J Cult Econ
DOI 10.1007/s10824-008-9060-4

Can public arts education replace arts subsidization?

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Received: 6 March 2007 / Accepted: 7 January 2008

Abstract The debate about whether the arts should be supported or not is far from new, and most governments support the arts in one way or the other. The literature considers several arguments in favor of such interventions. Public education may seem to be an action which could, in the long run, lead to possible reductions of subsidies. Surveys show that those who have been exposed to the arts when young participate more when adult. However, the "non-market" transmission from parents to children generates an external effect, which has to be taken into account to reach first-best situations. We construct an overlapping generations model in which young consumers are exposed to both public education toward the arts and to non-altruistic transmission of such a taste from their parents. We show that the first-best can be reached only if there is both public cultural education and subsidization of arts consumption. Therefore, education cannot be considered as a substitute for subsidies to arts consumption. However, as is often the case in European countries, government intervention is usually below the first-best level. Using a model calibrated on French

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data, we show that it is then preferable to subsidize education, while consumption, especially of the older generations, should be taxed rather than subsidized.

Keywords Arts consumption · Education · Subsidization of arts consumption

JEL classification Z1 · H23 · D9

1 Introduction

The debate about whether the arts should be supported or not is far from new, and though the problems and the approaches may vary across countries (and "cultures"), most governments are in favor of subsidizing the arts in one way or the other.

The United States are representative of the tradition in which the arts were mainly supported by noblemen, kings and popes, though, in modern times, these are industrialists turned into benefactors and patrons. Public budgets are rather modest,[1] but some congressmen find even that to be too much, and given away to politically incorrect or unjustified activities.[2] Countries in continental Europe (France and Italy, among others) represent the other extreme of the spectrum, where most artistic activities are supported by the State. In France, the objective for culture is to reach a budget that amounts to 1% of government expenditure; this is almost the case in 1998, with $2.5 billion, representing 0.95% of the total budget. The United Kingdom stands in between, with a public budget of $1.4 billion, complemented by private donations and, more recently, by the National Lottery, which not only funds institutions, but even goes as far as commissioning art.[3]

Though "top of the agenda for the ministers [of France, Italy, and the United Kingdom] is to make the arts more accessible to all,"[4] the policies followed can be very different. For instance, the French insist that museums should charge visitors—and they do so—while free admission at the six British national museums—which used to charge—was achieved in January 2002.

The arguments used in the economics literature to justify subsidies are discussed in the last chapter of Grampp (1989), who it should be said finds these arguments unconvincing. The list is long: (a) art is a public good, which, unless it gets subsidized, is not produced in a sufficient amount; (b) it yields positive externalities, (c) it is a merit good, (d) its demand depends on its supply, and if it were not available, consumers would not know its value, (e) for equity and efficiency reasons, it should be made available to everyone, and not only to those who can afford it, (f) the stock of art must be maintained, and maintaining is not a profitable activity,

[1] In 1990, governmental assistance was $900 million, while charitable contributions amounted to $650 million. See Heilbrun and Gray (1993, p. 8). Paul Mellon alone gave away some $600 million during the last 50 years. See *The Art Newspaper*, April 1999.

[2] On the debate about the funding by the National Endowment for the Arts, see Marquis Goldfarb (1995).

[3] See *The Art Newspaper*, April 1999.

[4] See *The Art Newspaper*, February 1999.

(g) producing art involves large fixed costs, and consumers should be charged only the marginal cost, to consume the available supply (the capacity of a museum or of a concert hall), and (h) art is labor intensive and productivity gains are hardly possible.[5] Most of these arguments can be used for many commodities or sectors, and have been studied by economists in more general settings than here. The last argument (due to Baumol and Bowen 1965, 1966) on the difficulty or impossibility of achieving productivity gains is more specific to the performing arts.

The reasons for justifying public support are mainly based on the normative, but unverified, assumption that "art is useful," and so are the arguments in favor of cultural education. In 1999, the French Minister of education pointed out that, in this respect, "France is lagging behind" since only 3% of the children of school age are exposed to some form of artistic education. The departments of education and of culture will have to decide on joint initiatives geared to educating children.[6]

Public education may indeed seem to be an action which could, in the long run, lead to possible reductions of subsidies. Indeed, surveys show that arts education, both at school and in the family or close community, increases participation in the arts. Bergonzi and Smith (1996) even show that providing both has superadditive effects on participation.[7] There are also dynamic effects which are at play, since parents will transmit the knowledge they were exposed to while young.[8] Public education has therefore the usual direct effect on children, and the indirect effect through the transfer from parents to children. Therefore, one may think that arts education could, if sufficiently intensive, provide enough incentives for consumers to participate, so that the direct support of arts consumption could be reduced or even dispensed with. This would also leave to consumers, and not to government agencies, the choice of which activities to support.

