Komlos, John; Salamon, Peter

Working Paper
The poverty of growth with interdependent utility functions

CESifo Working Paper, No. 1470

Provided in Cooperation with:
Ifo Institute – Leibniz Institute for Economic Research at the University of Munich

Suggested Citation: Komlos, John; Salamon, Peter (2005) : The poverty of growth with interdependent utility functions, CESifo Working Paper, No. 1470, Center for Economic Studies and Ifo Institute (CESifo), Munich

This Version is available at:
http://hdl.handle.net/10419/18834

Terms of use:
Documents in EconStor may be saved and copied for your personal and scholarly purposes.
You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.
THE POVERTY OF GROWTH WITH INTERDEPENDENT UTILITY FUNCTIONS

JOHN KOMLOS
PETER SALAMON

CESifo Working Paper No. 1470
Category 5: Fiscal Policy, Macroeconomics and Growth
May 2005

An electronic version of the paper may be downloaded
• from the SSRN website: www.SSRN.com
• from the CESifo website: www.CESifo.de
THE POVERTY OF GROWTH WITH INTERDEPENDENT UTILITY FUNCTIONS

Abstract

We argue that with interdependent utility functions growth can lead to a decline in total welfare of a society if the gains from growth are sufficiently unequally distributed in the presence of negative externalities, i.e., envy.

JEL Code: D62, D63, D64, O00.

Keywords: interdependent utility functions, growth, inequality.

John Komlos  
Department of Economics  
University of Munich (LMU)  
Ludwigstr. 33/IV  
80539 Munich  
Germany  
jk@econhist.de

Peter Salamon  
Department of Mathematics  
San Diego State University  
5500 Campanile Drive  
San Diego CA 92182-7720  
USA  
salamon@math.sdsu.edu
We explore the implications of economic growth for welfare in the presence of interdependent utility functions with negative externalities in consumption, i.e. envy. In conventional theory, the utility function of a "typical" economic agent is generally assumed to be independent of the consumption of others; hence more consumption invariably "...leads to more happiness" not only of the individual, but in the aggregate as well. According to the common wisdom, economic growth leads invariably to an increase in welfare (Layard and Walter, 1978, p. 5). Yet, experimental evidence refutes the notion that people invariably feel better off with increased consumption (Easterlin, 1974; Abramovitz, 1979; p. 9).

Our paper assumes that "...the individual does not think and act in the same way irrespective of whether he is or is not a member of a group" (Weisskopf, 1971, p. 161; Katona, 1975, p. 49; Leibenstein, 1950: Frank 1985; McCracken, 1988, p. xi; Konrad, 1990). "Reference groups" are important for providing standards for the subjective evaluation of one's own well-being, and in formulating expectations and aspirations on which satisfaction frequently depends. Thus, "...people's standards of wealth are determined by comparisons with kin, peers, etc., and thus if they all rise together [over time] the relative difference disappears, and so as people get wealthier over time they do not become any more happy" (Furnham and Lewis, 1986, p. 109).

This skepticism toward the received wisdom is shared by an increasing number of researchers (Sen, 1977; Hammond, 1989; Konrad, 1992a), but interdependent utility functions have been formulated ever since the publication of Veblen's seminal theory of conspicuous consumption (1899; Mishan, 1961; Frank, March 1985; Bagwell and
Duesenberry "...specified utility of an individual as a function of his own income and that of the income of the other members of the society" (Duesenberry, 1949, p. 97). Admittedly, consumption can also have positive externalities: for example, a wife's utility can enter the utility function of her spouse altruistically (Becker, 1981).

Empirical and theoretical investigations of the social nature of utility functions are important for several reasons: the "neglect of interdependence of welfare functions may substantially bias policy conclusions" (Kapteyn and Herwaarden, 1980, p. 395); it also has major implications for progressive taxation (Feldstein, 1976, p. 81; Ng, 1987), for income redistribution, for the formulation of growth policy, as well as for the justification of the existence of the welfare state in general (Freshtman, Murphy, Weiss, 1966; Hammond, 1991). We proceed in this vein, and explore some implications of economic growth for welfare in the presence of interdependent utility functions following Feldstein's formulation. We demonstrate that, contrary to standard theory, growth need not raise aggregate welfare, if its benefits accrue unevenly, and if the utility functions of the population are interdependent (Konrad, 1992b).

