The Role of Income Distribution in the Diffusion of Corporate Social Responsibility

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Abstract

The purpose of this paper is to investigate the link between CSR growth and income distribution. We present a general equilibrium model where social responsibility enters both firms' and consumers' decisions. The model admits the existence of multiple equilibria, each of them characterized by a different diffusion of CSR. We study the conditions under which there exists a virtuous circle which ties increases in the diffusion of CSR to reductions in income inequality and *viceversa*. Under certain circumstances, any policy which promotes the diffusion of CSR induces a reduction of income inequality. By contrast, when such conditions are not satisfied, only redistributive policies may generate the virtuous circle.

JEL classification: D30; D50; D63; H30; M14.
Keywords: CSR; ethical consumption; income distribution; non-linear dynamics; general equilibrium.

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1 Introduction

In the last decades, the EU has attributed great prominence to Corporate Social Responsibility (CSR), "A concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis" (see Green Paper, 2001). In the Green Paper (2001), CSR is defined as an instrument which can promote "a positive contribution to the strategic goal decided in Lisbon: to become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion" (see the Green Paper, 2001, p. 6). The expansion of CSR is then considered as crucial for the EU Institution. However, even if, nowadays, an increasing number of firms started to promote CSR, CSR market is still a small proportion of the total annual household consumer spend (see for instance the The Co-operative Bank, 2007). This can be partly explained by the fact that commodities produced in the CSR market are usually more expensive than traditional ones. Several studies show that consumers that purchase CSR commodities are usually characterized by a medium-high level of income (see for instance Livraghi, 2007, D'Alessio et al., 2007).

The purpose of this paper is to investigate the link between CSR and income distribution. Our main finding is that under certain circumstances there exists a virtuous circle which ties increases in the diffusion of CSR to reductions in income inequality. This result has strong policy implications if public authority considers both CSR growth and inequality reduction as two crucial policy goals.

Research into CSR can be traced back to a crucial question of political and economic debate: whether firms have any kind of social responsibility beyond employment, production of goods and services and the maximization of profits (Friedman, 1970). This kind of responsibility in firms decisions has been underestimated by neoclassical theory. However, the dichotomy between theoretical conclusions and actual firms' behavior appears puzzling. Because of this, not surprisingly, CSR research has mainly focused on why firms choose to internalized social cost beyond legal constraints.[1] To answer this question, some scholars introduce the concept of CSR in an oligopoly framework with product differentiation, since this approach is seen as the natural tool able to solve the mentioned dichotomy. The fact that a group of consumers is concerned about social traits of products is the foundation of the existence of firms that commit on CSR. Contributions in this strand of literature are, for instance, Arora and Gangopadhyay (1995), Amacher et al. (2004), Alves and Santos-Pinto (2008), Becchetti and Solferino (2003), Conrad (2005), Davies (2005), Mitrokostas and Petrakis (2008).[2] We follow this literature by assuming that some consumers are socially responsible, and that CSR is modeled as a variable cost that affects the prices of firms in the ethical sector. By contrast, we adopt a general equilibrium perspective.[3] This approach allows us to go a step forward in the understanding of CSR, that is, it allows us to investigate the relationship between CSR growth and income inequality. Such a relationship cannot be properly analyzed in a partial equilibrium set-up. The role of income distribution in the diffusion of CSR , to the best of our knowledge, has not been yet analyzed, even if, as shown by Livraghi (2007) and D'Alessio et al. (2007), it is a crucial variable in the determination of CSR demand.

We present a simple version of a general equilibrium model. The economy is divided in two sectors, the traditional and the ethical one. We refer to the latter as the sector where CSR firms operate. Moreover, a share of consumers is concerned with the social attributes of products. Hence, social responsibility is incorporated in the model both in production and consumption decisions. Two hypotheses are crucial for our findings: i) only a group of workers receive a share of profits in addition to wages, and ii) a group of consumers – *socially responsible consumers* – entirely spend their income in the ethical sector if their income is enough to afford the purchase

[1] A critical survey on this debate is Kitzmueller (2008).

[2] One of the main differences between this strand of literature and the conventional product differentiation approach is that CSR is modeled as a variable cost rather than a sunk or fixed cost (see Alves and Santos-Pinto, 2008).

[3] Applications of CSR to a general equilibrium set-up has not been deeply analyzed so far. An example in this direction can be found in Becchetti and Adriani (2004) that analyze a North-South model of trade, where a single consumption good is produced in the two countries. However, income distribution does not affect the equilibrium outcome in their model.

of a given quantity of goods at the price of the ethical good.[4] This implies that consumers' behavior is affected not only by preferences but also by income distribution. Hence, we can investigate whether income inequality is a deterrent to CSR growth.

Under these assumptions the model admits multiple equilibria, each of them characterized by a different extent of ethical sector. Indeed, preferences and the presence of two classes of income can produce three different cases: all the labour force can afford CSR goods, only workers getting the share of profits can afford them, no one can do it. The price of CSR goods determines which of these situations emerges. Since the dimension of ethical sector affects the price of CSR goods, it is possible that, for some extents of ethical sector, the system switches from one case to another. We examine below the conditions under which these discontinuities generate multiple equilibria.

This result is important not only because different extents of ethical sector can be sustained at equilibrium, but also because we found that under plausible conditions the increase in the dimension of CSR is associated to a reduction of inequality. In this case there exists a virtuous circle between the two policy goals. Therefore, any policy which promotes the diffusion of CSR induces a reduction of income inequality. When those conditions do not apply, we show that only redistributive policies can induce both a reduction of inequality and an increase in the diffusion of CSR.

Next Section introduces the main features of the model. Section 3 describes the assumptions on preferences and income distribution. In Section 4, we investigates the equilibrium configurations of the model. In Section 5, we give a brief description of the dynamics. In Section 6, we find the circumstances under which there exists the virtuous circle. In Section 7 we investigate the consequences of two kinds of policies that affect preferences for CSR and income distribution. Section 8 concludes.

2 A General Equilibrium Model

The economy is divided in two sectors, the Traditional (T) and the Ethical (E) one. Both produce a single good with two similar technologies which

[4] Otherwise, their income is entirely spent in traditional sector.

only differ for their ethical dimension. The ethical sector (hereafter, E-sector) respects the criteria of ethicality and has access to a certification, this does not apply to the traditional sector (hereafter, T-sector). In order to respect the criteria, firms must pay an additional cost for any unit produced, c. We denote w_E and w_T the wage of E and T-sector respectively. In both sectors, firms maximize profits. Profits are equally shared among a quota, $\sigma \in (0, 1]$, of the labour force, L, independently by the sector where they work. Since we assume full employment in the economy, the sum of workers in E and T-sector – L_E and L_T respectively – must be equal to L, that is

$$L_E + L_T = L. \tag{1}$$

For the sake of clarity, we define the share of workers employed in the T-sector as

$$\gamma = \frac{L_T}{L}, \tag{2}$$

and $1 - \gamma$ as the share of workers employed in the E-sector.

