On the Inefficiency of Inequality

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Abstract

A number of studies have examined the implications of preference interdependence. This paper models individual utility as depending either on the level of other people's consumption or on the difference in consumption levels. It assumes that the impact of an increase in other people's consumption on individual utility diminishes with the level of consumption, raising individual utility when that consumption is very small and lowering it when that consumption is very large. Based on that plausible assumption, the paper shows that, whether individual utility depends on the level of other people's consumption or on the difference in consumption levels, i) welfare declines with inequality, ii) equilibrium inequality is inefficient, and iii) the optimal intervention leads to a more equal distribution. Implications for the role of development institutions are examined.

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Non-Technical Summary

There is a lot of evidence that individual utility is affected by other people's consumption in the individual's reference group. A number of studies have examined the implications of such preference interdependence. In this paper, individual utility is modeled as depending either on the level of other people's consumption or on the difference in consumption levels, with preference interdependence taking a very specific form. The model assumes that the impact of an increase in other people's consumption on individual utility diminishes with the level of consumption, raising individual utility when that consumption is very small and lowering it when that consumption is very large. For instance, it is assumed that typical individuals tend to feel concern for people who are doing badly, such as the homeless or the very sick, and that their utility increases when housing conditions for the homeless and the health of the very sick improve. On the other hand, it is assumed that the same individuals will tend to feel envy toward the extremely wealthy and that their utility will decline when the situation of the very wealthy improves. Based on these plausible assumptions, the paper shows that, whether individual utility depends on the level of other people's consumption or on the difference in consumption levels, i) welfare declines with inequality, ii) equilibrium inequality is inefficient, and iii) the optimal intervention leads to a more equal distribution. Implications for the role of development institutions are examined, and it is argued that, in order to maximize their impact, development institutions should allocate much of their efforts to helping the poorest developing countries and should focus on the poorest segments of the populations in middle-income countries. Data is provided to show that World Bank lending has moved in that direction recently through the absolute and relative increase in IDA lending.

On the Inefficiency of Inequality

1. Introduction

Recent studies have shown a negative impact of inequality on growth.[1] As far as we know, a negative relationship between inequality and efficiency has not been established.[2] This paper aims to establish such a link.

In neoclassical theory, the competitive equilibrium is Pareto optimal. On the other hand, "[c]onsumption externalities potentially break the link between Pareto optimality and competitive equilibria and open the door for beneficial government intervention" (Dupor and Liu, 2003). The idea that individual well-being depends on the consumption of others has been used in the literature in analyses of government policy (e.g., Ljungqvist and Uhlig, 2000; Dupor and Liu, 2003) and of stock market behavior (e.g., Abel, 1990; Campbell and Cochrane, 1999). That idea is used here to show that welfare declines as inequality rises, that equilibrium inequality is inefficient, and that some redistribution is optimal.[3]

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[1] Empirical analyses of inequality and growth include Alesina and Rodrik (1994), Persson and Tabellini (1994), Benabou (1996) and Barro (2000). Theoretical analyses include Banerjee and Newman (1991) and Galor and Zeira (1993).

[2] Various studies (e.g., Baland and Platteau, 1997; Bardhan et al. 2002; and Dayton-Johnson and Bardhan, forthcoming) have examined the relationship between inequality and the efficiency of provision of public or collective goods.

[3] A literature on social capital (including social norms, trust and cooperation) has interpreted recent findings from experimental and other empirical studies that individuals behave non-opportunistically or cooperatively in Prisoner's Dilemma and other games by assuming that individuals have preferences for reciprocity or aversion to inequality (Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000; Schiff,

Define "concern" ("jealousy") as an increase (decrease) in individual utility when other people's consumption rises. In other words, an increase in other people's consumption generates a positive (negative) externality in the case of concern (jealousy). It is argued here that as general consumption grows, preferences gradually evolve from being dominated by concern to being dominated by jealousy.

Dupor and Liu (2003) examine the implications of jealousy on the one hand, and of "keeping up with the Joneses" on the other. This paper expands on the former in two ways. First, the analysis in Dupor and Liu assumes symmetry, with all individuals being identical. We extend the analysis to the case of inequality. Second, consumption externalities depend on the *level* of per capita consumption in their analysis. We also examine the case where consumption externalities depend on the *difference* between individual and per capita consumption.

