Mirrleesian second-best environment and derive the main theoretical results. In section 5, I present the empirical application. In section 6, I assume a stigma associated to benefits recipients while in section 7 I conclude.

2 Model

There is a finite set $\mathcal{I} = \{1, ..., I\}$ of I agents. There are only two goods, consumption and labor, denoted by c and l. A bundle is $z_i = (c_i, l_i) \in X$. The homogeneous consumption good $c \in \mathbb{R}_+$ is produced either in the home sector or in the labor market. The labor supply variable l is set to -1 when the agent stays at home, or takes value of hours

[11] Gayle and Shephard (2019) introduced home production in an optimal income tax model. However, their focus is different as they estimate a large structural microeconometric model, with a marriage market and they focused on the jointness of spouses taxation.

[12] For a more recent treatment of the redistribution versus insurance problem in cash transfers and unemployment insurance, see Ferey (2022).

worked in a normalized interval $[0,1]$ when the agent is in the labor market. Hence, an inactive agent has $l=-1$, an unemployed agent has $l=0$ and an employed agent has $l\in(0,1]$.

Each agent is endowed with a monotonic and convex preference ordering R_i that can be represented by a continuous ordinal utility function $u_i(c,l)$ which is strictly increasing in c and nonincreasing in l. This flexible setup allows agents to have an idiosyncratic[13] disutility to be active on the labor market that can be expressed as follows :

$$\forall i\in\mathcal{I}, d_i:\mathbb{R}\to\mathbb{R}_+ : d_i(c)\equiv u_i(c,-1)-u_i(c,0)$$

The positive-valued function $d_i(\cdot)$ associates to each consumption level the disutility of participation of agent i. It captures the utility loss for an inactive that becomes unemployed while keeping the same level of consumption. If an agent does not have disutility of participation, all $c\geq 0$ are zeros of her $d_i(\cdot)$ function. Importantly, the disutility of participation must be distinguished from the willingness to work[14]. In this framework, disutility of participation embodies a preference to produce at home rather than in the labor market, while willingness to work reflects the substituability between consumption and hours worked on the labor market. Let me denote the set of all preferences respecting the above restrictions by $\mathcal{P}$.

In addition to their preferences, agents are also heterogeneous along their vector of innate productive abilities $(w_i,h_i)\in[\underline{w},\bar{w}]\times[\underline{h};\bar{h}]\subseteq\mathbb{R}^2_+$, where the first coordinate denotes the marginal productivity used on the labor market and the second coordinate captures the *surplus* of home production that inactivity allows for relative to activity, not its *level*.

In the labor market, I retain the standard assumption of a constant return to scale technology whose sole input is hours worked, and its marginal productivity is given by w_i. In the home sector, h_i captures the surpluses of production that active agents lose by joining the labor market. It is a reduced-form term for outcomes of activities such as gardening, child rearing or housekeeping. Obviously in reality all agents produce at home, be they inactive, unemployed or employed. Hence, it is implicitly assumed here that all actives produce an identical level at home, normalized to 0 (i.e. the first-best Laissez-faire consumption of unemployed agents) and inactives produce h_i more than

[13]It is known that disutility of participation displays substantial heterogeneity in the cross-section of households (Kaplan & Schulhofer-Wohl, 2018). Here, it may capture (but it is not restricted to) the stigma utility cost of welfare conditionality as in Moffitt (1983), see section 6.

[14]In this setup, the willingness to work may be approximated by the marginal rate of substitution over non-negative values for l. A low (resp. high) marginal rate of substitution in absolute value reflects a high (resp. low) willingness to work

them[15].

In the first-best, the second fundamental welfare theorem prescribes that efficient redistribution could be achieved through lump-sum transfers. Denoting these transfers by t_i, the first-best budgets, illustrated in Figure 1 are defined by :

$$B(t_i, w_i, h_i) = \left\{(c, l) \in X : c \leq a(l)w_i l + (1 - a(l))h_i + t_i\right\}$$

where $a(\cdot)$ is an indicator function that takes value 1 if the agent is active (i.e. $l \in [0, 1]$) or 0 if the agent stays at home (i.e. $l = -1$)[16].

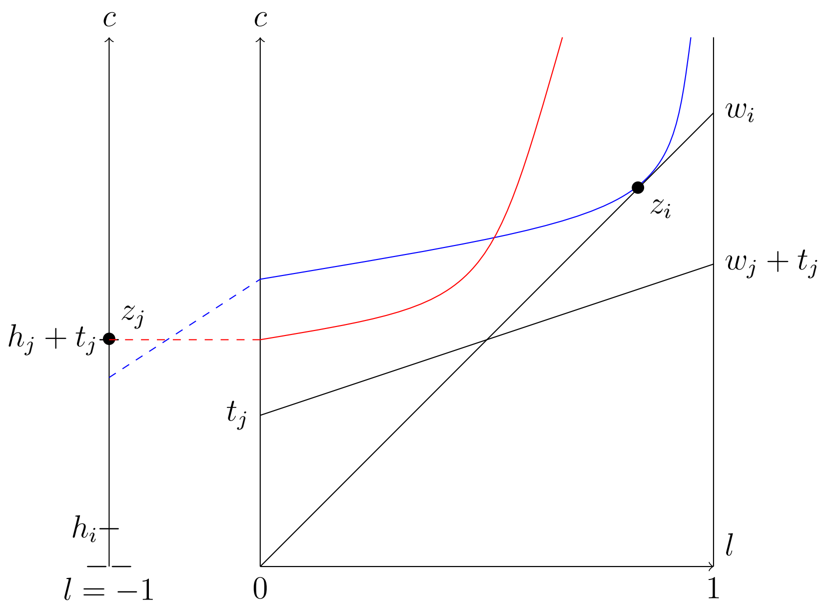

Figure 1: Illustration with two agents i, j such that $w_i > w_j$ but $h_j > h_i$. Blue agent i receives no lump-sum transfer and has a nonzero disutility of participation, but still chooses optimally to be active. Contrarily, the red agent j receives $t_j > 0$ and does not display disutility of participation but chooses to be inactive.

This model nests the standard linear production model used e.g. in optimal taxation theory when $a = 1$. Four important remarks must be raised.

First, this model allows for both involuntary and voluntary unemployment. In the former case, the (primitive) state of the labor market nullifies the productivity of some agents (such that $\underline{w} = 0$) which can remain active with $l = 0$. By contrast, voluntary unemployment arises when $l = 0$ is the utility-maximizing choice of an agent endowed

[15]In the empirical section 5, I argue that, while absolute levels of home production are typically unobservable, reasonable values for home surpluses h_i may be found.

[16]Observe that the use of this indicator function renders moot the actual value of l when inactive as long as it is not in [0,1]. The choice of -1 is arbitrary and harmless.

with some positive wage rate $w > 0$[17].

Second, I assume that there is no intensive margin in the home sector[18]. Of course, in reality agents partition their time between leisure, paid work and home production. However, labor market inactivity is a binary status for any tax-benefit system, such that there is no such thing as a part-time inactive in the eyes of the fiscal authority : agents can either be full time in the home sector or not at all in this sector.

Third, inactive and unemployed agents both enjoy the full unit of leisure. However, only the former are able to produce at home. This is equivalent to say that there is a fixed time cost spent looking for a job when unemployed that can be used productively when inactive. Hence, h_i must be understood (and measured) as the product of this time cost with the hourly idiosyncratic[19] value of production in the home sector. For example, in a legal working week of, say, 40 hours, the inactive and the unemployed do not provide any hours worked and thus enjoy 40 hours of leisure. However, an unemployed must spend, say, 10 hours sending job applications during which the inactive takes care of his children. The inactive's h_i is then the product of $\frac{10}{40}$ with the shadow price of an hour of day care services in that economy. This estimation procedure for h_i is discussed at length in section 5.

Fourth, the model assumes away any positive externality of job search. This is again a conservative assumption, in the sense that such externality would lay the grounds for Pigouvian subsidies to the unemployed (or Pigouvian tax on inactivity) in the redistributive problem, which would be unfavorable to the emergence of a basic income. Despite that, I find below that basic income is not desirable such that this result would be even stronger with such an externality.

Note that throughout the paper, no parametric specification of utility functions is imposed. Moreover, I will not impose any correlation between primitives R_i, w_i and h_i, neither at the individual level nor in the cross-section. As a consequence, the results are valid *for any* empirical moments observed in the data.

Finally, let me define an economy e by a list of endowments for each agent in each heterogeneity dimension $e = \{(R_i, w_i, h_i)_{\forall i \in \mathcal{I}}\}$. I denote the set of all such economies by E. An allocation is denoted $z = \{(c_i, l_i)_{\forall i \in \mathcal{I}}\}$ and the set of all possible allocations is

[17] In the first-best, unemployment (both voluntary and involuntary) only happens when $h = 0$. In the second-best, this happens when transfers to unemployed are larger than transfers to inactives, which is the empirically relevant case.

[18] Moreover, an intensive margin in the home sector would imply that the inactivity benefit distorts effort in the home production which would be unfavorable to the emergence of a basic income. Hence, this modelling assumption is conservative with respect to my result.

[19] In a structural macro exercise with time use data, Boerma and Karabarbounis (2021) show that (1) inequalities in the home sector are quantitatively important and (2) inequalities in home production efficiency are needed to explain the variance of home inputs conditional on wages and preferences.

denoted by $Z \subseteq X^{\mathcal{I}}$.