Consumers choose to buy ethical or traditional commodities according to their preferences and their income. Demands can be defined as follows

$$D_T = \frac{1}{p_T}[\lambda_T w_T \gamma L + \lambda_E w_E (1 - \gamma) L + \lambda_\Pi \Pi], \tag{3}$$

and

$$D_E = \frac{1}{p_E}[(1 - \lambda_T) w_T \gamma L + (1 - \lambda_E) w_E (1 - \gamma) L + (1 - \lambda_\Pi)\Pi], \tag{4}$$

where D_i – with $i \in (E, T)$ – is the demand for each sector, and p_i the price of the good in sector i; $w_T \gamma L$ and $w_E(1 - \gamma)L$ are the total wages in T and E-sector respectively, and Π are total profits; λ_T is the share of income spent in the T-sector coming from workers employed in the T-sector, λ_E is the share of income spent in the T-sector coming from workers employed in the E-sector, λ_Π is the share of total profits spent in the T sector.

We assume that the production in the two sectors follows a Cobb-Douglas technology. Hence the two production functions are $T(L_T) = BL_T^\beta$ with $B > 0$ and $\beta \in (0, 1)$, and $E(L_E) = AL_E^\alpha$ with $A > 0$ and $\alpha \in (0, 1)$, in the traditional and in the E-sector respectively. From equation (2) we can rewrite the two productions as

$$T(\gamma) = B\gamma^{\beta} L^{\beta}, \tag{5}$$

and

$$E(\gamma) = A(1-\gamma)^{\alpha} L^{\alpha}. \tag{6}$$

Total profits are given by

$$\Pi = \Pi_T + \Pi_E, \tag{7}$$

where, given (2), (5) and (6)

$$\Pi_T = p_T T(\gamma) - w_T \gamma L, \tag{8}$$

$$\Pi_E = (p_E - c)E(\gamma) - w_E(1-\gamma)L. \tag{9}$$

Profits maximization implies

$$w_T = p_T T'(\gamma), \tag{10}$$

$$w_E = (p_E - c)E'(\gamma), \tag{11}$$

where $T'(\gamma) \equiv \frac{\partial T(L_T)}{\partial L_T} = \beta B\gamma^{\beta-1}L^{\beta-1}$, and $E'(\gamma) \equiv \frac{\partial E(L_E)}{\partial L_E} = \alpha A(1-\gamma)^{\alpha-1}L^{\alpha-1}$. Defining the traditional commodity as numeraire, $p_T = 1$, from (2), (10), (5), (6) and (11), the following holds

$$w_T = T'(\gamma) = \beta B\gamma^{\beta-1}L^{\beta-1}, \tag{12}$$

and,

$$w_E = (p_E - c)E'(\gamma) = (p_E - c)\alpha A(1-\gamma)^{\alpha-1}L^{\alpha-1}. \tag{13}$$

Labour is perfectly mobile, hence at equilibrium the wages in the two sectors must be equal, that is $w \equiv w_E = w_T$. Hence, from (12), and (13), we have:

$$p_E = \frac{T'(\gamma)}{E'(\gamma)} + c = \frac{\beta B(1-\gamma)^{1-\alpha}}{\alpha A \gamma^{1-\beta}} L^{\beta-\alpha} + c. \tag{14}$$

Since ethical commodities are usually more expensive than traditional ones, we assume $c > 1$, which, from (14) implies $p_E > p_T = 1$ for any $\gamma \in [0,1]$. From equations (2), (5), (6), (8), (9), (10), (11) and (14) we obtain:

$$\Pi = B\gamma^{\beta-1}L^{\beta}\left[\gamma - \beta + \frac{\beta}{\alpha}(1-\gamma)\right]. \tag{15}$$

At equilibrium, a vector of prices $\mathbf{p}^* = \{p_T^*, p_E^*\}$ ensures that demand and supply in each sector are equalized, i.e. $D_T = T(\gamma)$ and $D_E = E(\gamma)$.
From equation (3) and (5), the condition $D_T = T(\gamma)$ implies that

$$\gamma^* \equiv \frac{\alpha\beta(\lambda_E - \lambda_\Pi) + \beta\lambda_\Pi}{\alpha + \alpha\beta(\lambda_E - \lambda_T) + \lambda_\Pi(\beta - \alpha)}. \tag{16}$$

When $\gamma = \gamma^*$, the price vector cleans both markets and hence $\mathbf{p} = \mathbf{p}^*$. Since $\frac{\partial p_E(\gamma)}{\partial \gamma} < 0$, $\forall \gamma \in [0,1]$, in order to study the features of the equilibria it is convenient to focus on the share of workers employed in the two sectors, which directly measures the degree of E-sector development.

3 Preferences and Income Distribution

In the previous Section a general form for demands was considered. Here, according to consumer preferences and income distribution we characterize the equilibria. We assume that there are two types of consumers, ethical and standard. The share of ethical consumers is denoted by $\phi \in (0,1)$, while traditional ones are $1-\phi$. Both types spend entirely their income in one of the two sectors.[5] Standard consumers are not interested in ethical aspects and purchase the good where the price is lower, that is in the T-sector. Thus, for any standard consumer, we have:

$$\omega_{i,s} = p_T q_T, \tag{17}$$

[5] This assumption is strong, however, our effort is to build a very simple model, according to Occam's razor principle. Moreover, assuming that consumers spend their income in both sectors, would not modify the qualitative results of our model.

where $\omega_{i,s}$ is the income of the i-th standard consumer. On the other hand ethical consumers have hierarchical preferences: they would purchase the good according to the minimum price if and only if their income does not allow for buying a certain quantity, $\bar{q}$, while they would only buy the ethical goods otherwise.Thus, for any ethical consumer:

$$\omega_{i,e} = \begin{cases} p_T q_T, & \text{if} \quad \omega_{i,e} < p_E \bar{q}, \\ p_E q_E, & \text{otherwise} \end{cases} \tag{18}$$

where $\omega_{i,e}$ is the income of the i-th ethical consumer.[6]

A share of the population σ receive besides the wages an equal fraction θ of total profits. From equation (15):

$$\theta \equiv \frac{\Pi}{\sigma L} = \frac{B\gamma^{\beta-1}L^{\beta-1}}{\sigma}\left[\gamma - \beta + \frac{\beta}{\alpha}(1-\gamma)\right], \tag{19}$$

A share $(1-\sigma)$ of the labour force receive only wages. For the sake of the argument, both workers employed in the T and the E-sector may receive the share of profits. Since $w_E = w_T$, we obtain only two different classes of income: a share $(1-\sigma)$ of workers gets w, while a share σ gets $w+\theta$ independently of the sector where they work. This implies that the share of labour income spent in each of the two sectors is the same, and we can define $\lambda_w \equiv \lambda_E = \lambda_T$.