The paper is organized as follows. Section 2 presents a model of consumption externalities under asymmetry, with consumption externalities modeled in the two alternative ways described above. Section 3 deals with the role of development institutions, and Section 4 concludes.

2. Model

Whether individuals experience concern or jealousy with respect to other people's consumption is likely to depend on the specifics of the situation. For instance, there is reason to believe that individual preferences exhibit concern for the consumption of

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2002). This is not the case in this paper where, even though they may be affected by other people's consumption, individuals are exclusively concerned with maximizing their own utility.

others when that consumption is very low, that the extent of concern diminishes as the consumption of others increases, and that concern eventually turns to jealousy as the consumption of others continues to increase. For instance, a reduction in homelessness or hunger is likely to make most people feel better. At the other extreme, individuals are likely to envy people who are buying their third summer home or who dine every day on specially flown-in out-of-season products.

Let society be divided into two groups X and Y. The size of the population is fixed and normalized to unity, and the size of each group is $1/2$. Welfare is $W = (U^X + U^Y)/2$. Per capita consumption is x and y, respectively. Individual consumption is c_i, $i = X, Y$. Assume $c_X = x$ and $c_Y = y$, i.e., there is symmetry within each of the two groups.

We introduce consumption externalities in two alternative ways. In Section 2.1, consumption externalities depend on the per capita level of consumption of the two groups, x and y, and have the same impact on all individuals, irrespective of the group they belong to.[4] In Section 2.2, consumption externalities depend on the difference between individual and per capita consumption, $c_i - x$ and $c_i - y$, $i = X, Y$.[5]

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[4] Thus, members of each group have the same concern or jealousy regarding other individuals' consumption, regardless of which group the other individuals belong to.

[5] We abstract from externalities associated with per capita leisure, based on evidence that consumption externalities are more likely and more important (Solnick and Hemenway, 1998; Frank, 1999; Dupor and Liu, 2003).

2.1. Externalities Based on the Level of Per Capita Consumption

Following Dupor and Liu (2003), assume that externalities are associated with the *level* of per capita consumption. Let the individual utility function be

$$U^i = U(c_i, x, y, n_i), \quad i = X, Y, \tag{1}$$

where n_i is individual labor, $c_i, x, y, n_i \geq 0$, and U is twice differentiable, with $U_{c_i} > 0$, $U_{n_i} < 0$, $U_{n_i n_i} \leq 0$, $\forall c_i, n_i, x, y$. Let $U_x = U_y$ for $x = y$. In order to abstract from redistribution based on interpersonal differences in marginal utility, we assume $U_{c_i c_i} = 0$, with $U_{c_X} = U_{c_Y}$. As in Dupor and Liu (2003), we assume $U_{c_X} + U_x > 0$, $U_{c_Y} + U_y > 0$, i.e., individual utility increases when everyone's consumption in the group increases.

If $U_x > 0$ ($U_Y > 0$), preferences exhibit concern with respect to per capita consumption in group X (Y). If $U_x < 0$ ($U_Y < 0$), preferences exhibit jealousy.[6] Taking x (y) as given, individuals in group X (Y) choose c_X (c_Y) in order to maximize U^X (U^Y) subject to the constraint $c_i = f^i(n_i), f^i_{n_i} > 0, f^i_{n_i n_i} < 0$, where f^i is the twice differentiable production function of individuals in group i, $i = X, Y$. Assuming conditions for an interior solution are satisfied, the first-order condition is

$$U_{c_i} + \frac{U_{n_i}}{f^i_{n_i}} = 0, \quad i = X, Y. \tag{2}$$

The social optimum is given by

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[6] Models with utility varying directly with own income and inversely with the average income of others date back at least to Pollak (1976).

$$U_{c_X} + \frac{U_{n_X}}{f_{n_X}^X} + 2U_x = 0 \,; \; U_{c_Y} + \frac{U_{n_Y}}{f_{n_Y}^Y} + 2U_y = 0 \,. \tag{3}$$