3 Fair social objective

Each economy can yield many allocations which are associated with observable inequalities in consumption-labor outcomes (c, l) all originating from unobserved heterogeneity in primitives (R, w, h). The key question for a government is: when should an allocation z be socially preferred to an allocation z'?

To answer this question, this section builds a Social Ordering Function (SOF), i.e. a function that associates to each economy a transitive ordering of allocations. This aggregation from individual preferences to social welfare follows the Arrow (1950) tradition and constructs the SOF axiomatically[20] as in the seminal work of Fleurbaey and Maniquet (2007)[21].

Notation-wise, the social ordering function **R(e)** for an economy $e \in E$ is such that for any $z, z' \in Z$, z **R(e)** z' whenever z is socially weakly preferred to z'. The strict social preference and the social indifference are denoted by **P(e)** and **I(e)**, respectively.

3.1 Axioms

The first axiom imposes that the SOF always respects the Pareto principle. Therefore, it will never be the case that a Pareto-dominated allocation is preferred by the planner. It is consistent with the widely shared non-paternalistic view[22] that any tax policy should be such that the resulting allocation lies somewhere on the (constrained) Pareto frontier.

Axiom 1 : Weak Pareto
For all economy $e \in E$, let $z, z' \in Z$ be two allocations. If $\forall i \in \mathcal{I}\ \ z_i\ P_i\ z'_i$ then z **P(e)** z'

Yet, as the Pareto frontier typically contains many points, one should add more conditions on social welfare to derive policy recommendations of practical use. The next axioms introduce equality of opportunity considerations.

The second axiom imposes a responsibility for one's preferences. In a nutshell, it captures the idea that inequalities spawned by unequal preferences should not be re-

[20]The present model has a larger number of dimensions of heterogeneity than previous works. Proofs, as well as the axioms' technical links with previous works, are relegated to Appendix A.

[21]Another way of including fairness considerations into optimal taxation theory was recently outlined by Saez and Stantcheva (2016)'s generalized Pareto weights. However, this approach is inherently related to local tax reforms, while the introduction of a basic income may be a global one. Moreover, relying on the SOF approach guarantees transitivity of social preferences in the evaluation of tax reforms. See Fleurbaey and Maniquet (2018) for a thorough discussion.

[22]The underlying postulate is that agents' preferences truthfully reflect their own tastes which should be considered as normatively compelling. If agents suffer behavioral biases, the analysis in the first-best is unaffected because they are assumed to be known and laundered for. Bernheim (2021) and Thoma (2021) provide a defense of such a non-paternalistic standpoint in behavioral welfare economics. I address the stigma bias in section 6.

duced. Formally, it requires that when all agents have identical productive endowments, thereby only differing in preferences, reducing the lump-sum transfers inequality between them is a social improvement. Hence, in that knife-edge case the Laissez-faire allocation is the best outcome as it correspond to the maximal reduction of lump-sum transfers inequality.

Axiom 2 : Responsibility
For all economy $e \in E$ and all allocations $z, z' \in Z$, with $(w_i, h_i) = (w_0, h_0)\ \forall i \in \mathcal{I}$,
If $\exists i, j \in \mathcal{I}$ with

$$z_i \in \max_{R_i} B(t_i, w_0, h_0) \quad z'_i \in \max_{R_i} B(t'_i, w_0, h_0)$$
$$z_j \in \max_{R_j} B(t_j, w_0, h_0) \quad z'_j \in \max_{R_j} B(t'_j, w_0, h_0)$$

and $z_k = z'_k$ for all $k \in \mathcal{I} \backslash \{i, j\}$
and $\exists \delta > 0$ such that

$$t'_i - \delta = t_i \geq t_j = t'_j + \delta$$

Then, z **P(e)** z'.

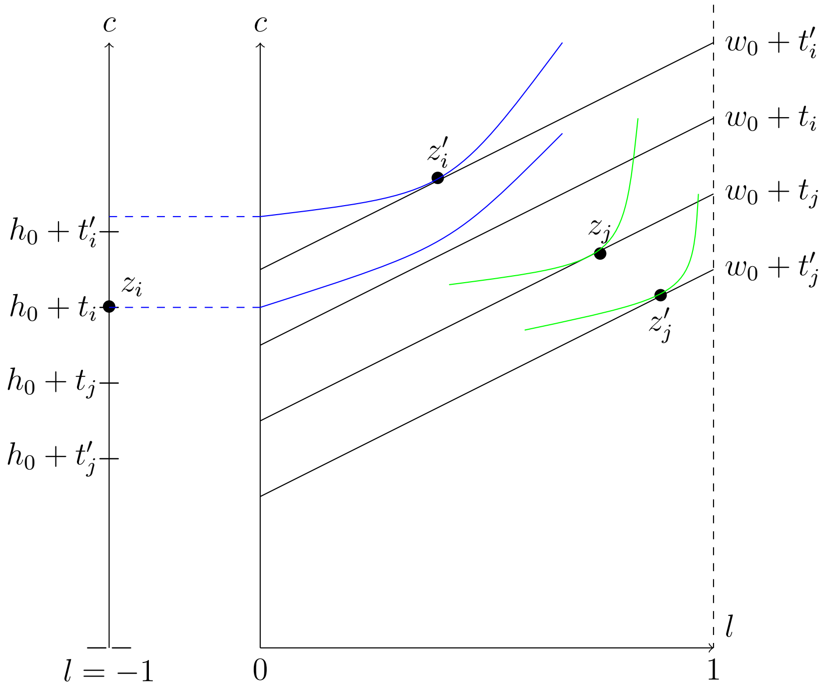

Figure 2: Responsibility imposes that (z_i, z_j) **R(e)** (z'_i, z'_j)

Importantly, ***Responsibility*** implies that the planner does not necessarily prefer labor market production to home production. As illustrated in Figure 2, z may be preferred to

z' even if z' entailed more formal hours worked in the aggregate. This sectoral neutrality is normatively important, because basic income advocates have argued that one should not take a stance on what a good life is (Van Parijs & Vanderborght, 2017). Hence, the SOF does not carry any (un)employment target.

The third axiom, illustrated in Figure 3, embodies some taste for redistribution. Essentially, it champions the idea that inequalities in productive endowments should be reduced. In particular, this axiom formally requires that an order-preserving transfer from a rich agent to a poor agent is a weak social improvement, provided that these two agents have the same preferences and the same labor supply choices[23].

Because this transfer is only a weak social improvement, it entails a non-negative but finite inequality aversion, as it strictly preserves the ordering between the richer and the poorer agent. Observe that it could be the case that the inequality aversion is null in the formulation below. Hence, this axiom only excludes cases in which the planner would have a taste for inequality between agents with identical preferences and behaviors.

Axiom 3 : Weak Transfer
For all economy $e \in E$, all allocations $z, z' \in Z$, if $\exists i, j \in \mathcal{I}$ two agents with $R_i = R_j$ such that

$$l_i = l_j = l'_i = l'_j$$

and for some $\delta > 0$

$$c'_i - \delta = c_i \geq c_j = c'_j + \delta$$

while $z_k = z'_k \ \forall i \in \mathcal{I} \backslash \{i, j\}$;
Then, z **R(e)** z'

When combined with ***Responsibility***, ***Weak Transfer*** sheds light on the normative stance that the government will take when designing the tax-benefit system: inequalities in preferences are unproblematic but inequalities in productive abilities should be reduced. This compensation-responsibility approach can be seen as championing the ethics of equality of opportunity, which has been defended on several grounds in philosophy (see e.g. Fleurbaey (2008)). I also note that recent surveys have shown that a significant fraction of the population supports these views (Saez & Stantcheva, 2016; Stantcheva, 2021; Weinzierl, 2017).

[23]This is version of the Pigou-Dalton transfer principle, popularized in the literature on inequality measurement, is weak as the transfer is only desirable between agents whose preferences as well as extensive and intensive labor supply decisions are identical. This weakening is meant to escape the incompatibility with the Pareto principle (Fleurbaey & Trannoy, 2003).

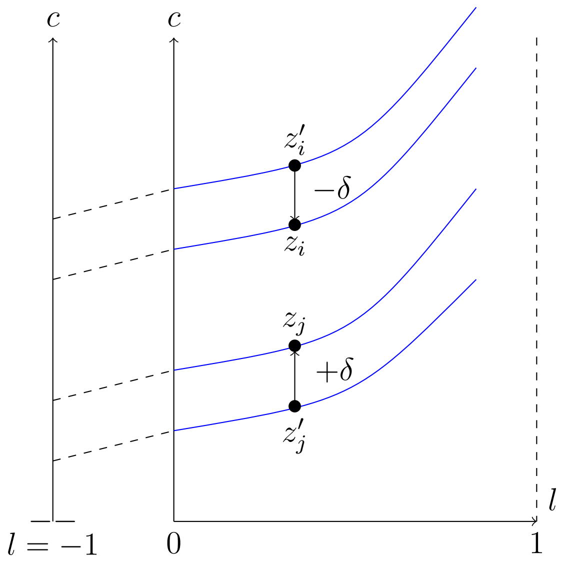

Figure 3: Weak Transfer axiom imposes that (z_i, z_j) **R(e)** (z'_i, z'_j)

Now, in order to build a SOF *for all economies* one needs consistency conditions i.e. invariance rules of the social evaluation when the economy changes.

A popular choice in the literature is *Separability* which prescribes that adding or removing from the economy indifferent agents should not affect the ranking between two allocations. However, as I prove in Appendix A.1, *Separability*, when combined with ***Weak Transfer*** and ***Responsibility*** leads to an impossibility in my two-sector model. This is a new result that does not hold in one-sector models.