Since at the price p_E the expenditures for buying at least $\bar{q}$ units in the E-sector is $p_E\bar{q}$, only consumers receiving $\omega_i > p_E\bar{q}$ may purchase the ethical good. Thus, depending on consumers' preferences and on the relation between ω_i and $p_E\bar{q}$, we obtain the following values of λ_w and λ_Π:

$$\lambda_w = \begin{cases} 1-\phi & \text{if} \quad w \geq p_E\bar{q}, \\ 1-\sigma\phi & \text{if} \quad w < p_E\bar{q} \leq w+\theta, \\ 1 & \text{if} \quad p_E\bar{q} > w+\theta; \end{cases} \tag{20}$$

$$\lambda_\Pi = \begin{cases} 1-\phi & \text{if} \quad w+\theta \geq p_E\bar{q}, \\ 1 & \text{if} \quad p_E\bar{q} > w+\theta. \end{cases} \tag{21}$$

[6]The behavior of the two types of consumers in equations (17) and (18) can be obtained through the maximization of the following utility functions: for standard consumers, $U(T,E) = T+E$; for ethical consumers,

$$u(T,E) = \begin{cases} \frac{T}{1+T}\bar{q}, & \text{if} \quad E < \bar{q}, \\ E, & \text{otherwise.} \end{cases}$$

The values of λ_i represent the share of income spent in the T-sector (while, $1-\lambda_i$ is the share of income spent in the E-sector). All the possible combinations of $p_E\bar{q}$ intervals generate for each sector, a piecewise continuous demand function. Indeed, as both p_E and w depend on γ, any increase in the E-sector can affect the consumers' behavior – i.e. λ_i. In the T sector, from equations (3), (15), (20) and (21), we have that:

$$D_T(\gamma) = \begin{cases} D_{T1}(\gamma) & \text{if} \quad p_E\bar{q} \leq w, \\ D_{T2}(\gamma) & \text{if} \quad w < p_E\bar{q} \leq w+\theta, \\ D_{T3}(\gamma) & \text{if} \quad w+\theta < p_E\bar{q}; \end{cases} \tag{22}$$

where

$$D_{T1}(\gamma) = (1-\phi)f(\gamma)\left[\gamma + \frac{\beta}{\alpha}(1-\gamma)\right]; \tag{23}$$

$$D_{T2}(\gamma) = f(\gamma)[\phi[\beta(1-\sigma)-\gamma] + \frac{\beta}{\alpha}(1-\gamma)(1-\phi)]; \tag{24}$$

$$D_{T3}(\gamma) = f(\gamma)\frac{\beta}{\alpha}(1-\gamma); \tag{25}$$

and $f(\gamma) = B\gamma^{\beta-1}L^{\beta}$. Firms in the T-sector face a demand D_{T1} if all the consumers receive enough to buy the ethical good, $p_E\bar{q} \leq w$; D_{T2} if only consumers receiving the profits' share can afford the ethical good, $w < p_E\bar{q} \leq w+\theta$; and D_{T3} if no one receives enough to buy the ethical good, $w+\theta < p_E\bar{q}$. Hence, for a given γ, $D_{T1} \leq D_{T2} \leq D_{T3}$. Furthermore, it is easy to prove that

$$\frac{\partial D_{Ti}(\gamma)}{\partial\gamma} < 0, \quad \forall\gamma \in [0,1] \tag{26}$$

with $i = 1,2,3$. The sign of the derivative of D_{Ti} is important in the description of the system dynamics (see Section 6).

4 Excess demand and equilibria

Let us define $Z(\gamma) = D_T(\gamma) - T(\gamma)$ the excess demand function in the T-sector. Given the shape of the demand function, $Z(\gamma)$ is a piecewise continuous function.

$$Z(\gamma) = \begin{cases} Z_1(\gamma) & \text{if} \quad p_E\bar{q} \leq w, \\ Z_2(\gamma) & \text{if} \quad w < p_E\bar{q} \leq w+\theta, \\ Z_3(\gamma) & \text{if} \quad w+\theta < p_E\bar{q}; \end{cases} \tag{27}$$

where $Z_j(\gamma) = D_T j(\gamma) - T(\gamma)$ with $j = 1, 2, 3$, and $Z_1(\gamma) \leq Z_2(\gamma) \leq Z_3(\gamma)$ $\forall\gamma$. The market clears if $Z(\gamma) = 0$. Each $Z_j(\gamma)$ is equal to zero for the following values of γ:

$$\gamma^*_{Z_1} = \frac{\beta(1-\phi)}{\alpha\phi + (1-\phi)\beta}; \tag{28}$$

$$\gamma^*_{Z_2} = \frac{\alpha\beta\phi(1-\sigma) + \beta(1-\phi)}{\alpha\phi + \beta(1-\phi)}; \tag{29}$$

$$\gamma^*_{Z_3} = 1. \tag{30}$$

Hence, $\gamma^*_{Z_1}$ is an equilibrium if and only if $p_E(\gamma^*_{Z_1})\bar{q} \leq w(\gamma^*_{Z_1})$, $\gamma^*_{Z_2}$ if and only if $w(\gamma^*_{Z_2}) < p_E(\gamma^*_{Z_2})\bar{q} \leq w(\gamma^*_{Z_2}) + \theta(\gamma^*_{Z_2})$, and $\gamma^*_{Z_3}$ if and only if $w(\gamma^*_{Z_3}) + \theta(\gamma^*_{Z_3}) < p_E(\gamma^*_{Z_3})\bar{q}$. Moreover, from (28), (29) and (30), it follows $0 \leq \gamma^*_{Z_1} \leq \gamma^*_{Z_2} \leq \gamma^*_{Z_3}$.