2. The Model

We begin with a model in which the society is assumed to be composed of two individuals A and B with interdependent Cobb-Douglas utility functions with one good, $x$, (i.e., income).\(^7\)

1) \[ U_A = \frac{x_A^\alpha}{x_B^\beta} \quad ; \quad U_B = \frac{x_B^\alpha}{x_A^\beta}. \]

The social welfare function is assumed to be additive and democratic:
2) \( U_T = U_A + U_B \).

Suppose that national income increases exogenously, e.g. through the discovery of new resources. Assume, that the increment in \( x \) accrues only to A. The question is under what circumstances, if any, might economic growth lead to a decline in total welfare, contrary to standard analysis (McAdams, 1992).

Noting that

\[ 3) \frac{\partial U_T}{\partial x_A} = \alpha_a \frac{U_A}{x_A} - \beta_b \frac{U_B}{x_A} \]

we obtain that the aggregate utility of the society decreases if and only if

\[ 4) \frac{U_A}{U_B} < \frac{\beta_b}{\alpha_a}. \]

The outcome depends on the relative magnitudes of the terms on the two sides of this inequality. The right hand side is an index of the degree of interdependence of the utility functions, while the left hand side measures the inequality in the initial distribution of utility. The initial income distribution determines \( \frac{U_A}{U_B} \), and hence whether it is smaller than \( \frac{\beta_b}{\alpha_a} \). The stronger is the interdependence, i.e. the larger is the value of \( \frac{\beta_b}{\alpha_a} \), the larger is the range of utility values for which inequality (4) holds.

The ratio \( \frac{\beta_b}{\alpha_a} \) indicates the extent to which the consumption of \( x \) by A decreases B's utility as compared with the extent that it increases A's own utility. The size of the ratio is indicative of the degree to which members of society may be characterized as "envious" (\( \beta \)) relative to being self-contained (\( \alpha \)). The larger is the ratio, the stronger is the interdependence. Without interdependence \( \beta = 0 \) and the ratio on the right hand side is zero, making it impossible for inequality (4) to ever hold, since the left hand side is always positive. In an altruistic society \( \beta < 0 \), and again the inequality becomes
impossible. Consequently, in these two cases we have the standard conclusion that
growth always increases total welfare. If $\beta > 0$, however, the inequality can hold provided
the ratio of utility levels is less than $\beta_b / \alpha_a$. The case $\beta_b / \alpha_a > 1$ corresponds to the
unrealistic case of a society in which enviousness dominates over self-centeredness.\(^8\) Hence, we assume that $0 < \beta_b / \alpha_a < 1$.

In this parameter range, growth can lead to a diminution in total social welfare in
the two person case provided the gain accrues to the individual whose utility is initially
lower by a sufficient ratio. This result becomes understandable by noting that in this
model a part of the utility of the "wealthier" person, B, is derived from his relative
wealth. If he is sufficiently envious, his utility can decrease more than the increase in A's
utility.\(^9\)

The main conclusion from the above example is that there exists a region of
parameter space where an exogenous increase in income which changes the distribution
of income, decreases total welfare in a democratic aggregate utility function. One should
note that this conclusion is dependent on the assumed form of the utility function. In
particular, if we repeat the analysis with $U' = \ln U$, where $U$ is as in eq. 1., the conclusion
changes and welfare increases in response to growth with any income distribution
provided only that $\beta_b < \alpha_a$, as expected. On the other hand, replacing the Cobb-Douglas
utility functions (eq. 1) with Stone-Geary, or, in fact, with separable utility functions of
the form

$$
5) \quad U_A = \hat{U}_A / \hat{U}_B^{\delta_a} \quad ; \quad U_B = \hat{U}_B / \hat{U}_A^{\delta_b}.
$$
where \( \hat{U} \) indicates the utility of a consumer at some fixed level of utility for the other consumer,\(^{10}\) we obtain that total welfare can decrease provided\(^{11}\)

6) \[ \frac{U_A}{U_B} < \delta_b. \]

The parameter \( \delta_b \) now plays the role of \( \beta_b/\alpha_a \).