The clash arises from the fact that removing indifferent agents from a sector may shrink the amount of *potential* available resources for redistribution in the other sector. In order to escape the impossibility, one needs to restrict the removal of indifferent agents to those that leave the *per capita* amount of resources across sectors unchanged.

It is precisely what the fourth axiom, ***Mean-Preserving Separability***, achieves. It formally requires that the social ordering is unchanged by the inclusion or exclusion of indifferent agents whose endowment vector is equal to the economy's arithmetic average.

Finally, the fifth axiom, ***Hansson (1973) Independence***, deals with the informational structure of the SOF. It weakens the Arrovian binary independence in order to escape the impossibility of social choice. It imposes that when the indifference curves over two allocations are unchanged between two economies, then the social ordering over these allocations is unchanged as well. Because these last two axioms embody more a technical than normative substance, I relegate their formal definitions to Appendix A.1.

3.2 Characterization

The combination of these five axioms entails two consequences for the present undertaking. First, it endogenizes a particular measure of well-being that respects individual preference orderings while being interpersonally comparable, in Definition 1. Second, these axioms pin down an aggregation rule for these well-being indices such that any two allocations can be ranked in a transitive way, as shown in Theorem 1.

Definition 1. *The Arithmetic Average Indirect Money-Metric Utility (AIMU) is defined as*

$$M_i(z_i) = \min\left\{t \in \mathbb{R} : \exists (c,l) \in X \textit{ s.t. } (c,l) \;\; R_i \;\; z_i \textit{ with } (c,l) \in B(t, \tilde{w}, \tilde{h})\right\}$$

$$\textit{where} \quad \tilde{w} = \frac{1}{I}\sum_i w_i \qquad \tilde{h} = \frac{1}{I}\sum_i h_i$$

In short, the well-being of agent i when she consumes the bundle z_i will be measured as the smallest transfer that renders this agent indifferent between z_i and the budget determined by the average productive vector. Loosely speaking, the further away the individual sees herself from an average agent, the worst will be her well-being.

The graphical construction of the AIMU-utility is illustrated in Figure 4.

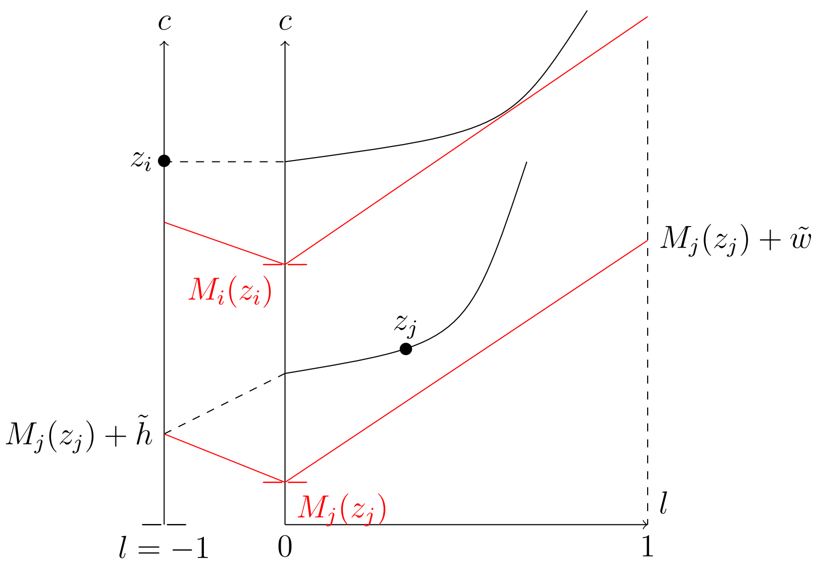

Figure 4: The AIMU-utility

Some remarks can be raised about this well-being measure. First, $M_i(z_i)$ is defined everywhere which implies that in addition to being transitive, the SOF will also be complete. Second, it is an (indirect) money-metric representation of preferences, hence ordinally equivalent to the agent's direct utility function (Samuelson & Swamy, 1974). Third, for a given economy $e \in E$, the distribution of well-being levels is bounded below by $M_i^{min}(z_i) = \min\{-\tilde{w}, -\tilde{h}\}$. This lower bound would be reached by an agent consuming $c = 0$ whose preferences are represented by linear and flat indifference curves in X. This indicates that agents with the lowest productive endowments and a high willingness to work will typically be found among the worst-off.

Let me now turn to the characterization of the SOF based on the axioms of the previous section. From now on, I shall call this SOF the AIMU-maxmin ordering and denote it by $\mathbf{R}^{A-min}$.

Theorem 1. *Let z, z' be two allocations, and let **R(e)** satisfy Weak Pareto, Responsibility, Weak Transfer, Hansson Independence, and Mean-preserving Separability. Then one has* $\forall e \in E$

$$\min_{i\in\mathcal{I}} M_i(z_i) > \min_{i\in\mathcal{I}} M_i(z_i') \implies z \;\; \textbf{\textit{P(e)}} \;\; z'$$

Proof. See Appendix A.2. ■

Observe that the non-negative and finite inequality aversion embodied in ***Weak Transfer*** has become, due to the combination with other axioms, an infinite inequality aversion, as reflected by the maximin aggregator. This has become a standard result in that literature (see e.g. Fleurbaey and Maniquet (2011b) and Piacquadio (2017)). This entails that this SOF will prioritize the worst-off in the $M_i(z_i)$ well-being measure.

It must be recalled that an infinite degree of aversion to inequality in a well-being measure does not necessarily lead to an infinite taste for redistribution (i.e. pure egalitarianism). For example, *maximinning* a money-metric utility function with individual-specific reference prices (w_i, h_i) imply that the absence of redistribution is optimal (Fleurbaey & Maniquet, 2018). Hence, the key determinant of the following results lies more on the use of $M_i(z_i)$ than on the maximin. I discuss the relationship of this paper with the literature on axiommatic measurement of well-being in Appendix A.2.

Finally, before turning to the non-linear taxation, it is useful to close this section by analyzing the optimal allocation with respect to $\mathbf{R}^{A-min}$ which can be reached by setting properly $(t_i)_{i\in\mathcal{I}}$ in the first-best. Obviously, the optimal allocation consists in equalizing all $M_i(z_i)$. All agents then reach their indifference curve tangent to this reference budget set, thereby all enjoying the same level of well-being in the eyes of the planner. Crucially, observe that, given the heterogeneity in preferences, this does not mean that all agents consume the same bundle. Also, note that such strongly egalitarian allocations may also be reached with a standard utilitarian setup in the first-best, as it is known since Edgeworth (1897).

4 Redistributive taxes and transfers

In this section I characterize the tax-benefit system pursuing equality of opportunity under incentive-compatibility constraints. As in Mirrlees (1971), these constraints arise because the government is unable to observe the endowment vector of each individual despite knowing its joint distribution in the population[24].

Moreover, the government is unable to observe l_i and can only observe $y_i = a_i(l_i)w_il_i$, the gross labor income reported in tax returns. I will also assume that, when $y = 0$, the government can perfectly distinguish the inactive from the unemployed agent. In other words, $a_i(\cdot)$ is observable even if l_i is not. This is consistent with the observation that in most developed economies, there exists a screening mechanism enforcing the conditionality of welfare benefits to a job-seeking behavior. For the remainder of the paper, I omit the argument of the indicator function and denote it by a_i for brevity.

For active agents with $a_i = 1$, the government designs the tax schedule on the labor market through the nonlinear tax function $\tau(y)$ which is a subsidy whenever $\tau(y) < 0$ on some y. As it is the case in the real world, the government cannot observe outcomes from the home sector, but inactive agents may receive an amount $D \in \mathbb{R}$ which is a tax if $D < 0$ such that the second-best budgets are

$$\Big\{(c, l) \in X | c = a(l)[a(l)w_il_i - \tau(a(l)w_il)] + (1 - a(l))[h_i + D]\Big\}$$

It will prove much simpler to consider the following rescaling of the consumption space $\dot{X} = \{(c, y, a) \in \mathbb{R}_+ \times [0, \bar{w}] \times \{0, 1\}\}$ where y and a are both determined by the labor supply variable l in the original space X. Budgets in the rescaled environment are simply:

$$B(\tau, D, w_i, h_i) = \Big\{(c, y, a) \in \dot{X} | c = a[y - \tau(y)] + (1 - a)[h_i + D]\Big\}$$

The preference ordering in this second-best environment is rescaled accordingly

$$\forall i \in \mathcal{I} : \quad (c_i, l_i)R_i(c'_i, l'_i) \iff (c_i, \frac{y_i}{w_i}, a_i)R^*_i(c'_i, \frac{y'_i}{w_i}, a'_i)$$

A bundle $z_i = (c_i, l_i)$ in X is the bundle $z_i = (c_i, a_iw_il_i, a_i)$ in $\dot{X}$. I retain the same notation as no confusion can arise.

At this point, one may wonder about the relationship between the tax-benefit system (τ, D) studied here and the basic income proposals. Indeed, why wouldn't we give a basic income *universally* to both actives and inactives? Observe that the tax-benefit system (τ, D) studied here is completely equivalent to a universal basic income $(\tau' - D, D)$ for a τ' chosen such as $\tau' - D = \tau$, i.e. both systems decentralize the very same allocation. In other words, it is the (consequentialist) difference between active and inactive transfers

[24] As the government knows the distribution of types in the population, it is able to compute the reference vector $(\tilde{w}, \tilde{h})$.

that has welfare consequences, not the (deontological) means of transfers[25]. For clarity, I retain the formulation with an inactivity benefit.