This will however not be so if, as is assumed by Becker and Tomes (1986), culture is "automatically transferred from parents to children." Given its automatic and thus non-altruistic character, this private transmission of education cannot be internalized by parents and public intervention is needed for agents to consume the socially optimal level of culture.[9] The (optimal) level of subsidies will depend on the (optimal) level of public education, but the former cannot be fully replaced by the latter. This is the issue that we study in our paper, without questionning whether culture is important or not, but we assume that arts consumption has a positive impact on consumers' utility.

The dynamic nature of the problem, and the intergenerational transfer of knowledge, leads us to introduce (Sect. 2) an overlapping generations model in which agents live three periods. In period 0, they are exposed to arts education

[5] See also Chap. 11 in Heilbrun and Gray (1993).

[6] See *Le Journal des Arts*, April 1999.

[7] See also Heilbrun and Gray (1993, p. 362).

[8] Bisin and Verdier (2001) were among the first to study the dynamics of cultural transmission. Their model aims at studying the stationary distribution of preference traits. We are interested in the tradeoff between arts education and arts subsidiation.

[9] The model studied by Bisin and Verdier (2001) also assumes that parents transfer their culture to their offsprings in a paternalistic way.

provided by schools, and inherit (at least, in part) the cultural capital of their parents. In period 1, they work and consume two goods: an aggregate commodity and art. In period 2, they retire, but still consume both goods.

In Sect. 3, we turn to the stationary state of this economy and study under which conditions this first-best can be decentralized. We show that though the government chooses the optimal level of public cultural education, subsidizing arts consumption can only be partly avoided, given that parents are supposed non-altruistic: support is needed for the consumption of the young, but can be cut back for retirees.

Section 4 considers the results of a model whose parameters try to capture the situation that prevails in most continental European countries, where the current level of public expenditure devoted to the arts is well below the first-best level that is generated by the calibrated model. We show that if this is the case, arts consumption (and, therefore, production) should be much less subsidized (and may even be taxed), while more should be devoted to public arts education.

Our results lead to two conclusions that are in stark contrast with the behavior of most governments which tend to subsidize cultural consumption rather than education to the arts, and consumption of retirees more than that of young agents. Though the first-best with non-altruistic parents requires subsidizing both education and consumption, we show that *only* the young generation's consumption should benefit from subsidies. Most economies are, however, characterized by second-best situations. In that case, we show that it is more useful to subsidize education than consumption.

Section 5 concludes the paper.

2 The model

We assume that the economy consists of one sector, with overlapping generations of consumers and competitive firms producing a commodity that is both the usual consumption-investment good and "art."

Population is constant. Each of the N identical consumers (households) lives three periods: childhood, young age, old age. As a child, a consumer makes no decisions of his own, but is exposed to public cultural education, the level of which is decided and financed by the government and, within the household, to the culture transmitted by his parents. He works when young, supplying the unit of labor he is endowed with. In period t, his wage income w_t is spent to consume c_t units of the consumption good and a_t units of art, which may be taxed or subsidized at a rate θ_t^a; he saves s_t for his old age; he also pays (or receives) a lump-sum T_t^1 to finance public education in culture, as well as possible subsidies. In period 2, he retires, earns $s_t(1 + r_{t+1})$ from his savings in period 1 (r_{t+1} is the interest rate), spends d_{t+1} on consumption, b_{t+1} on art, possibly taxed or subsidized at a rate θ_{t+1}^b and pays (or receives) a lump-sum T_{t+1}^2.

The two-period utility function of the typical consumer $u(c_t, \lambda_t, d_{t+1}, \mu_{t+1})$ depends on the consumption good in both periods, c_t and d_{t+1}, and on "cultural capital stocks," λ_t and μ_{t+1}, produced within the household *à la* Stigler and Becker

(1977).[10] This process uses as inputs public arts education, the cultural capital acquired from the family and through habit formation, and arts consumption itself. We thus model art as a good that is addictive. More specifically, we assume the following:

$$\lambda_t = \phi(e_{t-1}, \lambda_{t-1}, a_t), \tag{1}$$

and

$$\mu_{t+1} = \psi(\lambda_t, b_{t+1}). \tag{2}$$

In period 1, the cultural capital of the (young) consumer is influenced by his past exposure to public education (e_{t-1}) and to family culture (λ_{t-1}) as a child, as well as by the amount of art that he consumes (a_t). When old, the consumer inherits from his past habits (λ_t) and can still increase his capital by consuming b_{t+1} units of art. We assume that the functions appearing in (1) and (2) are differentiable, and that all the partial derivatives are positive: the stock of habits is increasing in education, in the past stock and in the consumption of art.

In Eq. 1, λ_{t-1} is taken as given by agents born in t, and represents the external effect of culture within the family. An alternative way of looking at this is to assume that λ_{t-1} represents a social externality, the mean cultural capital of the previous generation.[11] Since in our model, agents are identical, the two formulations lead to the same conclusions. More generally, λ_{t-1} can be thought of as resulting from both a family and a community or social effect, which is consistent with the Bergonzi and Smith (1996) survey results alluded to in the introduction.