A numerical illustration of the model is represented in Figure 1. The first graph shows the curve $\bar{q}p_E(\gamma)$, $w(\gamma)$ and $w(\gamma) + \theta(\gamma)$. The second graph displays the excess demand function in the T-sector, which is denoted by the thickest curve. The lowest curve $Z_1(\gamma)$ shows the case in which all the labor force is able to purchase the ethical good – $\bar{q}p_E(\gamma) \leq w(\gamma)$, the middle curve $Z_2(\gamma)$ the case in which only the laborers who get the share of profits, θ, are able to purchase the ethical good – $w(\gamma) \leq \bar{q}p_E(\gamma) \leq w(\gamma) + \theta(\gamma)$, while the highest curve $Z_3(\gamma)$ the case in which nobody is able to purchase it – $w(\gamma) + \theta(\gamma) < \bar{q}p_E(\gamma)$. In the interval $[0, \bar{\gamma}]$ the excess demand function assumes the value $Z_1(\gamma)$ (since $\bar{q}p_E(\gamma) \leq w(\gamma)$); between $(\bar{\gamma}, \bar{\bar{\gamma}}]$ the value $Z_2(\gamma)$ (since $w(\gamma) \leq \bar{q}p_E(\gamma) \leq w(\gamma) + \theta(\gamma)$); and between $(\bar{\bar{\gamma}}, 1]$ the value $Z_1(\gamma)$ (since again $\bar{q}p_E(\gamma) \leq w(\gamma)$). In Figure 1, the excess demand function does not assume the value $Z_3(\gamma)$ since for any γ richest consumers can always afford the ethical good. In this example the model admits two equilibria: $\gamma^*_{Z_1}$ and $\gamma^*_{Z_2}$. In particular, the E-sector is wider at $\gamma^*_{Z_1}$ than at $\gamma^*_{Z_2}$.[7]

We can give an intuition for the emergence of multiple equilibria. The shape of the three curves in the first graph of Figure 1 is due to the fact that different values of γ determine non-linear changes in wages, profits and

[7]Note that in this example, $\gamma^*_{Z_3}$ is not an equilibrium since when $\gamma = 1$ both the curves $w(\gamma)$ and $w(\gamma) + \theta(\gamma)$ are above $p_E(\gamma)\bar{q}$ curve.

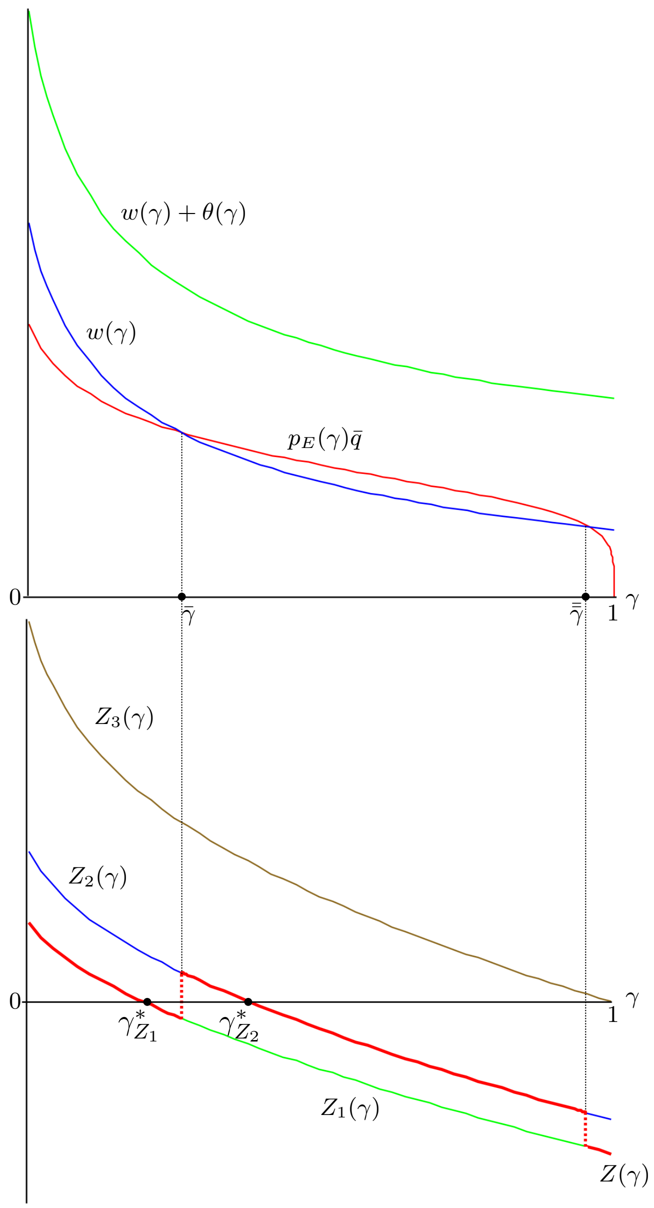


Figure 1: The first picture shows the graph of $p_E\bar{q}$, w and $w+\theta$, as functions of γ. The interceptions between $p_E\bar{q}$ and the other functions determine the intervals of the excess demand function. The second picture shows the graph of the excess demand function – i.e. the red piecewise curve. Values of parameters: $c=1$, $\phi=0.7$, $\sigma=0.6$, $\bar{q}=1$, $L=100$, $\alpha=0.8$, $\beta=0.7$, $B=8$, $A=6$.

relative prices. Hence, not surprisingly, it is possible that for a certain value of γ all the consumer may afford the purchase of ethical good, while for a different value of γ, only richest consumers can do it. This explain why $Z(\gamma)$ is a piecewise function. In its points of discontinuity, the demands of the two sectors change suddenly, and it is possible to switch from an excess of supply to an excess of demand – as at point $\bar{\gamma}$ – and the other way round. Although the dynamics of the model is analyzed in the next Section, it is evident that this change would make market forces work in opposite directions, driving the system towards different equilibria.

The number of equilibria which arise depends on the intersections between $w(\gamma)$ and $p_E(\gamma)\bar{q}$, and between $w(\gamma) + \theta(\gamma)$ and $p_E(\gamma)\bar{q}$. If there is no intersection the model shows only one equilibrium.

i. If $w > p_E\bar{q}$ for any $\gamma \in [0, 1]$, the fraction of ethical consumers ϕ can always demand the ethical good, thus the excess of demand in the T-sector is given by Z_1, and for $\gamma^*_{Z_1}$ the market clears.

ii. If $w + \theta > p_E\bar{q} > w$ for any $\gamma \in [0, 1]$, only the ethical consumers receiving the share of profits θ demand the ethical good, thus the excess of demand in the T-sector is given by Z_2, and for $\gamma^*_{Z_2}$ the market clears.

iii. If $p_E\bar{q} > w+\theta > w$ for any $\gamma \in [0, 1]$, no one is rich enough to consume the ethical good, thus the excess of demand in the T-sector is given by Z_3, and the only equilibrium is $\gamma^*_{Z_3} = 1$, i.e. the E-sector does not exist.