An incentive-compatible allocation z is such that :

$$\forall i, j \in \mathcal{I}, z_i R_i^* z_j$$
$$\text{or } z_j \notin B(\tau, D, w_i, h_i)$$

I call the set of all such allocations $\widehat{Z(E)}$. Before turning to the main results of this section, I will impose two assumptions.

The first assumption, Minimality, restricts the number of tax-benefit systems (τ, D) that decentralizes a particular allocation $z \in \widehat{Z(E)}$ by focusing on those where no inconsequential tax cut are left. It formally requires that the after-tax income function $y - \tau(y)$ coincides with the envelope curve of agent's indifference surfaces at z. I relegate its formal definition to Appendix A.3.

When the tax-benefit system is not minimal, one can devise tax cuts that do not affect any individual nor the budget constraint of the government. It is therefore a quite natural assumption. Figure 5 provides an example of a violation of Minimality. Altough $y - \tau(y)$ decentralizes z in this two-agent economy, one could find a tax cut such that no one is affected. It would amount to make the blue locus coincide with the agents' indifference curves at z.

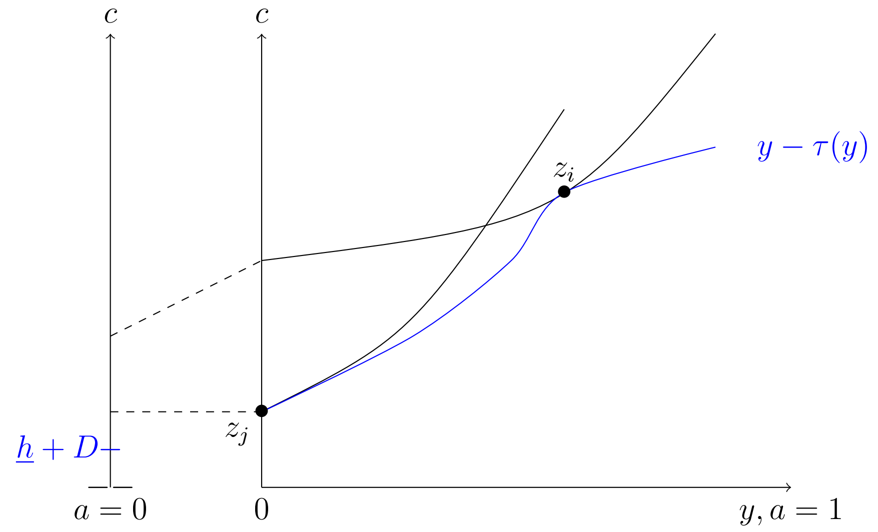

Figure 5: $y - \tau(y)$ violates Minimality.

Two important consequences must be raised.

[25] In layman terms, whether a job-seeker receives 1000 USD as social assistance or 500 USD as basic income combined with 500 as social assistance yield the same allocation.

Remark 1. *When* (τ, D) *is minimal,* $y - \tau(y)$ *is non-decreasing in* y *because preferences are monotonic in* $(c, -l)$*. As a consequence, Minimality forbids* $\tau'(y) > 1$ *on some* y*, i.e. a confiscatory tax rate on some interval of income.*

Remark 2. *The inactivity benefit* D *acts as a consumption floor in the model. To see this observe that by incentive-compatibility and Minimality, one must have* $\underline{h} + D \leq -\tau(0)$ *as disutilities of participation are nonnegative. In addition to that, by Remark 1,* $y - \tau(y)$ *is increasing afterwards. Therefore, even in the case where* $\underline{h} = 0$*, there will be no agent in the economy with a consumption smaller that* D*.*

The second assumption ensures that among those with the worst productive endowments, one finds all sort of possible preferences. Importantly, this implies that one can find agents with any degree of disutility of participation, including an infinite one. Hence, no matter how attractive the labor market may be, there will always be some agents with the worst home surplus that optimally decide to remain inactive. Similarly, it implies that there will be low-skilled active agents with a disutility of participation large enough so that they are indifferent between their current situation and inactivity. This assumption is rather strong for a small number of agents, but seems adequate when designing tax systems for large economies.

Assumption (Diversity)**.** *For all* $e \in E$*, if* $R \in \mathcal{P}^*$ *then* $\exists j \in \mathcal{I}$ *with* $(w_j, h_j) = (\underline{w}, \underline{h})$ *and* $R_j = R$*.*

These two assumptions are mostly harmless for the generality of the results. Incidentally, they allow me to translate the allocation ordering implied by the axioms from a function expressed in abstract well-being measures (in Theorem 1) to a function expressed in terms of policy tools and economy's parameters.

Theorem 2. *Under Minimality and Diversity, consider* $z, z' \in \widehat{Z(E)}$ *that are decentralized by* (τ, D) *and* (τ', D') *respectively. If social preferences are* $\mathbf{R}^{A-min}$*, then* z *is socially preferred to* z' *whenever*

<u>Case 1</u>: for $e \in E$ *such that* $\underline{w} > 0$*:*

$$\min\left\{\underline{h} + D - \tilde{h}; \min_{0 \leq y \leq \underline{w}} (1 - \frac{\tilde{w}}{\underline{w}})y - \tau(y)\right\} \geq \min\left\{\underline{h} + D' - \tilde{h}; \min_{0 \leq y \leq \underline{w}} (1 - \frac{\tilde{w}}{\underline{w}})y - \tau'(y)\right\} \tag{1}$$

<u>Case 2</u> : For $e \in E$ *such that* $\underline{w} = 0$

$$\min\left\{\underline{h} + D - \tilde{h}; -\tau(0) - \tilde{w}\right\} \geq \min\left\{\underline{h} + D' - \tilde{h}; -\tau'(0) - \tilde{w}\right\} \tag{2}$$

Proof. Observe that the well-being measure $M_i(z_i)$ in the second-best environment can trivially be decomposed as the smallest transfer over the two smallest transfers in each of the two subspaces $\dot{X}_1$ and $\dot{X}_0$, i.e.

$$\begin{aligned} M_i(z_i) &= \min\{m_i^1(z_i), m_i^0(z_i)\} \\ \text{with } m_i^0(z_i) &= \min\{t \in \mathbb{R} : \exists (c,0,0) \in \dot{X}_0 \text{ with } (c,0,0) R_i\, z_i, \quad c = \tilde{h} + t\} \\ m_i^1(z_i) &= \min\{t \in \mathbb{R} : \exists (c,y,1) \in \dot{X}_1 \text{ with } (c,y,1) R_i\, z_i, \quad c = \frac{\tilde{w}}{w_i} y + t\} \end{aligned}$$

Consider first case 1. By Minimality, the locus $y - \tau(y)$ coincides with the envelope curve of agents over $\dot{X}_1$. By Diversity, over the range $[0, \underline{w}]$, the envelope curve is the one of agents with a wage rate equal to $\underline{w}$. Over that interval, the smallest $m_i^1(z_i)$ can be found as the smallest transfer such that $c = y - \tau(y)$ and $c = \frac{\tilde{w}}{w_i} y$. In other words, one has:

$$\min_{w_i = \underline{w}} m_i^1(z_i) = \min_{0 \le y \le \underline{w}} (1 - \frac{\tilde{w}}{\underline{w}}) y - \tau(y)$$

For agents with $w > \underline{w}$, this value is at least as great as

$$\min_{0 \le y \le w} (1 - \frac{\tilde{w}}{w}) y - \tau(y)$$

This object is non-decreasing in w because by Remark 1, $y - \tau(y)$ is non-decreasing in y. Hence one has $\min_{w_i = \underline{w}} m_i^1(z_i) = \min_{i \in \mathcal{I}} m_i^1(z_i)$.

By Diversity, for any (τ, D) it must be that the smallest $m_i^0(z_i)$ will be reached by inactive agents with the lowest skill, as well as by active agents with a disutility of participation that renders them indifferent between their bundle and $z_i = (\underline{h} + D, 0, 0)$. Hence, $\min_{i \in \mathcal{I}} m_i^0(z_i) = \underline{h} + D - \tilde{h}$, completing the proof for case 1.

The proof for case 2 trivially reproduces the reasoning above taking the limit $\underline{w} \to 0$ and is left to the reader.

■

The theorem consists in two cases depending on the value of the smallest wage rate $\underline{w}$ in the economy. When it is positive, one can interpret it as the statutory (legal) minimum wage rate that prevails in this economy. Conversely, whenever it is null $\underline{w} = 0$, I interpret it as reflecting the prevalence of involuntary unemployment in that economy, such that the state of the labor market nullifies the productivity of some agents. The empirical application in section 5 carefully addresses that.

This theorem amounts to identifying a sufficient statistic for the evaluation of the desirability of *any* tax-benefit reform, even in a suboptimal world. It can be used to compare a reform scenario (τ, D) against the status quo tax-benefit system (τ', D'). I come back to the usefulness of this theorem in the empirical section 5.

Observe that the key components of this sufficient statistics are the within-sector distance to the average endowments $\tilde{h}$ and $\tilde{w}$. To see this, consider for simplicity the *Laissez-faire* policy $(\tau', D') = (0, 0)$ and imagine $\underline{w} = \underline{h} = 0$. If the ratio $\frac{\tilde{h}}{\tilde{w}}$ is smaller (larger) than 1, welfare-improving reforms consist in allocating resources to the worst-off in the labor market (home sector). Hence, the government pursuing equality of opportunity has a tendency to allocate resources towards the relatively more productive sector for fairness reasons, independently of efficiency motives.