3. Conclusion

The above model explores the welfare implications of economic growth in a society composed of individuals with interdependent utility functions with negative externalities in consumption. We demonstrate that there do exist specifications of utility functions with regions of parameter space in which the welfare consequences of a rise in per-capita income are ambiguous, if the gains are distributed unequally. Hence, economic growth might bring about an increase as well as a decrease in aggregate social welfare depending on the relationship between the two indices in eq. 4. One index measures the extent of envy in the society and the other the degree of income inequality as measured by the initial ratio of utilities. Total welfare is more likely to decrease if the gains from growth accrue disproportionately to the individual with the lower level of utility, the more envious is the individual who does not benefit from growth, the less selfish is the individual who gains from growth, and the more unequally income is distributed initially. Cooper, García-Penalosa and Funk (2001) recently derived similar results.

These considerations are important, insofar as economic growth has been frequently associated with the skewing of the income distribution in favor of the upper income brackets. In an historical context, Simon Kuznets recognized this pattern for the early phases of modern economic growth (Kuznets, 1996, p. 212; Williamson and Lindert, 1980, pp. 62, 67; Lindert, 1991, p., 216; Williamson, 1985, p. 18; Williamson, 1991, p. 15),\(^{12}\) and recent evidence confirms the increase in the Gini coefficient in Eastern Europe and the successor states of the Soviet Union during the recent transition to a market economy (Milanovic, 1996, p. 133). In many of these countries the Gini coefficient increased from 0.25 to 0.30 in just five years (United Nations Development, 1993, p. 17). In the United Kingdom a 2.1 percent growth rate in per capita GNP between 1965 and 1993 has been accompanied by a rise in the gini coefficient from 0.25 to 0.32. (The World Bank, 1993).
In most countries of the world a wide divide separates the poor from the rich. In the United States, for instance, the richest 20 percent of the population earns 9 times as much as the poorest 20 percent.\textsuperscript{13} Hence, insofar as the benefits of economic growth often accrue unevenly, our theoretical considerations have practical policy implications.

Clearly, we analyzed a special case, and therefore, the result ought not be assumed to pertain generally. Nonetheless, our derivation does have far-reaching policy implications. One issue to explore is the extent to which the utility function of economic agents are interdependent. We have demonstrated that with gains of economic growth accruing unevenly, circumstances do exist such that a society could be better off either by choosing to forgo the opportunities for growth, or by government policy affecting the distribution of gains. Thus, there is room for government intervention. The reason for the existence of the welfare state is not only the amelioration of market failure, or the provision of comprehensive security, but also because of the existence of externalities in consumption – envy - imply that individual utility maximization does not automatically bring about utility maximization for the society. The society could be not only happier, but also more stable politically, with a more even distribution of the gains from growth, and a diminution in envy (Hammond, 1995). Our conclusion vividly redirects our focus from growth per se to its distributional consequences for aggregate welfare.\textsuperscript{14} In sum, the interdependent nature of a society’s utility function should not be neglected in the formulation economic policy, particularly with regard to such key issues as progressive taxation, redistribution of income, and the enactment of growth-inducing policy measures.\textsuperscript{15}
References


Footnotes

1 Admittedly, in the short run "...one might feel happier by a recent increase in the standard of living, [but] one soon adapts to this and the positive relationship disappears." Hence, over time "...no strong positive relationship [has been found] either cross-sectionally or longitudinally between money
[income] and happiness" (Furnham and Lewis, 1986, p. 109). We are not substantially happier than our ancestors even though we consume much more than they did (Scitovsky, 1976).