If instead, $w(\gamma)$ and/or $w(\gamma) + \theta(\gamma)$ intersect $p_E(\gamma)\bar{q}$, the model admits multiple equilibria.

iv. If $w \cap p_E\bar{q}$, and $w + \theta > p_E\bar{q}$ for any $\gamma \in [0, 1]$, for some values of γ the fraction of ethical consumers ϕ can demand the ethical good, and $Z = Z_1$, while for other values of γ only the ethical consumers receiving the share of profits θ demand the ethical good, and $Z = Z_2$. Thus both the equilibria $\gamma^*_{Z_1}$ and $\gamma^*_{Z_2}$ may arise – which is the case drawn in Figure 1.

v. If $w + \theta \cap p_E\bar{q}$, and $w < p_E\bar{q}$ for any $\gamma \in [0, 1]$, for some values of γ only the ethical consumers receiving the share of profits θ demand the ethical good, and $Z = Z_2$, while for other values of γ no one is rich enough to consume the ethical good, and $Z = Z_3$. Thus both the equilibria $\gamma^*_{Z_2}$ and $\gamma^*_{Z_3}$ may arise.

vi. If $w \cap p_E\bar{q}$ and $w + \theta \cap p_E\bar{q}$, the excess demand functions takes the values of the three arguments in $\gamma \in [0, 1]$. Thus all the three equilibria may, in principle, arise.

Furthermore, when $w(\gamma)$ and/or $w(\gamma) + \theta(\gamma)$ intersect $p_E(\gamma)\bar{q}$, the model admits the existence of limit cycles. This happens if and only if, given $\gamma_1, \gamma_2 \in [0, 1]$ and $\gamma_2 = \gamma_1 + \epsilon$, $\forall$ arbitrarily small $\epsilon > 0$, it holds

i. $Z(\gamma_1) = Z_i(\gamma_1)$ and $Z(\gamma_2) = Z_j(\gamma_1)$, with $i > j$;

ii. $Z(\gamma_1) > 0$ and $Z(\gamma_2) < 0$.

Figure 2 clarify this result. In γ^{**} the excess demand function jumps from a positive to a negative value. Although prices do not clear the markets, market forces tend to keep the relative extent of the two sectors around γ^{**} – i.e. γ^{**} is a fixed point.[8]

The analysis presented above took into account all the possible model configurations. The following result holds.

Proposition 4.1. *The model always admits at least a fixed point.*

Proof. In our model, any $Z_i(\gamma)$, for $i = 1, 2, 3$, is a decreasing function of γ, $Z(0) \geq 0$, $Z(1) \leq 0$, and the excess demand function is always defined in all its domain. Given this properties, we have the following results. If $Z(0) = 0$ or $Z(1) = 0$ an equilibrium trivially exists. Assume now $Z(0) > 0$ and $Z(1) < 0$, then either an equilibrium exists or there is a limit cycle, since otherwise there is not a way to have $Z(1) < 0$ starting from $Z(0) > 0$. $\square$

[8]In order to explain better this result, the dynamics of the system must be introduced. This would be discussed in the next Section.

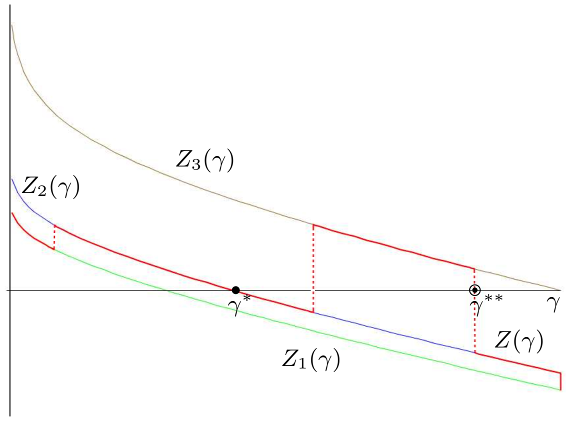


Figure 2: Graph of the excess demand function. The double circle highlights the presence of a limit cycle. Values of parameters: $c = 2$, $\phi = 0.7$, $\sigma = 0.8$, $\bar{q} = 1.2$, $L = 100$, $\alpha = 0.9$, $\beta = 0.85$, $B = 6$, $A = 6$.

5 Dynamics

Let us assume that at a certain instant $\gamma = \gamma_0$, with $Z(\gamma_0) > 0$, i.e. there is an excess of demand in the T-sector and an excess of supply in the E-sector. Since we defined the traditional commodity as numeraire, market forces tend to reduce the relative price of the ethical goods, i.e. p_E decreases. Since the price of the E-sector is decreasing in γ, the reduction in p_E induces an increase in γ. The change in γ modifies the distribution in the economy. However, from inequality (26), an increase in γ implies a decrease in the demand of the T-sector. Hence, as expected, the reduction in the price of ethical goods induces an increase in the demand of the E-sector. This adjustment process continues until the relative price of ethical goods is such that $Z(\gamma) = 0$.

In other words, the univocal relation between p_E and γ allows us to consider the dynamics of the model in terms of $Z(\gamma)$ and γ. We capture the movement of the system through the following dynamics,

$$\dot{\gamma}_t = h(Z(\gamma_t)), \tag{31}$$

where t is the time index, $\dot{\gamma}_t \equiv \frac{d\gamma_t}{dt}$, $\frac{dh(Z)}{dZ} > 0$, and $\dot{\gamma}_t = 0 \Leftrightarrow h(0) = 0$, that is when the economy is at equilibrium. As we pointed out in Section 4, the model can admit multiple equilibria, hence initial conditions determine which equilibrium arises. Internal equilibria, if they exist, are always locally stable since the derivative of each excess demand function with respect to γ is always negative. The equilibrium $\gamma = 1$, if it exists, is always locally stable since the sign of $\dot{\gamma}_t$ in the left interval of $\gamma^* = 1$ is positive.