Let me now turn to the characterization of the optimal tax benefit-system. It is enough to concentrate on D^* for our purposes.

Theorem 3. *Under Minimality and Diversity, assume that there exists a $z^* \in \widehat{Z(E)}$ decentralized by (τ^*, D^*) that is optimal with respect to $\mathbf{R}^{A-min}$. Then, one has that:*
For economies with $\underline{w} > 0$

$$D^* = \tilde{h} - \underline{h} + \min_{0 \leq y \leq \underline{w}} (1 - \frac{\tilde{w}}{\underline{w}})y - \tau^*(y)$$

For economies with $\underline{w} = 0$

$$D^* = \tilde{h} - \underline{h} - \tau^*(0) - \tilde{w}$$

The proof is immediate from Theorem 2.

This optimal inactivity benefit formula is interesting for several reasons. First, it gives us an idea of the consumption difference that should hold between actives and inactives. In other words, it pinpoints the premium that active agents *fairly* deserve because of their participation in the labor market, if any, the magnitude of which must be pinned down by empirical moments of the economy.

Second, this premium is increasing in the discrepancy between average productivity in the labor market and at home $(\tilde{w} - \tilde{h})$. This suggests that as the labor market becomes more productive, the inactivity benefit should decrease for a given τ^*. For most developed economies, it is likely that this difference is quantitatively large, because the labor market technology has benefited from specialization, innovation, and capital accumulation over the course of development.

Third, this theorem also informs us on the complementarity/substituability of the inactivity benefit with the traditional safety net programs. In particular, one sees that the basic income should supplement, rather than crowd out, the standard safety net as they covary in identical rather than opposite directions.

Finally, this theorem characterizes the optimal relationship between the safety net and the inactivity benefit, but it is silent about the optimal joint *level* of (τ^*, D^*). To sketch its design[26], consider a given economy e and the *Laissez-faire* policy $(0, 0)$. The government computes the well-being of the worst-off in the labor market and the worst-off in the home sector using Theorem 2. In most cases, the distance to the average is much greater in the former than in the latter sector. Hence, the government will start by directing some transfers to the worst-off in the labor market, up to the point where the distances to the averages are equalized across sectors, as embodied by Theorem 3. In turn, the Rawlsian government will pursue tax collection as much as efficiency permits. In other words, it will direct redistribution such that any dollar spent on D is matched with a dollar spent on the safety net, thereby setting their joint level as high as efficiency permits.

5 Empirical application

Whether introducing an inactivity benefit is a welfare-improving reform or an optimal policy is ultimately an empirical question, as one can notice from Theorem 2 and Theorem 3, respectively. In this section, I leave aside the determination of the optimal policy because observed tax-benefit systems around the world are probably far away from the Mirrleesian optimum such that policy recommendations of practical use are more likely to emerge from the study welfare-improving reforms. I therefore need to estimate parameters $\tau, \underline{w}, \underline{h}, \tilde{w}, \tilde{h}$ from equations (1) and (2) in Theorem 2.

I set the right handside of these equations with the status-quo tax-benefit system such that $(\tau', D') = (\tau', 0)$ for all countries as to date no OECD government has waived the conditionality of welfare benefits to labor market participation[27]. Then, I calibrate the left handside with the reform that consists in giving one dollar of inactivity benefit, i.e. the reform $(\tau, D) = (\tau, 1)$. In turn, one obtains a sufficient statistic for the desirability of the reform of the inactivity benefit as an answer to the following question : *by how much should one increase the safety net in order for 1 dollar of inactivity benefit to be welfare-improving ?* Hence, this section performs a bounding exercise.

The sufficient statistics differ if $\underline{w} > 0$ or $\underline{w} = 0$. The latter can be interpreted as an economy where there exists involuntary unemployment such that the current state of the labor market nullifies the productivity of some agents. For the former, I interpret $\underline{w}$ as the statutory minimum wage and I set[28] $\min_{0 \le y \le \underline{w}} (1 - \frac{\tilde{w}}{\underline{w}})y - \tau'(y) = \underline{w} - \tau'(\underline{w}) - \tilde{w}$.

[26]It is easy to prove that τ^* would have the same qualitative properties as Fleurbaey and Maniquet (2007), i.e. setting $\underline{w} - \tau(\underline{w})$ as high as possible with negative marginal tax rates over $[0, \underline{w}]$.

[27]Interestingly, Spain introduced an inactivity benefit, the *Ingreso minimo vital* during the year 2020. The simulated tax-benefit system for Spain 2020 does not include it yet. Hence, this paper incidentally evaluate the desirability of this reform.

[28]Not only this assumption is conservative with respect to the results, but it also seems the most empirically relevant one given the marginal tax rates on low incomes estimated by Maniquet and Neumann (2021).

The advantage of the sufficient statistics (1) and (2) is that estimates for the current tax-benefit system τ' on low incomes as well as the average gross earnings $\tilde{w}$ are readily available statistics for many countries[29]. However, the difficulty of this exercise is that home production surpluses estimates for $\underline{h}$ and $\tilde{h}$ are not readily available. From section 2, we know that h_i must be measured as the product of the sunk time cost of participating in the labor market[30] with the productivity in the home sector. Let me denote the former by F and the latter by γ_i:

$$\underbrace{h_i}_{\text{home surplus}} = \overbrace{F}^{\text{Time cost of participation}} \times \underbrace{\gamma_i}_{\text{home hourly productivity}}$$

To estimate these two key unobservables, I will take a Beckerian view on home production and set average productivities to be identical across the two sectors, i.e. $\tilde{\gamma} = \tilde{w}$ (Becker, 1965). Moreover, I impose that $\underline{\gamma} = 0$. Observe that I only impose two moments restrictions, i.e. on the minimum and the average, while staying completely agnostic about the shape of the γ_i distribution. The next section address robustness.

To get an estimate of F, I exploit the recent G-SWA survey on time savings when working from home (Aksoy et al., 2023). On average across countries, workers spent 72 minutes per day commuting which is taken to reflect the sunk cost of labor market participation[31]. In turn, F is expressed as the fraction of this time cost over the statutory length of the working week[32] because l is normalized to 1. For example, the average American spends 55 minutes commuting per day over a 40 hours workweek, yielding a $F_{US} = 11.56\%$.

The results are reported in table 1.

Despite a series of conservative assumptions, I find that for all 29 countries, the safety net should be increased by very large amounts before any dollar spent on inactivity benefit constitutes a welfare improvement. As an example, consider childless singles in the US in 2019. The net earnings of full time minimum wage earners was $12,876$\$ while average gross earnings were $56,577$\$. As the time cost is $F_{US} = 11.56\%$, the value of

[29] I recover $-\tau'(0), \underline{w} - \tau'(\underline{w}), \tilde{w}$ from the OECD (2020) tax-benefit simulator for 29 developed economies. The results are differentiated for two different family compositions (i.e. two different status-quo τ') : childless singles and lone parents with two children. The reference year is set to 2020 for the case $\underline{w} = 0$ because there is little doubt that there has been involuntary unemployment. I set it to 2019 for the case $\underline{w} > 0$.

[30] Observe that in the real world, this sunk time cost can only be partly controlled by the government (through job-seeking ordeals). This paper focuses on the redistribution problem considers that these ordeals are set for other reasons (see e.g. Rafkin et al. (2023)). Accordingly, the measurement of F is set to match commuting time, which is independent of these ordeals.

[31] An alternative strategy would have been to use estimates of the time devoted to job search activities. However, Mukoyama et al. (2018) documented that unemployed Americans spend on average 31.1 minutes per day searching for a job, such that my choice is again conservative.

[32] Additional details on the empirical application are relegated to Appendix B.

Table 1: Summary of results. Sufficient increase in $\underline{w} - \tau(\underline{w})$ for $D = 1$ to be a welfare-improving reform, in percentage of current $\underline{w} - \tau(\underline{w})$.

	Case $\underline{w} = 0$: increase in $-\tau(0)$ 2020		Case $\underline{w} > 0$: increase in $\underline{w} - \tau(\underline{w})$ 2019	
Country	Lone parents	Singles	Lone parents	Singles
Australia	365,99%	410,22%	102,75%	116,50%
Belgium	142,67%	248,18%	50,47%	112,84%
Bulgaria	352,10%	1109,41%	74,41%	139,96%
Canada	353,95%	600,39%	118,73%	165,95%
Czech Republic	303,34%	730,34%	96,99%	147,41%
Estonia	116,44%	657,54%	53,97%	114,82%
France	121,11%	371,55%	46,91%	91,72%
Greece	294,24%	589,93%	158,22%	158,22%
Germany	218,40%	744,30%	132,58%	214,20%
Croatia	325,47%	793,48%	129,42%	129,42%
Hungary	1490,03%	1490,03%	137,39%	233,21%
Israel	223,35%	549,81%	52,77%	119,34%
Ireland	186,29%	288,84%	46,10%	111,43%
Japan	68,66%	319,12%	54,23%	179,36%
Lithuania	224,54%	788,99%	88,95%	157,29%
Latvia	302,19%	1307,68%	43,39%	139,87%
Luxembourg	82,64%	189,04%	50,49%	110,96%
Malta	205,47%	235,06%	93,07%	138,38%
Netherlands	257,60%	257,60%	116,16%	142,99%
New Zealand	164,09%	295,15%	44,68%	59,68%
Poland	188,73%	994,14%	125,05%	165,15%
Portugal	244,71%	589,42%	107,27%	107,27%
Romania	1012,90%	2697,91%	185,09%	192,31%
Slovenia	35,97%	245,36%	11,61%	97,30%
Slovak Republic	511,34%	1365,17%	77,42%	118,30%
Spain	220,58%	374,47%	89,53%	102,38%
Turkey	3639,13%	∞	119,83%	126,20%
United Kingdom	226,69%	638,80%	83,42%	134,01%
United States	762,76%	2163,63%	103,51%	289,04%

average home production $\tilde{h}$ is simply $11.56\% \times 56,577$\$, i.e. 6483\$. As a result, the distance to the average in the labor market is $43,701$\$ for only 6483\$ at home. Hence, the disposable income of minimum wage earners should increase by the difference between $43,701$\$ for 6483\$, that is $37,217$\$ or 289% of its current level, before any dollar of inactivity benefit is welfare-improving.