2 As Duesenberry pointed out a generation ago, "the utility derived from one's own house or car depends on a friend's house or car" (1949, p. 27).

3 Its main insight fits well the post-World War II U.S. private consumption experience (Bassman, Molina, and Slottje, 1988).

4 Furthermore, the price of the consumed good can be included in the utility function, thus generating a "snob appeal" effect (Basmann, Molina, and Slottje, 1983; Haavelmo, 1970; Fisher, 1977; Spiegel and Templeman, 1985; Frank 1987).

5 For instance, Spiegel and Templeman have shown "...that a 'compulsory bundle' which a group... accepts as binding upon all its members might be superior to any other consumption pattern from the point of view of each and every member of the group" (1985, p. 315). Moreover, employees care about relative income within a firm, not only about their own absolute salaries (Frank 1984).

6 In Feldstein's analysis initially $U_A = U_B$, and $\alpha = \beta$ (notation as in eq. 1). He finds that an increment accruing unequally between two members of a society raises social welfare.

7 The presence of additional goods complicates the notation while leaving the analysis and conclusions unchanged.

8 If the distribution of income is egalitarian to begin with (i.e. $U_B = U_A$), then social welfare is likely to increase. This follows, since in this case inequality (4) holds only if $\beta_b / \alpha_a > 1$.

9 We can extend the analysis of the model in eq. (1) to n individuals. We treat only the simplest case of a society with two types of individuals A and B. We assume that all type A (or type B) individuals have identical utility functions and are at identical levels of utility. If there are $n_A$ individuals of type A and $n_B$ individuals of type B, then the total democratic welfare function becomes $U_T = n_A U_A + n_B U_B$. The constants $n_A$ and $n_B$ are carried through the derivation, yielding a modified form of
inequality (4): $n_A U_A / n_B U_B < \beta_B / \alpha_a$. The larger is the number of individuals who do not partake in the benefits of growth relative to the number of individuals who do benefit, the smaller $\beta_B / \alpha_a$ can be and still allow the last inequality to be satisfied, implying a decline in welfare as a consequence of growth.

Note that similar inequalities also follow for non-democratic welfare functions if one reinterprets the coefficients $n_A$ and $n_B$ as the degrees to which society values the utility that accrues to persons A and B. The $n$ person case also follows if the coefficients are again reinterpreted as the number of individuals times the degree to which the utility of such individuals is valued. Again, if the total initial welfare of the subgroup to which the gain accrues is sufficiently small as compared with the total welfare of the subgroup not enjoying gains, the total combined welfare of the two subgroups will decrease. Thus, there exist ways to apportion additional income to a population so as to decrease its total welfare.

10 We require that the indifference curves of each consumer be unaffected by the consumption of the other.

11 Once again, using a democratic welfare function and assuming that the gains accrue entirely to A as an increase in $x_A$, we have

$$U_T = \frac{\widehat{U}_A}{\delta_a} + \frac{\widehat{U}_B}{\delta_b}.$$  

and

$$\frac{ZU_T}{Zx_A} = \frac{ZU_A}{Zx_A} \left( \frac{1}{\frac{\widehat{U}_B}{\delta_a}} - \delta_b \frac{\frac{\widehat{U}_B}{\delta_b}}{\frac{\widehat{U}_A}{\delta_b+1}} \right).$$

which is negative provided $\frac{\widehat{U}_A}{\delta_a} < \delta_b$. If we note that $\frac{U_A}{U_B} = \frac{(\widehat{U}_A)^{\delta_a+1}}{(\widehat{U}_B)^{\delta_b+1}}$ the inequality reduces to $U_A / U_B < \delta_b$.  

13
12. This is the case partly because during economic growth gainers never compensate the losers whose marketable skills or investments became devalued.