The externality U_x (U_y) is multiplied by 2 in equation (3) because it affects individuals in both groups. Let $t_i > 0$ (< 0) be a proportional tax (subsidy). From the budget constraint, lump-sum transfers are $T = (t_X f^X + t_Y f^Y)/2$, the tax is $T_i = t_i f^i - T$, and consumption is $c_i = (1 - t_i)f^i + T$. The private optimum in this case is

$$U_{c_i} + \frac{U_{n_i}}{(1 - t_i)f_{n_i}^i} = 0 \,, \; i = X, Y \,. \tag{4}$$

From equations (3) and (4), the optimum tax rates for groups X and Y are

$$t_X^* = -2U_x / U_{c_X} \,, \; t_Y^* = -2U_y / U_{c_Y} \,. \tag{5}$$

Assume U_x (U_y) > 0 for low values of x (y) and U_x (U_y) < 0 for high values of x (y). Formally, $U_{xx} < 0$, $U_{yy} < 0$, $\forall \, c_i, x, y, n_i$, with $U_x(c_i, 0, y, n_i) > 0$, $U_x(c_i, \infty, y, n_i) < 0$, $\forall \, c_i, y, n_i$, and $U_y(c_i, x, 0, n_i) > 0$, $U_y(c_i, x, \infty, n_i) < 0$, $\forall \, c_i, x, n_i$.

<u>Proposition 1</u>: Equilibrium inequality is inefficient, and the optimal intervention entails a reduction in inequality.

<u>Proof</u>: Denote per capita consumption by z, with $z = (x + y)/2$. We start from an initial case of full symmetry ($x = y = z$). Define z_E as the level of per capita consumption where $U_x = U_y = 0$ for $x = y = z$. There are three possible initial full-symmetry equilibrium situations: $z = z_E$, $z < z_E$, or $z > z_E$.

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If $z = z_E$, $U_x = U_y = 0$ under full symmetry. From equation (5), $t_X^* = t_Y^* = 0$, i.e., the private equilibrium is optimal. Assume now that individuals of group X (Y) become less (more) efficient at producing c_x (c_y), with $f^X(n_X) < f^Y(n_Y)$ for $n_X = n_Y$, such that the new equilibrium is $x = z_E - \alpha$ and $y = z_E + \alpha$, $\alpha > 0$. Per capita consumption is unchanged, but by virtue of $U_{xx}, U_{yy} < 0$, we have $U_x > 0$ and $U_y < 0$. From equation (5), $t_X^* < 0 < t_Y^*$.

Thus, the private equilibrium is not optimal under asymmetry when $z = z_E$. Consumption of group X (Y) generates positive (negative) externalities and is thus too small (large). Optimal intervention entails a subsidy for group X (the poor) and a tax on group Y (the rich).

If $z < z_E$, $U_x = U_y > 0$ under full symmetry (implying a subsidy $t_X^* = t_Y^* < 0$ for both groups). With $x = z - \alpha$ and $y = z + \alpha$, t_X^* falls (a larger subsidy) and t_Y^* increases (a smaller subsidy or a tax), with $t_X^* < t_Y^*$. If $z > z_E$, $U_x = U_y < 0$ under full symmetry (with $t_X^* = t_Y^* > 0$). With $x = z - \alpha$ and $y = z + \alpha$, t_X^* falls (a smaller tax or a subsidy) and t_Y^* increases (a higher tax), with $t_X^* < t_Y^*$. Thus, irrespective of whether z is larger, equal or smaller than z_E, the equilibrium distribution is excessively unequal from the efficiency viewpoint, and the optimal policy results is a redistribution from the rich to the poor and a reduction in inequality.

Proposition 2: An increase in inequality reduces welfare.

Proof: An increase in α has no impact on per capita consumption but raises inequality. The impact of an increase in inequality on group X is $\partial U^X / \partial \alpha = -U_{c_X} - U_x + U_y$ and on group Y is $\partial U^Y / \partial \alpha = U_{c_Y} + U_y - U_x$. Then,

$$\partial W / \partial \alpha = \frac{U_{c_Y} - U_{c_X}}{2} + (U_y - U_x) < 0. \tag{6}$$

The first term is equal to zero. Recall that $U_{xx}, U_{yy} < 0$ and $U_x = U_y$ for $x = y$. Since $x < y$, $U_x > U_y$ and the term in parenthesis is negative. Thus, $\partial W / \partial \alpha < 0$.[7] Evidence supporting this result is provided at the end of Section 2.2.