The magnitude of estimates are in general smaller for lone parents than for childless singles, as most countries typically offer more generous coverage to the former than the latter. These results come from the fact that distances to the average are much larger in the labor market than in the home sector, or equivalently, that the well-being measurement pinned down by the axioms always identify the worst-off as being a job-seeker or a low-skilled worker in these economies, but never an inactive.

There are two ways to interpret this result. The first interpretation follows the line of the inverse-optimum literature[33]. If the current safety nets are assumed to be optimal with respect to $\mathbf{R}^{A-min}$, then the optimal D^* in all countries studied should be negative. This goes against the idea that introducing a basic income without modifying the safety net would be welfare-improving. The second interpretation goes as follows. Before introducing a basic income, a prioritarian government should significantly (most of the time, unrealistically) increase the safety net coverage offered to the actives.

5.1 Discussion

I made several (implicit) assumptions that, if relaxed, would render the conflict between basic income and equality of opportunity even stronger. In this section, I discuss them in turn for the empirical application, the theoretical framework and the government's objective.

From the theorems of section 4, we know that a positive basic income is more likely to emerge if $\tilde{\gamma}$ is large with respect to $\tilde{w}$, or if the fixed cost of participation F is large, or if $\tilde{w}$ is small. In order for my negative result on its desirability to be robust, I have made measurement assumptions that were favorable to the emergence of a basic income, i.e. conservative assumptions. First, the ratio of the average productivity in the home sector to the labor market $\frac{\tilde{\gamma}}{\tilde{w}}$ has been set to 1 while Bridgman et al. (2018) found it closer to 0.3. Second, the choice of F could have been smaller if it had reflected time devoted to job search rather than commuting. Third, I assumed that the average marginal product of labor $\tilde{w}$ is equal to the average gross earnings. However, as firms have monopsony power, the marginal product of labor is higher than the wage[34]. All in all, these choices suggest that estimates in table 1 are lower bounds.

[33] See Bourguignon and Spadaro (2012) and Stantcheva (2016) for an introduction and a critique of the inverse-optimum approach, respectively.

[34] Mas and Pallais (2019) review the literature and consider that the marginal product of labor may be 25% larger than the average wage.

Moreover, several features of the theoretical framework are also conservative with respect to this conflict. First, I considered that there is no negative externality of home production. However, if it includes black market activities, the government might wish to impose a Pigouvian tax on inactives and/or hold them responsible for their h_i, thereby decreasing even more the desirable level of D^*. Similarly, I assumed away any positive externality of job search which would have lay the grounds for a Pigouvian subsidy to unemployed. Second, the model assumed away the existence of an intensive margin in the inactives' production function. As in Saez (2001, 2002), such an intensive margin would have driven an additional efficiency cost of raising D by disincentivizing effort in the home sector. Hence, these results would only be reinforced by including an intensive margin.

However, I have assumed that the government can perfectly distinguish a job-seeker from an inactive at a zero cost, which might seem a strong assumption. Yet, as long as the monitoring cost for the government has a lower dollar value than estimates from Table 1, the government should fully invest in it. Given the size of the estimates, the inclusion of costly monitoring is unlikely to overturn the policy recommendation.

Most interestingly, several underpinnings of the social objective $\mathbf{R}^{A-min}$ were likely to justify an inactivity benefit in the second-best, but failed to do so.

First, Diversity implied that some agents with the worst endowments will remain inactive, no matter how generous in-work benefits might be, thereby enjoying the smallest levels of consumption in the economy. Moreover, the inactivity benefit D is the only redistributive tool at the government's disposal to directly fight inequalities in the home sector, and ***Weak Transfer*** prescribes that it is a desirable goal. What the present result says is that the government can also fight inequalities in the home sector by providing better opportunities in the labor market, under the proviso that the technology in that sector is productive enough, i.e. when the gap $(\tilde{w} - \tilde{h})$ is large.

Second, and perhaps most importantly, this result holds despite the fact that I have not favored the production in the formal sector with respect to the one in the home sector[35] even if there may be good reasons to do so. Indeed, there has been recent calls in the public debate for an increase in the employment rate, notably in order to maintain the sustainability of public pension systems in aging economies.

However, this paper did not exclude the possibility that other social objectives may lead to different policy recommendations. In particular, among the family of social objectives pursuing equality of opportunity, the $\mathbf{R}^{A-min}$ studied above may be criticized

[35]This is especially relevant to the debate because proponents of basic income have argued that one should not be paternalistic about what a good life is (see in particular Van Parijs (1995)).

by some because it holds agents responsible for their disutilities of participation. Let me now address this case.

6 Welfare recipient stigma

In this section, I consider the case of a government that does not wish to hold agents fully responsible for their preferences because their disutilities of participation have been partly driven by the *welfare recipient stigma*. It captures the idea that some agents remain inactive and do not take up conditional social benefits because enduring the screening device of the government entails a mental burden, rooted in the stigma that societies attach to benefits recipients[36].

Consider the following structure for the disutility of participation d_i:

$$d_i(c) \equiv u_i(c,-1) - u_i(c,0) = s_i + \delta_i(c)$$

where $\delta_i \in [-s_i, +\infty)$ is the idiosyncratic taste parameter[37] and s_i is the value of stigma. Observe that s_i has a money-metric interpretation: it is the maximal amount of consumption that an agent is willing to forgo in order to escape enduring the screening device of the government.

For clarity of the exposition, let me assume that there are only two draws of this stigma utility cost : $s_i \in \{S, 0\}$ with $S > 0$. Hence, there are only two different exposures to the stigma cost of conditionality in the population : those that do suffer from it and those that do not[38]. The social planner wishes to compensate for s_i as well as w_i and h_i, while holding responsible for δ_i and their willingness to work.

Rather than deriving rigorously the full axiomatization that this compensation for s_i would entail, I sketch the result by an example. Consider the case of two fraternal twin sisters, agents k and j. They are identical in every respect but they differ in their exposure to the stigma utility cost: agent k suffers from it such that $s_k = S$ while agent j do not and $s_j = 0$.

Consider the bundle z_I and z_U that are such that agent j is indifferent between the two, and they are consumed when inactive and unemployed, respectively. I sketch this setup in Figure 6.

[36]This *welfare stigma hypothesis* has received attention from the theoretical literature (Besley & Coate, 1992a; Hupkau & Maniquet, 2018; Lindbeck et al., 1999; Moffitt, 1983) and was recently backed by experimental evidence (Friedrichsen et al., 2018).

[37]The fact that δ_i can now have negative values reflect the possibility for some agents to derive non-pecuniary benefits from labor market participation (such as friendliness from colleagues for example) which could partly offset the burden S puts on them.

[38]If this partitioning in two sets in degenerate, we are back to the analysis of the previous sections as there is no inequality to compensate for. In other words, if all agents experience the same stigma cost of conditionality, or if none of them does, the main formulas are unaffected.

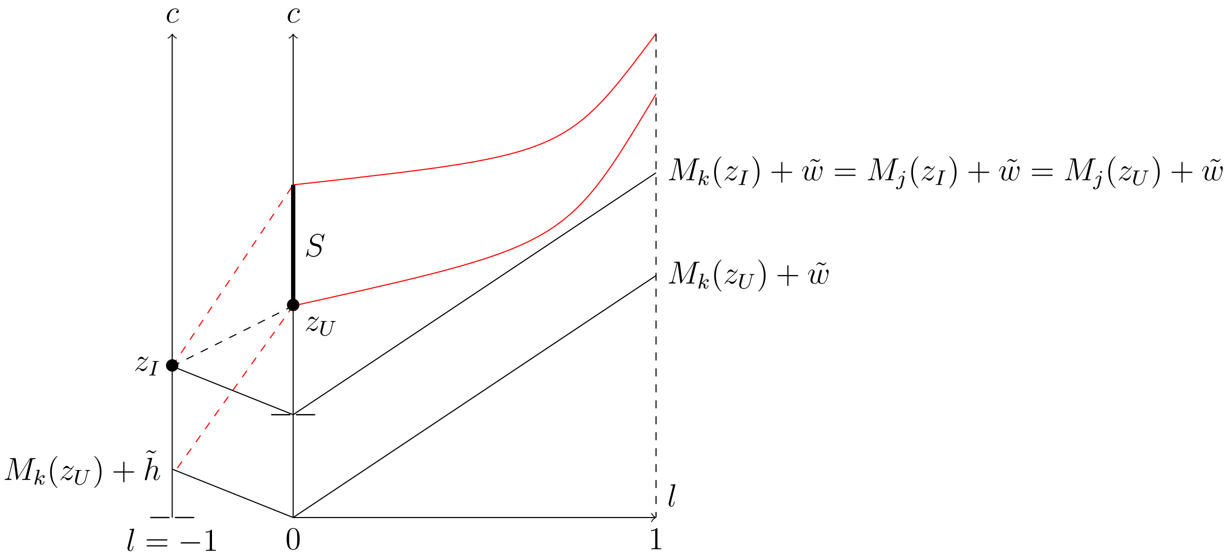

Figure 6: Agents k and j are identical in every primitive but one: the inactive k suffers a stigma utility cost of S while the unemployed j does not. In red, the indifference curves of k. Agent j is indifferent between z_I and z_U.