13 The comparable figure for Brazil is 32 (United Nations Development, 1993, p. 17).

14 In addition, envy can have an influence on the growth process itself (Cole, Maliath, and Postelwaite, 1992).

15 "If growth is less important for welfare than we have so far supposed, other goals would rise in the scale of social priorities" (Abramovitz, 1979, p. 20).
Luisa Fuster, Ayşe İmrohoroğlu and Selahattin İmrohoroğlu, Personal Security Accounts and Mandatory Annuityization in a Dynastic Framework, February 2005

Peter Claeys, Policy Mix and Debt Sustainability: Evidence from Fiscal Policy Rules, February 2005

James M. Malcomson, Supplier Discretion over Provision: Theory and an Application to Medical Care, February 2005

Thorvaldur Gylfason, Interview with Assar Lindbeck, February 2005

Christian Gollier, Some Aspects of the Economics of Catastrophe Risk Insurance, February 2005

Gebhard Kirchgässner, The Weak Rationality Principle in Economics, February 2005

Carlos José Fonseca Marinheiro, Has the Stability and Growth Pact Stabilised? Evidence from a Panel of 12 European Countries and Some Implications for the Reform of the Pact, February 2005

Petter Osmundsen, Frank Asche, Bård Misund and Klaus Mohn, Valuation of International Oil Companies – The RoACE Era, February 2005

Gil S. Epstein and Shmuel Nitzan, Lobbying and Compromise, February 2005

Marcel F. M. Canoy, Jan C. van Ours and Frederick van der Ploeg, The Economics of Books, February 2005


George Kapetanios and M. Hashem Pesaran, Alternative Approaches to Estimation and Inference in Large Multifactor Panels: Small Sample Results with an Application to Modelling of Asset Returns, February 2005

Samuel Mühlemann, Jürg Schweri, Rainer Winkelmann and Stefan C. Wolter, A Structural Model of Demand for Apprentices, February 2005

Giorgio Brunello and Lorenzo Rocco, Educational Standards in Private and Public Schools, February 2005

Alex Bryson, Lorenzo Cappellari and Claudio Lucifora, Why so Unhappy? The Effects of Unionisation on Job Satisfaction, March 2005
1420 Annalisa Luporini, Relative Performance Evaluation in a Multi-Plant Firm, March 2005
1421 Giorgio Bellettini and Carlotta Berti Ceroni, When the Union Hurts the Workers: A Positive Analysis of Immigration Policy, March 2005
1422 Pieter Gautier, Michael Svarer and Coen Teulings, Marriage and the City, March 2005
1423 Ingrid Ott and Stephen J. Turnovsky, Excludable and Non-Excludable Public Inputs: Consequences for Economic Growth, March 2005
1424 Frederick van der Ploeg, Back to Keynes?, March 2005
1426 Hans Pitlik, Friedrich Schneider and Harald Strotmann, Legislative Malapportionment and the Politicization of Germany’s Intergovernmental Transfer System, March 2005
1427 Konstantinos Angelopoulos and Apostolis Philippopoulos, The Role of Government in Anti-Social Redistributive Activities, March 2005
1428 Ansgar Belke and Daniel Gros, Asymmetries in the Trans-Atlantic Monetary Policy Relationship: Does the ECB follow the Fed?, March 2005
1429 Sören Blomquist and Luca Micheletto, Optimal Redistributive Taxation when Government’s and Agents’ Preferences Differ, March 2005
1430 Olof Åslund and Peter Fredriksson, Ethnic Enclaves and Welfare Cultures – Quasi-Experimental Evidence, March 2005
1432 Peter Egger, Stefan Gruber, Mario Larch and Michael Pfaffermayr, Knowledge-Capital Meets New Economic Geography, March 2005
1433 George Economides and Apostolis Philippopoulos, Should Green Governments Give Priority to Environmental Policies over Growth-Enhancing Policies?, March 2005
1434 George W. Evans and Seppo Honkapohja, An Interview with Thomas J. Sargent, March 2005
1435 Helge Berger and Volker Nitsch, Zooming Out: The Trade Effect of the Euro in Historical Perspective, March 2005
1436 Marc-Andreas Muendler, Rational Information Choice in Financial Market Equilibrium, March 2005
1437 Martin Kolmar and Volker Meier, Intra-Generational Externalities and Inter-Generational Transfers, March 2005