2.2. Externalities Based on the Difference in Consumption Levels

We assume in this section that externalities depend on the difference in consumption levels. This is assumed for instance by Robson (1992) in his study of the impact of relative wealth status on risk-taking behavior. Let the individual utility function be $U^i = U(c_i, c_i - x, c_i - y, n_i)$, $i = X, Y$, where $c_i, x, y, n_i \geq 0$, and U is twice differentiable, with $U_{c_i} > 0$, $U_{n_i} < 0$, $U_{n_i n_i} \leq 0$, $\forall c_i, n_i, x, y$. Assume that $U_{c_Y - x} = U_{c_X - y} = 0$ for $c_Y - x = c_X - y = 0$. Since individuals are identical within each group (that is, $c_X = x$ and $c_Y = y$), externalities associated with consumption differences only occur across groups, and the utility function simplifies to

$$U^X = U(c_X, c_X - y, n_X), \ U^Y = U(c_Y, c_Y - x, n_Y), \tag{7}$$

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[7] Assuming diminishing marginal utility would reinforce this result because the first term would also be negative.

with $U_{c_X-y} = U_{c_Y-x}$ for $c_X - y = c_Y - x$, and $U_{c_X} + U_{c_X-y} > 0$, $U_{c_Y} + U_{c_y-x} > 0$,

i.e., individual utility in a group increases when everyone's consumption in that group increases. Assuming conditions for an interior solution are satisfied, the first-order condition is

$$U_{c_X} + U_{c_X-y} + \frac{U_{n_X}}{f_{n_X}^X} = 0 \,; \; U_{c_Y} + U_{c_Y-x} + \frac{U_{n_Y}}{f_{n_Y}^Y} = 0 \,. \tag{8}$$

The social optimum is given by

$$U_{c_X} + U_{c_X-y} + \frac{U_{n_X}}{f_{n_X}^X} - U_{c_Y-x} = 0 \,; \; U_{c_Y} + U_{c_Y-x} + \frac{U_{n_Y}}{f_{n_Y}^Y} - U_{c_X-y} = 0 \,. \tag{9}$$

As in Section 2, let t_i be a proportional tax or subsidy rate. The private optimum is given by

$$U_{c_X} + U_{c_X-y} + \frac{U_{n_X}}{(1-t_X)f_{n_X}^X} = 0 \,; \; U_{c_Y} + U_{c_Y-x} + \frac{U_{n_Y}}{(1-t_Y)f_{n_Y}^Y} = 0 \,. \tag{10}$$

From equations (9) and (10), the optimum tax rates are:

$$t_X^* = \frac{U_{c_Y-x}}{U_{c_X} + U_{c_X-y}} \,, \; t_Y^* = \frac{U_{c_X-y}}{U_{c_Y} + U_{c_Y-x}} \,. \tag{11}$$

If $U_{c_Y-x}, U_{c_X-y} < (>) 0$, preferences exhibit concern (jealousy). For instance, if x falls so that $c_Y - x$ increases, the externality $U_{c_Y-x} < 0$ if individuals in group Y feel concern for the fall in consumption in group X, and $U_{c_Y-x} > 0$ if the individuals feel jealousy. Assume individuals are concerned (jealous) about those whose consumption is lower (higher) than their own, with $U_{c_X-y} (U_{c_y-x}) \lessgtr 0$ for $c_x - y (c_y - x) \gtrless 0$ and

$U_{c_X-y,c_X-y}, U_{c_Y-x,c_Y-x} < 0$.

Proposition 1*: Equilibrium inequality is inefficient, and the optimal intervention entails a reduction in inequality.

Proof: We start from an equilibrium with $f^Y = f^X$ and $c_Y - x = c_X - y = 0$. Then, $U_{c_Y-x} = U_{c_X-y} = 0$ and $t_X^* = t_Y^* = 0$ (equation 11). Let f^Y increase and f^X decrease, such that y increases by β and x decreases by β, with $c_y - x = 2\beta$ and $c_x - y = -2\beta$. Then, $U_{c_X-y} > 0 > U_{c_y-x}$ and $t_X^* < 0 < t_Y^*$.

As in Section 2.1, we find that equilibrium inequality is inefficient and that the optimal policy reduces inequality by redistributing from the rich (Y) to the poor (X).

Proposition 2*: An increase in inequality reduces welfare.