The basin of attraction of any equilibrium for $\gamma \in [0, 1]$ is given by the interval defined by the maximum γ in which $Z(\gamma) < 0$ for any $\gamma < \gamma^*_{Z_i}$; and by the minimum γ in which $Z(\gamma) > 0$ for any $\gamma > \gamma^*_{Z_i}$. If these two values do not exist the boundaries are $\gamma = 0$ and $\gamma = 1$ respectively. For instance, let us consider Figure 1. The basin of attraction of $\gamma^*_{Z_1}$ is defined in the interval $[0, \bar{\gamma}]$. For $\gamma = \bar{\gamma}$ the excess demand function jumps to the function $Z_2(\gamma)$, while the basin of attraction of $\gamma^*_{Z_2}$ is included in $(\bar{\gamma}, 1]$. The second discontinuity for $\gamma = \bar{\bar{\gamma}}$ do not affect the basins of attractions of any equilibria since the sign of $Z(\gamma)$ does not change.

Figure 2 shows the phase diagram of the model with the presence of a stable limit cycle around γ^{**} – marked with a double circle. On the left of γ^{**} there is an excess of demand in the T-sector, hence γ tends to increase. By contrast, on its right side there is an excess of supply, hence γ tends to decrease. This dynamics generate a fixed point of second order.

6 CSR growth and Income Inequality

The expansion of the E-sector affects income inequality in the economy since at different values of γ are associated different levels of wage and total profits – see equations (12) and (15). This issue is relevant because i) the model admits multiple equilibria, hence the emergence of one equilibrium or another also affects the degree of inequality; ii) policies on preferences and income distribution shape the demand in the two sectors moving the equilibrium and its basin of attraction.

We define as *virtuous circle* a trajectory of γ which associates an expansion of the E-sector to a reduction of income inequality and viceversa. The central question of this paper is to study under which conditions the described virtuous circle emerges. In order to investigate this issue, in Appendix A.1 we compute the Gini Index for this economy, $G(\gamma)$, as an index of income inequality.[9] Then it holds

$$G(\gamma) = (1-\sigma)\frac{(\alpha-\beta)\gamma + \beta(1-\alpha)}{(\alpha-\beta)\gamma+\beta}. \tag{32}$$

Proposition 6.1 presents the results on the relation between the Gini Index and γ.

Proposition 6.1. *If $\alpha > \beta$, then $\frac{\partial G(\gamma)}{\partial \gamma} > 0$, for any $\gamma \in [0,1]$. Otherwise, $\frac{\partial G(\gamma)}{\partial \gamma} \leq 0$, for any $\gamma \in [0,1]$.*

Proof. From equation (32), it holds

$$\frac{\partial G(\gamma)}{\partial \gamma} = \frac{\alpha(\alpha-\beta)(1-\sigma)}{[\alpha\beta - \alpha - \beta - \gamma(\alpha-\beta)]^2}. \tag{33}$$

This derivative is positive for $\alpha > \beta$, while it is non-positive otherwise. □

When the derivative of the Gini Index with respect to γ is positive, any expansion of the E-sector – that is a reduction in γ – reduces the inequality in the economy. Proposition 6.1 proves that this result holds if and only if the share of product going to workers in the E-sector is higher than the corresponding share in the T-sector, that is $\alpha > \beta$.[10]

For instance, in Figures 1 and 2, $\alpha > \beta$, hence given Proposition 6.1 starting from a small E-sector (γ close to 1), its expansion (driven by the dynamics of the model) induces a reduction of income inequality: that is a virtuous circle. However, in Figure 2 the trajectory of γ tends to a limit cycle around γ^{**} while, in Figure 1, the trajectory tends to the equilibrium $\gamma^*_{Z_2}$. Hence the model generates qualitative different scenarios. For instance, in Figure 1, the increase of the E-sector is significantly higher than that in Figure 2. Policy makers through distributional and preference levers may shape the demand in the two sectors, shifting the equilibria and the size of their basins of attraction. In the next Section we investigate the impact of those policies on the two goals: reduction of inequality and expansion of the ethical sector; that is on the building of a virtuous circle.

[9] As it is well known, the Gini Index is an increasing function of income inequality. In particular when $G(\gamma) = 0$, the inequality is minimal (all the consumers have the same income), while when $G(\gamma) = 1$, the inequality is greatest.

[10] It seems reasonable that in real economies the share of product going to profits is lower in the E-sector than in the traditional one, since the respect of criteria, especially labour ones, can easily induce a reduction in the share of profits.

7 Policy Implications

We concentrate our analysis on two kinds of policies, that affect preferences – through ϕ – and income distribution – through parameter σ.[11] The model shows the following two properties:

a) Parameter ϕ does not influence w, $w+\theta$ and $p_E\bar{q}$. Hence the values of γ in correspondence of which the excess demand function is discontinuous do not vary through changes in ϕ. By contrast, ϕ influences Z_1 and Z_2 with $\frac{dZ_1}{d\phi} < \frac{dZ_2}{d\phi} < \frac{dZ_3}{d\phi} = 0$. Hence an increase in ϕ induces a lower value of $\gamma^*_{Z_1}$ and $\gamma^*_{Z_2}$.[12]

b) Parameter σ influences $w+\theta$ with $\frac{d(w+\theta)}{d\sigma} < 0$. This implies that intervals in which Z_2 and Z_3 are defined can be influenced by σ. This happens when $w+\theta$ intersects $p_E\bar{q}$. Moreover σ influences Z_2 with $\frac{dZ_2}{d\sigma} < 0 = \frac{dZ_1}{d\sigma} = \frac{dZ_3}{d\sigma}$. Hence an increase in σ induces a lower value of $\gamma^*_{Z_2}$.

Let us assume that the economy is at equilibrium $\gamma^*_{Z_1}$ or $\gamma^*_{Z_2}$ and policy maker induces an increase in ϕ. This change always causes an expansion of ethical sector. Indeed, the T-sector switches from an equilibrium position to an excess of supply. This in turns leads to a reduction in γ^* and the extent of the E-sector increases (see Property "a" above). Since changes in preferences do not affect the income distribution, if the economy is at equilibrium $\gamma^*_{Z_3}$ – i.e. no one in the economy can afford the ethical good – changes in preferences cannot play any role to induce the emergence of the E-sector. Finally if the economy is at a limit cycle, the effects of an increase in ϕ can produce different results whether the limit cycle is between Z_3 and Z_2 or between Z_2 and Z_1. Indeed, while in the first case policy makers cannot induce any change (since Z_3 is fixed), in the latter the increase in ϕ may induce the T-sector to switch from an excess of demand to an excess of supply. Hence, the limit cycle disappears and the E-sector increases.

[11] There are other parameters which may affect income distribution (e.g. α and β) and the behavior of consumers (e.g. $\bar{q}$). However, given our framework σ and ϕ generate more interesting results and can be easily influenced by policy makers.