In red are drawn the indifference curves of agent k. Obviously, when she is unemployed and consumes z_U she suffers the stigma $s_k = S > 0$ associated to this labor market status. If one computes the AIMU-utility of these two agents when they consume z_U, one gets that $M_k(z_U) = M_j(z_U) - S$. In other words, *when unemployed*, the well-being measure derived in previous sections already accounts for the fact that those suffering from a larger disutility of participation (here, coming from the stigma) have a lower well-being.

Now, the difference is when the agents are inactive and consume z_I. In this case, the indifference curve of k lies above the one of j, and they only coincide at z_I. If one applies the AIMU-utility to this situation, one gets that $M_k(z_I) = M_j(z_I)$, i.e. both agents have the same level of well-being, even if agent k *would* have suffered from the stigma *had she joined the labor market*.

A government that compensates for S should treat the well-being of k when inactive as if she had actually experienced this stigma cost. In other words, the well-being measure when inactive must be reduced by s_i with respect to the AIMU-utility. Hence, the new well-being measure compensating for the stigma, is given by

$$W_i(z_i) = M_i(z_i) - (1 - a_i)s_i$$

In turn, all the analysis above can be repeated using $W_i(z_i)$ instead of $M_i(z_i)$. Obviously, the worst-off in the home sector will now have a well-being measure of $\underline{h} - S + D - \tilde{h}$.

Hence, the optimal (τ^{**}, D^{**}) that maximins $W_i(z_i)$ follows:

$$D^{**} = S + \tilde{h} - \underline{h} + \min_{0 \geq \underline{w}}(1 - \frac{\tilde{w}}{\underline{w}})y - \tau^{**}(y)$$

I conclude that S positively influences the optimal inactivity benefit in an additive fashion and thereby weakens the conflict between fairness and basic income outlined in previous sections. Because of the formalization, S has a money-metric interpretation and should measured as an answer to this question : *how much would one be willing to pay (i.e. forgo consumption) to escape enduring the screening device of the government?*

To the best of my knowledge, such empirical estimates for S are not available in the literature. In order to justify that one dollar of inactivity benefit is welfare-improving, S must be at least larger than the estimates of table 1. In many instances, it seems unrealistically large. Alternatively, S could also be interpreted as an ethical parameter. In that case, estimates from table 1 would provide lower bounds on the government's willingness to pay to escape its own screening device.

7 Conclusion

This article has explored redistribution between active and inactive agents. The inquiry showed that abandoning the conditionality of social benefits to labor market participation is unlikely to be justified by the ethics of equality of opportunity in most developed economies.

A priori, this ethical standpoint could have justified both an anti- and a pro-basic income argument as could be attested by the debate between Rawls (1988) and Van Parijs (1991) on whether Malibu surfers should be fed. What the present paper has done is precisely to reconcile these two diametrically opposed interpretation of a single fairness viewpoint, by proving the conjecture outlined in Van Parijs and Vanderborght (2017, p.112) : "*[Once leisure is included in the index], the optimal option, by the standard of the difference principle, will crucially depend on the relative weights the index places on income and leisure, [...] and on a great many contingent empirical facts*". In this paper, the relative weights on these dimensions are those of the agents themselves because of the non-paternalistic nature of the social objective. Then I precisely quantify where and when these empirical facts are such that basic income may be not be justified: in developed economies.

The main explanation lies in the fact that as the value of home production is small, inactivity is driven by preferences for which agents are held responsible. Hence, an inequality-averse government can fight inequalities outside the labor force by providing better opportunities within the labor market, which is desirable under the proviso that the aggregate technology in the formal sector is productive enough.

This paper has left exogenous the definition of the eligibility requirements to be considered as an active job-seeker. However, it is well-known that there exists a heterogeneity in the stringency of these requirements across developed countries, whose positive and normative study is left for future research.

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A Axiomatic proofs

A.1 Impossibility of Separability

Consider the following Separability axiom:

Axiom : Separability

$\forall e \in \mathcal{E}$ and $e_{-j} \in \mathcal{E}_{-j} = \left\{(R_i, h_i, w_i)_{i \in \mathcal{I} \setminus \{j\}}\right\}$, and $z, z' \in Z$ such that $z_j = z'_j$ then,

$$z\mathbf{R(e)}z' \iff z_{-j}\mathbf{R(e}_{-j})z'_{-j}$$

with $z_{-j} = (z_1, ...z_{j-1}, z_{j+1}, ..., z_I)$ and $z' - j = (z'_1, ...z'_{j-1}, z'_{j+1}, ..., z'_I)$

Proposition 1. *There is no $R(e)$ that satisfies **Responsibility, Weak Transfer** and Separability for all $e \in \mathcal{E}$*

Proof. By contradiction, suppose the statement does not hold. Consider the economies $e_1 = \{(R_i, \bar{h}, \underline{w}), (R_j, \bar{h}, \underline{w})\}$, $e_2 = \{(R_i, \underline{h}, \bar{w}), (R_j, \underline{h}, \bar{w})\}$, $e_3 = \{(R_i, \bar{h}, \underline{w}), (R_j, \bar{h}, \underline{w})(R_i, \underline{h}, \bar{w}), (R_j, \underline{h}, \bar{w})\}$, with $\bar{h} > \underline{h}$ and $\bar{w} > \underline{w}$, as well as their associated utility-maximizing bundles:

$$z_1 \in \max_{R_i} B(0, \bar{h}, \underline{w}) \qquad z_2 \in \max_{R_i} B(0, \underline{h}, \bar{w})$$
$$z_3 \in \max_{R_j} B(0, \bar{h}, \underline{w}) \qquad z_4 \in \max_{R_j} B(0, \underline{h}, \bar{w})$$

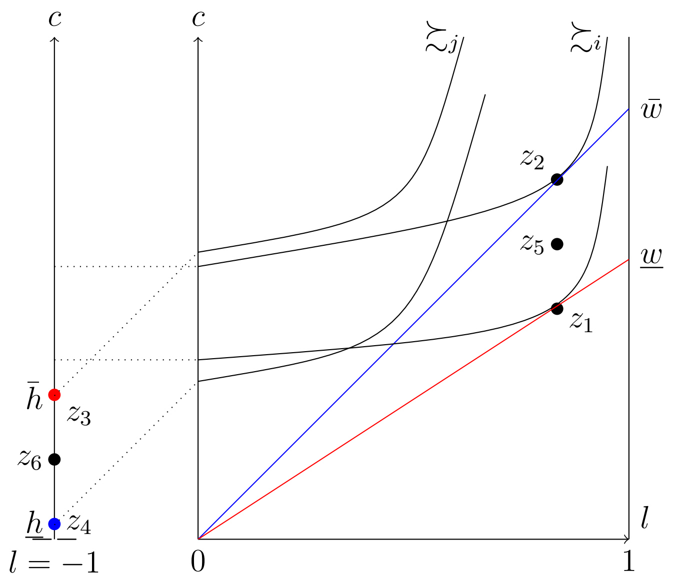

Figure 7: Illustration of the proof

Let me add the additional restrictions that $c_3 - c_4 = c_1 - c_2$, and $l_1 = l_2$ as well $l_3 = l_4$. I define the average bundles $z_5 = \frac{z_1 + z_2}{2}$ and $z_6 = \frac{z_3 + z_4}{2}$ and illustrate the setup in Figure 6.

By Responsibility, $(z_1, z_3)\mathbf{P(e}_1)(z_5, z_6)$,

By Separability, $(z_1, z_3, z_2, z_4)\mathbf{P(e}_3)(z_5, z_6, z_2, z_4)$,

By Compensation, $(z_5, z_6, z_5, z_6)\mathbf{R(e}_3)(z_1, z_3, z_2, z_4)$,

By Transitivity, $(z_5, z_6, z_5, z_6)\mathbf{P(e}_3)(z_5, z_6, z_2, z_4)$,

By Separability, $(z_5, z_6)\mathbf{P(e}_2)(z_2, z_4)$,

But this contradicts Responsibility, proving the statement. ■

A.2 Proof of Theorem 1

I start by formally defining the fourth and fifth axioms described in the main body of the paper.