Proof: Inequality increases with β, with $\partial U^X / \partial \beta = -U_{c_X} - U_{c_X-y} + U_{c_Y-x}$,

$\partial U^Y / \partial \beta = U_{c_Y} + U_{c_Y-x} - U_{c_X-y}$, and $\partial W / \partial \beta = \dfrac{U_{c_Y} - U_{c_X}}{2} + (U_{c_Y-x} - U_{c_X-y})$. The first term is equal to zero. The second term is negative because $U_{c_X-y} > 0 > U_{c_Y-x}$. Thus, $\partial W / \partial \beta < 0$.

Is there empirical support for the conclusion that an increase in inequality reduces welfare? Alesina et al. (2002) explore whether inequality affects individual utility, with utility measured in terms of survey answers about happiness. They find, after controlling for individual income and a set of other individual and aggregate characteristics, that in the US, a 10 percentage point increase in inequality reduces the number of people who report themselves as "Very Happy" by 18.5% and increases those who report themselves as "Not Too Happy" by 26%, with the corresponding figures for the EU being similar,

namely, 21% and 27%, respectively. These findings are consistent with the implications of the model.

3. The Role of Development Institutions

Development institutions can help developing countries by supporting policy reform and investing in public projects with high social rates of return, thereby raising consumption for a given amount of work. Assume first one group, with the externality depending on per capita consumption x. For a given amount of work, the impact on utility of increased consumption is $U_c + U_x$, where the first term is the impact of an increase in own consumption and the second term is the impact of an increase in the consumption of others.

As discussed in Section 2.1, the externality U_x is likely to be positive at low levels of consumption. On the other hand, at high levels of consumption, U_x is likely to be negative and the impact $U_c + U_x$ is likely to be small. Inkeles (1993) argues that higher income is likely to raise utility in poorer countries, while he and Frank (1999) argue that higher income need not raise utility in rich societies.

What is the empirical evidence? Based on time series studies, Easterlin (1995) reports that higher income has little or no effect on happiness in developed countries (the US and nine European countries) and in one country, Japan, that went from being a developing country to being a developed one. No time series studies are reported for developing countries. Based on international cross-sectional analysis, Frey and Stutzer (2002) find (p. 90) that "… higher income clearly raises happiness in developing

countries, while the effect is small, if it exists at all, in rich countries." Thus, it appears that the social return to increased income declines with the income level.

Based on the arguments and evidence provided, it does seem plausible that $U_c + U_x$ is larger in developing countries than in developed ones, and is larger in least developing countries than in middle-income ones. Consequently, in order to maximize their impact, development institutions should allocate much of their efforts to helping the poorest developing countries and should focus on the poorest segments of the populations in middle-income countries. This also holds when externalities depend on consumption differences. The first of these efforts would lower cross-country inequality while the second would lower within-country inequality.[8]

Note that these implications are based on the welfare arguments developed here and not on arguments that the poor are more deserving *per se*. Assuming the latter would reinforce the arguments made here.

The World Bank Group's lending to the public sector is done through two main lending windows, the World Bank and the International Development Agency (IDA). IDA loans are really closer to grants and are destined for the world's poorest countries. According to the World Bank Annual Report (2002), the recent trend has been to increase lending commitments through the IDA window, from $billion 4.4 in FY 2000 to $billion 8.1 in FY 2002, or an 85% increase over two years. As a share of total lending

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[8] Bourguignon and Morrisson (2002) distinguish between cross-country and within-country inequality in their study of world inequality in the last two centuries. They find that world inequality was mainly due to within-country differences in the early part of the period and to cross-country differences in the later part. Their findings indicate that focusing on cross-country differences may be more effective in reducing world inequality.

commitments, IDA loans increased from 28.5% to 42% over these two years, or by close to 50%. This trend, together with the increased focus on poverty alleviation in recent years, is consistent with the implications of the paper.

4. Conclusion

The paper examined the implications of the interdependence of preferences. It expands on aspects of Dupor and Liu (2003) by examining optimal interventions under inequality and by considering two alternative types of interdependencies. In the first case, as in Dupor and Liu (2003), a low (high) level of consumption generates concern (jealousy) in other consumers. In the second case, a low (high) level of consumption *relative* to that of others generates concern (jealousy) in the latter. In both cases, we show that welfare declines as inequality rises, that equilibrium inequality is inefficient, and that the optimal intervention lowers inequality. The analysis suggests that development institutions should allocate most of their efforts to the poorest countries and to the poorest segments of populations in middle-income countries, two groups where the social return to increased consumption is likely to be high.

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