[12] As we pointed out in Section 4, each $\gamma^*_{Z_j}$ $(j = 1, 2)$ may not be an equilibrium. However, this result applies both when $\gamma^*_{Z_j}$ is or is not an equilibrium.

Differently from ϕ, σ does not affect preferences but may affect consumers' behavior through changes in income distribution. For instance, an increase in σ reduces the income of consumers receiving the profits share, but increase their number. As we pointed out in Property "b", this implies that both $w + \theta$ and the excess demand function Z_2 shift down. Hence, if the economy is at equilibrium $\gamma^*_{Z_1}$ any change in σ does not have any consequence. Instead if the economy is at equilibrium $\gamma^*_{Z_2}$, the increase in σ implies an increase in the E-sector if the class of richest consumer can still afford the ethical good. Otherwise, i.e. after the change in σ, $w + \theta < p_E\bar{q}$, no consumer can demand the ethical good and the T-sector faces an excess of demand, thus γ^* increases and the E-sector decreases. For $\gamma = \gamma^*_{Z_3}$ only a reduction of σ may allow the emergence of the ethical sector, since a group of consumer rich enough to afford the ethical good is necessary. When the economy lies in a limit cycle between Z_3 and Z_2, $w + \theta = p_E\bar{q}$; hence, the increase in σ reduces the extent of the E-sector, since a lower number of consumers may afford the ethical good. The opposite applies when σ decreases. Finally, if the economy lies in a limit cycle between Z_2 and Z_1, the increase in σ has the same effect of an increase in ϕ.

Changes in the relative dimensions of the two sectors affect the level of inequality in the economy. We can characterize the effect of changes of ϕ and σ on the Gini index derived in the previous Section. Parameter ϕ does not directly affect $G(\gamma)$, see equation (32). However, as analyzed above, changes in ϕ can affect the extent of the E-sector, and hence through γ the level of inequality. By Proposition 6.1, we prove that for $\alpha > \beta$, policies on preferences that increase the extent of the E-sector result in a reduction of inequality. Otherwise, policies on preference that increase the extent of the E-sector result in an increase of inequality. In other words, when the share of product going to workers in the E-sector is greater than that in the T-sector, policies which induce an expansion of ethical sector also leads to a reduction of inequality, i.e. policies produce a virtuous circle.

Parameters σ directly enter the Gini Index. Without considering the effect of σ on γ, an increase in σ induces a reduction in the Gini Index, see equation (32). However, as analyzed above, changes in σ can also affect the extent of E-sector. The effect of γ on $G(\gamma)$ is given by Proposition 6.1.

Hence, if $\alpha > \beta$ policies that increase the extent of the E-sector, through an increase in σ, also reduce income inequality, i.e. they produce a virtuous circle. If instead $\alpha < \beta$, while the increase in σ tends to reduce income inequality, the increase in the E-sector goes in the opposite direction. Hence, the dominant effect determines whether the inequality decreases, and hence whether redistributive policies result in an expansion of E-sector. We found that redistributive policies can generate a virtuous circle even if $\alpha < \beta$. As an example, Appendix A.2 shows that this result holds for a wide range of parameters when the economy lies at the equilibrium $\gamma^*_{Z_2}$.

Finally, it is possible that the increase in the E-sector is due to a reduction of σ. In this case, the effects of policies on σ and on the expansion of the ethical sector work in the opposite directions of those illustrated above.[13]

8 Concluding Remarks

This paper introduces CSR differentiation in a general equilibrium model. The main novelty is the analysis of the role of income distribution in CSR growth. Using Occam's razor, we made three simplifying assumptions: i) socially responsible consumers cannot afford the *ethical* goods if their purchasing power is not enough to buy a certain quantity; ii) if a socially responsible consumer is reach enough, she totally spends her income in the CSR sector; iii) there are only two classes of income, since profits are equally distributed among a fraction of the labour force. As a consequence, the model admits the existence of multiple equilibria, each of them characterized by a different diffusion of CSR. Different hypotheses generate different scenarios but do not change the finding that income inequality is a deterrent to the diffusion of CSR. In our set-up, we found that when the share of product going to workers is higher in the CSR sector than in the traditional one, there is a virtuous circle which ties CSR growth to inequality reduction. In this case, any policy which increases the demand for CSR commodities results in a reduction of inequality. Otherwise, only redistributive policies can generate the virtuous circle between those two policy targets. This result holds for a

[13]That is, when $\alpha > \beta$ changes in σ and γ conflictingly affect the Gini Index; while, when $\alpha < \beta$ they work in the same direction.

wide range of parameters.

The Lisbon Strategy identifies in CSR diffusion a valuable instrument for Europe development. Our contribution argues that income distribution and CSR cannot be independently analyzed.

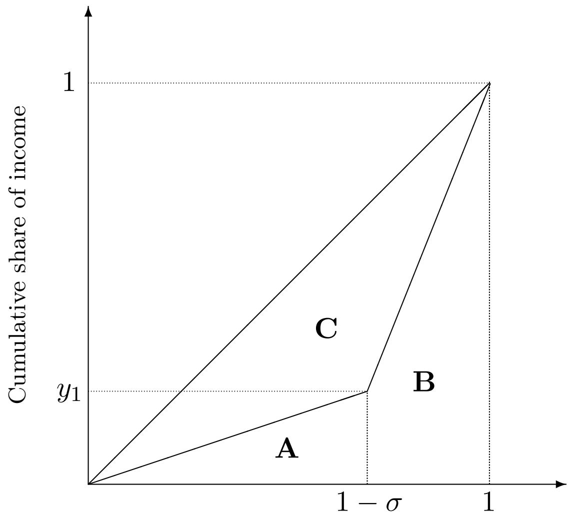
A Appendixes

A.1 The Gini Index

The Gini Index is defined as the ratio of the area that lies between the line of equality and the Lorenz curve (marked **C** in Figure A.1) over the total area under the line of equality (the sum of areas **A**, **B** and **C** in Figure A.1), i.e. the Gini Index, $G(\gamma)$ is given by the ratio $\frac{\mathbf{C}}{\mathbf{A}+\mathbf{B}+\mathbf{C}}$. Since in our model there are only two classes of income, the Lorenz curve drawn in Figure A.1 is given by two segments of different shapes: in relative terms, $\frac{w}{y}$ for the share of poorest workers and $\frac{w+\theta}{y}$ for the share of richest ones, where y is the average per capita income, i.e. $y = w + \frac{\Pi}{L}$. The share of workers which does not receive profits is $1-\sigma$, thus their cumulative income express in the vertical axis is $y_1 = \frac{w}{Y}(1-\sigma)$. By determining the areas **A**, **B** and **C**, it holds

$$G(\gamma) = \frac{\sigma(1-\sigma)\theta(\gamma)}{w(\gamma)+\sigma\theta(\gamma)}. \tag{34}$$

From equations (12), (19) and (34), we get equation (32) of Section 6.