Axiom 4 : Mean-Preserving Separability

For all $\mathcal{S}, \mathcal{I}$ and for all economy $e, e_{-\mathcal{S}} \in E$ with $e_{-\mathcal{S}} = \Big((w_i, h_i, R_i)_{\forall i \in \mathcal{I} \setminus \mathcal{S}}\Big)$, and for all $z, z' \in Z$ such that

- $z_i = z'_i$ for all $i \in \mathcal{S}$ and
- $\frac{1}{I}\sum_{i=1}^{I} w_i = \frac{1}{S}\sum_{i=1}^{S} w_i$ and $\frac{1}{I}\sum_{i=1}^{I} h_i = \frac{1}{S}\sum_{i=1}^{S} h_i$

Then z **R(e)** $z' \iff z_{-\mathcal{S}}$ **R(e$_{-\mathcal{S}}$)** $z'_{-\mathcal{S}}$
where $z_{-\mathcal{S}}, z'_{-\mathcal{S}} \in \{X \times \mathcal{I} \setminus \mathcal{S}\} \subset Z$

Axiom 5 : Hansson (1973) independence

For all economy $e = \Big((w_i, h_i, R_i)_{\forall i \in I}\Big)$ $e' = \Big((w_i, h_i, R'_i)_{\forall i \in I}\Big) \in E$ with $(R_i)_{i \in \mathcal{I}}$ and $(R'_i)_{i \in \mathcal{I}}$ two profiles of preferences, let $z, z' \in Z$ be two allocations,

$$\text{If} \quad \forall q \in X \quad \Big[z_i \;\; I_i \;\; q \iff z_i \;\; I'_i \;\; q \quad \text{and} \quad z'_i \;\; I_i \;\; q \iff z'_i \;\; I'_i \;\; q \;\; \forall i \in \mathcal{I} \Big]$$

$$\text{Then,} \quad [z \;\; \mathbf{R(e)} \;\; z' \iff z \;\; \mathbf{R(e')} \;\; z']$$

I prove Theorem 1 by using two lemmas. This proof is reminiscent to Fleurbaey and Maniquet (2006, 2011) and Valletta (2014)[39]. Lemma 1 implies the maximin[40] nature of the social ordering while Lemma 2 characterize the well-being measure.

[39] In comparison with Fleurbaey and Maniquet (2006), I have a stronger Responsibility requirement but a weaker Separability requirement and more dimensions of heterogeneity. With respect to Valletta (2014), I have weaker versions of Pareto and Transfer axiom. That paper dealt with the fair income tax if there are two consumption goods but only one productive skill. In the present paper, I have an homogeneous consumption good but productive skills in two sectors.

[40] There has been recent axiomatizations of money-metric aggregator with finite inequality aversion which consists in weakening either Weak Transfer (Bosmans et al., 2018) or Hansson Independence (Piacquadio, 2017). However, I kept the present structure as the maximin has been crucial in the basic income debate.

Lemma 1. *If the SOF $\tilde{R}(e)$ satisfies Weak Pareto, Hansson independence and Weak Transfer, then $\forall e \in E$, $z, z' \in Z$ if there exists $\{i, j\} \in \mathcal{I}$ such that $R_i = R_j \equiv R_0$ and*

$$z_i' \;\; P_0 \;\; z_i \;\; P_0 \;\; z_j \;\; P_0 \;\; z_j'$$

and $z_k' = z_k$ for all $k \in \mathcal{I} \backslash \{i, j\}$, one has $z \;\; \tilde{P}(e) \;\; z'$.

Proof of Lemma 1. Follows mutatis mutandis the proof of lemma 1 in Fleurbaey and Maniquet (2006). ■

Lemma 2. *If $\forall e \in E$, $\tilde{R}(e)$ satisfies Weak Pareto, Responsibility, Weak Transfer, Hansson Independence, and Mean-Preserving Separability, and $\exists z, z' \in Z$ such that*

$$M_i(z_i') > M_i(z_i) > M_j(z_j) > M_j(z_j')$$

and $z_k = z_k' \;\; \forall k \in \mathcal{I} \backslash \{i, j\}$
Then,

$$z \;\; \tilde{P}(e) \;\; z'$$

Proof of Lemma 2. By contradiction, suppose that $z' \;\; \tilde{R}(e) \;\; z$.
Let me introduce two new agents, a, b such that :

- $(w_a, h_a) = (w_b, h_b) = (\tilde{w}, \tilde{h})$
- $R_a = R_i$ and $R_b = R_j$

I denote the relevant economies in the following way :

$$e^{\{a,b\}} = \Big((w_i, h_i, R_i)_{\forall i \in \{a,b\}} \Big) \qquad e^{\mathcal{I} \cup \{a,b\}} = \Big((w_i, h_i, R_i)_{\forall i \in \mathcal{I} \cup \{a,b\}} \Big)$$

Let z, z' be two allocations in $e^{\{a,b\}}$ such that

$$z_a \in \max_{R_a} B(t_a, \tilde{w}, \tilde{h}) \quad z_a' \in \max_{R_a} B(t_a', \tilde{w}, \tilde{h})$$
$$z_b \in \max_{R_b} B(t_b, \tilde{w}, \tilde{h}) \quad z_b' \in \max_{R_b} B(t_b', \tilde{w}, \tilde{h})$$

with $t_a' > t_a > t_b > t_b'$
and

$$M_i(z_i') > M_i(z_i) > M_a(z_a') > M_a(z_a) > M_b(z_b) > M_b(z_b') > M_j(z_j) > M_j(z_j')$$

By Mean-Preserving Separability,

$$(z', z_a, z_b) \;\; \tilde{R}(e^{\mathcal{I} \cup \{a,b\}}) \;\; (z, z_a, z_b)$$

By Lemma 1 and $M_i(\cdot)$ being a particular representation of individual preferences,

$$(z'_{-i}, z_i, z'_a, z_b) \ \ \tilde{P}(e^{\mathcal{I}\cup\{a,b\}}) \ \ (z'_{-i}, z'_i, z_a, z_b)$$

By the same argument,

$$(z'_{-\{i,j\}}, z_i, z'_a, z_j, z'_b) \ \ \tilde{P}(e^{\mathcal{I}\cup\{a,b\}}) \ \ (z'_{-\{i,j\}}, z_i, z'_a, z'_j, z_b)$$

By transitivity of the SOF,

$$(z'_{-\{i,j\}}, z_i, z'_a, z_j, z'_b) \ \ \tilde{P}(e^{\mathcal{I}\cup\{a,b\}}) \ \ (z, z_a, z_b)$$

As $z_k = z'_k$ for all $k \in I \backslash \{i, j\}$, by Mean-Preserving Separability one has,

$$(z'_a, z'_b) \ \ \tilde{P}(e^{\{a,b\}}) \ \ (z_a, z_b)$$

and this contradicts Responsibility, which completes the proof for lemma 2. ■

Proof of Theorem 1. The proof of theorem 1 is immediate from the combination of Lemma 1 and Lemma 2, with the characterization of the maximin ordering by Hammond (1976). □

I conclude this section by commenting on this result with respect to the literature on well-being measurement.

There is a revival of interest for using money-metric utility functions for welfare analysis. This tradition dates back to Samuelson and Swamy (1974) but recent papers have justified their use in a variety of context: e.g. Bosmans et al. (2018), Piacquadio (2017), and Schlee and Khan (2022). Money-metric utility functions have also been characterized along other families in Fleurbaey and Maniquet (2017, 2018, 2019).

However, it is well-known that there does not exists a unified theory for the reference prices used in the definition of the money-metric utility function, despite their crucial role in the cardinalization of utilities and, as a consequence, for interpersonal welfare analysis. Fleurbaey and Blanchet (2013) discusses some possibilities in their appendix. However, they do not deal with the case of linear production economies. Fleurbaey and Maniquet (2007) had similar axioms to the present paper in a one-sector linear production model, but it was compatible with any reference price w such that $\min_i w_i \leq w \leq \max_i w_i$.

The present paper shows that the axioms single out the arithmetic averages as reference prices whenever there are two productive sectors. The intuition behind this result has been explained in the paper and is also apparent from the impossibility in Proposition 1 (hence, only comes from the combination of Responsibility, Weak Transfer and

Separability).

A.3 Assumption 1

Assumption (Minimality). *$\forall z \in \widehat{Z(E)}$, a tax-benefit system (τ, D) that decentralizes z is minimal if the tax function $\tau(\cdot)$ is such that*

$$y - \tau(y) = cl\Bigg\{\bigcup_{i\in\mathcal{I}} UC\Big((c_i, y_i, a_i), w_i, R_i^*\Big)\Bigg\} \cap \dot{X}_1$$

where cl denotes the closure of a set, $UC(\cdot)$ is the upper contour set of agent (R_i^*, w_i, h_i) at z_i, and $\dot{X}_1 = \{(z_i \in \dot{X} : z_i = (c_i, y_i, 1)\}$.

B Details on the empirical application

I used the OECD tax-benefit simulator version 2.5.0. with the following parameters:

- Childless single 2020 : aged 40, unemployed for 6 months, with 216 months of social security contributions accumulated over the lifetime, earning social assistance, for the year 2020. Eligible to social assistance, net of income tax and social security contributions.

- Lone parents 2020 : aged 40, unemployed for 6 months, with 216 months of social security contributions accumulated over the lifetime, earning social assistance, for the year 2020. Children aged 4 and 6. Eligible to social assistance, lone parents support, net of income tax and social security contributions.

- Childless single 2019 : aged 40, unemployed for 6 months, with 216 months of social security contributions accumulated over the lifetime, earning statutory minimum wage. Eligible to social assistance, in-work benefits, net of income tax and social security contributions.

- Lone parents 2019 : aged 40, unemployed for 6 months, with 216 months of social security contributions accumulated over the lifetime, earning statutory minimum wage. Children aged 4 and 6. Eligible to social assistance, in-work benefits, lone parents support, net of income tax and social security contributions

The set of countries covered by the G-SWA survey (Aksoy et al., 2023) is a strict subset of the 29 countries I study. Whenever the estimate for F was not available, I kept the maximum of the series, i.e. 100 minutes per day.

The legal length of the working week is taken from the OECD (2021) (Annex Table 5.A.1.). The statutory length may differ from the negotiated length in some countries. When both are present, I took the maximum among the two. If both are absent, I set the length of the working week to 45 hours, corresponding to the maximum of the series. I considered that the working week lasts 5 days.

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