1438 M. Hashem Pesaran and Takashi Yamagata, Testing Slope Homogeneity in Large Panels, March 2005

1439 Gjermund Nese and Odd Rune Straume, Industry Concentration and Strategic Trade Policy in Successive Oligopoly, April 2005

1440 Tomer Blumkin and Efraim Sadka, A Case for Taxing Education, April 2005

1441 John Whalley, Globalization and Values, April 2005

1442 Denise L. Mauzerall, Babar Sultan, Namsoug Kim and David F. Bradford, Charging NOx Emitters for Health Damages: An Exploratory Analysis, April 2005

1443 Britta Hamburg, Mathias Hoffmann and Joachim Keller, Consumption, Wealth and Business Cycles in Germany, April 2005

1444 Kohei Daido and Hideshi Itoh, The Pygmalion Effect: An Agency Model with Reference Dependent Preferences, April 2005

1445 John Whalley, Rationality, Irrationality and Economic Cognition, April 2005

1446 Henning Bohn, The Sustainability of Fiscal Policy in the United States, April 2005

1447 Torben M. Andersen, Is there a Role for an Active Fiscal Stabilization Policy? April 2005

1448 Hans Gersbach and Hans Haller, Bargaining Power and Equilibrium Consumption, April 2005


1450 Raymond Riezman, John Whalley and Shunning Zhang, Metrics Capturing the Degree to which Individual Economies are Globalized, April 2005

1451 Romain Ranciere, Aaron Tornell and Frank Westermann, Systemic Crises and Growth, April 2005

1452 Plutarchos Sakellaris and Focco W. Vijselaar, Capital Quality Improvement and the Sources of Growth in the Euro Area, April 2005

1453 Kevin Milligan and Michael Smart, Regional Grants as Pork Barrel Politics, April 2005

1454 Panu Poutvaara and Andreas Wagener, To Draft or not to Draft? Efficiency, Generational Incidence, and Political Economy of Military Conscription, April 2005
1455 Maurice Kugler and Hillel Rapoport, Skilled Emigration, Business Networks and Foreign Direct Investment, April 2005


1457 Margarita Katsimi and Thomas Moutos, Inequality and Relative Reliance on Tariffs: Theory and Evidence, April 2005

1458 Monika Bütler, Olivia Huguenin and Federica Teppa, Why Forcing People to Save for Retirement may Backfire, April 2005

1459 Jos Jansen, The Effects of Disclosure Regulation of an Innovative Firm, April 2005


1461 Steffen Huck, Kai A. Konrad and Wieland Müller, Merger without Cost Advantages, May 2005

1462 Louis Eeckhoudt and Harris Schlesinger, Putting Risk in its Proper Place, May 2005

1463 Hui Huang, John Whalley and Shuming Zhang, Trade Liberalization in a Joint Spatial Inter-Temporal Trade Model, May 2005

1464 Mikael Priks, Optimal Rent Extraction in Pre-Industrial England and France – Default Risk and Monitoring Costs, May 2005

1465 François Ortalo-Magné and Sven Rady, Heterogeneity within Communities: A Stochastic Model with Tenure Choice, May 2005

1466 Jukka Pirttilä and Sanna Tenhunen, Pawns and Queens Revisited: Public Provision of Private Goods when Individuals make Mistakes, May 2005

1467 Ernst Fehr, Susanne Kremheler and Klaus M. Schmidt, Fairness and the Optimal Allocation of Ownership Rights, May 2005

1468 Bruno S. Frey, Knight Fever – Towards an Economics of Awards, May 2005

1469 Torberg Falch and Marte Rønning, The Influence of Student Achievement on Teacher Turnover, May 2005

1470 John Komlos and Peter Salamon, The Poverty of Growth with Interdependent Utility Functions, May 2005