Cumulative share of workers

A.2 Policies and virtuous circle

Let us assume that the economy is located in $\gamma^*_{Z_2}$. From (32), we have that σ influences directly both the Gini Index and $\gamma^*_{Z_2}$. Hence, to obtain the full effect of σ on the Gini Index, we substitute $\gamma^*_{Z_2}$ in $G(\gamma)$ and we compute the derivative $\frac{\partial G(\gamma^*_{Z_2})}{\partial \sigma}$:

$$\frac{\partial G(\gamma^*_{Z_2})}{\partial \sigma} = \frac{A\sigma^2 + B\sigma + C}{[1-\phi(\alpha-\beta)(1-\sigma)]^2}, \tag{35}$$

where

$$A = -\phi^2(\alpha-\beta)^2 < 0, \tag{36}$$

$$B = 2\phi(\alpha-\beta)[1+\phi(\alpha-\beta)] \tag{37}$$

and

$$C = \beta - 1 - \phi(\alpha-\beta)[1+\phi(\alpha-\beta)]. \tag{38}$$

From (35), it holds $\frac{\partial G(\gamma^*_{Z_2})}{\partial \sigma} > 0$ if and only if $A\sigma^2 + B\sigma + C > 0$ and $\frac{\partial G(\gamma^*_{Z_2})}{\partial \sigma} < 0$ otherwise. The numerator of (35) is a second-order polynomial which can be represented by a concave parabola – see (36) – whose roots are

$$\sigma_1 = \frac{\phi(\alpha-\beta)+1+\sqrt{\Delta}}{\phi(\alpha-\beta)} \tag{39}$$

and

$$\sigma_2 = \frac{\phi(\alpha-\beta)+1-\sqrt{\Delta}}{\phi(\alpha-\beta)}, \tag{40}$$

with $\Delta \equiv B^2 - 4AC = \phi(\alpha-\beta)+\beta > 0$ for any value of α, β and ϕ.

When $\alpha > \beta$, $\sigma_1 > \sigma 2 > 1$ and hence $A\sigma^2 + B\sigma + C < 0$ for any $\sigma \in [0,1]$. Therefore, $\frac{\partial G(\gamma^*_{Z_2})}{\partial \sigma} < 0$. If instead $\alpha < \beta$, $\sigma_1 < 0$ and the sign of σ_2 depend on α, β and ϕ. In particular:

- If $\beta < \frac{3}{4}$ for any $\alpha \in [0,1]$, $\sigma_1 < \sigma_2 < 0$. Hence $A\sigma^2 + B\sigma + C < 0$ for any $\sigma \in [0,1]$ and $\frac{\partial G(\gamma^*_{Z_2})}{\partial \sigma} < 0$.
- If $\frac{3}{4} < \beta < 1+\alpha-\sqrt{\alpha}$ and $\frac{1}{4} < \alpha < 1$, $\sigma_1 < \sigma_2 < 0$. Hence $A\sigma^2 + B\sigma + C < 0$ for any $\sigma \in [0,1]$ and $\frac{\partial G(\gamma^*_{Z_2})}{\partial \sigma} < 0$.
- If $\frac{3}{4} < \beta < 1+\alpha-\sqrt{\alpha}$ and $\alpha < \frac{1}{4}$, $\sigma_1 < \sigma_2 < 0$ for $\phi < \frac{-1+\sqrt{-3+4\beta}}{2(\alpha-\beta)}$ or $\phi > \frac{-1-\sqrt{-3+4\beta}}{2(\alpha-\beta)}$, and $0 < \sigma_2 < 1$ for $\frac{-1+\sqrt{-3+4\beta}}{2(\alpha-\beta)} < \phi < \frac{-1-\sqrt{-3+4\beta}}{2(\alpha-\beta)}$. Hence, if $\phi < \frac{-1+\sqrt{-3+4\beta}}{2(\alpha-\beta)}$ or $\phi > \frac{-1-\sqrt{-3+4\beta}}{2(\alpha-\beta)}$, $\frac{\partial G(\gamma^*_{Z_2})}{\partial \sigma} < 0$ for any $\sigma \in [0,1]$, while, for $\frac{-1+\sqrt{-3+4\beta}}{2(\alpha-\beta)} < \phi < \frac{-1-\sqrt{-3+4\beta}}{2(\alpha-\beta)}$, $\frac{\partial G(\gamma^*_{Z_2})}{\partial \sigma} < 0$ if and only if $\sigma_2 < \sigma < 1$, and $\frac{\partial G(\gamma^*_{Z_2})}{\partial \sigma} > 0$ if and only if $0 < \sigma < \sigma_2$.
- If $1+\alpha-\sqrt{\alpha} < \beta < 1$, $\alpha < \frac{1}{4}$ and $\alpha > \frac{1}{2}$, then $\sigma_1 < \sigma_2 < 0$ for $0 < \phi < \frac{-1+\sqrt{-3+4\beta}}{2(\alpha-\beta)}$, and $0 < \sigma_2 < 1$ for $\frac{-1+\sqrt{-3+4\beta}}{2(\alpha-\beta)} < \phi < 1$. Hence, if $0 < \phi < \frac{-1+\sqrt{-3+4\beta}}{2(\alpha-\beta)}$, $\frac{\partial G(\gamma^*_{Z_2})}{\partial \sigma} < 0$ for any $\sigma \in [0,1]$, while, for $\frac{-1+\sqrt{-3+4\beta}}{2(\alpha-\beta)} < \phi < 1$, $\frac{\partial G(\gamma^*_{Z_2})}{\partial \sigma} < 0$ if and only if $\sigma_2 < \sigma < 1$, and $\frac{\partial G(\gamma^*_{Z_2})}{\partial \sigma} > 0$ if and only if $0 < \sigma < \sigma_2$.
- Finally, if $1+\alpha-\sqrt{\alpha} < \beta < 1$, $\frac{1}{4} < \alpha < \frac{1}{2}$, then results on Gini are identical to the case $\frac{3}{4} < \beta < 1+\alpha-\sqrt{\alpha}$ and $\alpha < \frac{1}{4}$.

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