When making his decision, a consumer takes as given prices w_t, r_{t+1}, lump-sum transfers T_t^1, T_{t+1}^2, possibly non-zero tax (or subsidy) rates $\theta_t^a, \theta_{t+1}^b$, the level of public education e_{t-1}, as well as his parents' cultural capital λ_{t-1}, and solves the following problem:

$$\max_{c_t, a_t, s_t, d_{t+1}, b_{t+1}} u(c_t, \lambda_t, d_{t+1}, \mu_{t+1}), \tag{3}$$

subject to his budget constraints

$$c_t + (1 - \theta_t^a)a_t + s_t = w_t - T_t^1, \tag{4}$$

and

$$d_{t+1} + (1 - \theta_{t+1}^b)b_{t+1} = (1 + r_{t+1})s_t - T_{t+1}^2, \tag{5}$$

where λ_t and μ_{t+1} are defined by (1) and (2). The utility function defined in (3) is assumed strictly concave, increasing in all its arguments, and twice continuously differentiable.

Production is carried out by identical perfectly competitive firms. Aggregate output Y_t is given by

[10] In terms of the Stigler and Becker model, this process could also be described in two steps. "Taste for the arts" is produced by a function that depends on the consumption of arts and on human capital produced within the household (say, through learning by doing) by accumulating the effects of past tastes.

[11] As is the case for the external effects of human capital in e.g., Lucas (1988) or Azariadis and Drazen (1990).

$$Y_t = F(K_t, L_t), \tag{6}$$

where K_t and L_t represent aggregate capital and labor demand, and F is homogeneous of degree one. The behavior of the representative firm is:

$$\max_{K_t, L_t} F(K_t, L_t) - (1 + r_t)K_t - w_t L_t, \tag{7}$$

where we assume complete depreciation of the capital stock in every period.

The government collects (or redistributes) lump-sum transfers, finances education in the arts and may tax consumption. It has no optimizing behavior and simply seeks to satisfy its budget constraint

$$e_t + \theta_t^a a_t + \theta_t^b b_t = T_t^1 + T_t^2, \tag{8}$$

where $e_t, \theta_t^a, \theta_t^b$ and say, T_t^1 are given.

Market equilibrium on the goods market,[12] the labor market, and the capital market, respectively, requires the three following conditions to hold:

$$N(c_t + d_t + a_t + b_t + e_t + s_t) = Y_t, \tag{9}$$

$$L_t = N, \tag{10}$$

$$K_t = N s_{t-1}. \tag{11}$$

An intertemporal overlapping generations equilibrium is defined by a sequence of consumptions (c_t, a_t, d_{t+1}, b_{t+1}), capital stocks K_t, labor demands L_t, public education e_t, lump-sum transfers (T_t^1, T_t^2), tax or subsidy rates (θ_t^a, θ_t^b), supported by prices (w_t, r_t), satisfying (1) to (11) for $t = 0, 1, ...$

Along the perfect foresight equilibrium path, and assuming interior solutions, the following first-order conditions will hold for the consumer optimization problem:

$$u'_c = (1 + r_{t+1})u'_d, \tag{12}$$

$$(1 - \theta_t^a)u'_c = [u'_\lambda + u'_\mu \psi'_\lambda]\phi'_a, \tag{13}$$

and

$$(1 - \theta_{t+1}^b)u'_d = u'_\mu \psi'_b. \tag{14}$$

In all these expressions, u'_x denotes the partial derivative of $u(\cdot)$ with respect to argument x, evaluated in equilibrium (c_t, λ_t, d_{t+1}, μ_{t+1}); likewise, ψ'_x and ϕ'_x are derivatives of $\psi(\cdot)$ and $\phi(\cdot)$ with respect to x, evaluated in equilibrium.

Equation 12 is the usual Euler condition describing the arbitrage between first- and second-period consumptions, c_t and d_{t+1}. Equations 13 and 14 represent the tradeoff between consumption of the commodity and of art in period 1 (c_t and a_t) and in period 2 (d_{t+1} and b_{t+1}), respectively. Equation 13 shows that for the young consumer, the loss of utility when he foregoes one unit of the consumption good should, in equilibrium, be equal to the marginal utility of one additional unit of art that accrues over the two periods of his life ($(1 - \theta_t^a)^{-1} u'_\lambda \phi'_a$ when young and

[12] Note that there is only one good in this economy. This can be rationalized if arts production results from a linear technology that transforms the usual consumption good into art. By a suitable normalization, both goods can then be aggregated.

$(1-\theta_t^a)^{-1}u'_\mu\psi'_\lambda\phi'_a$ when old). Equation 14 can be interpreted in a similar way for the retired consumer.

From the producer optimization problem, and since $L_t = N$, it follows that

$$F'_K(K_t, N) = (1 + r_t), \tag{15}$$

and

$$F'_L(K_t, N) = w_t, \tag{16}$$

where $F'_K(\cdot)$ and $F'_L(\cdot)$ are the derivatives of the production function with respect to labor and capital.

3 The long-run first-best solution and its decentralization

Let $k_t \equiv K_t/N$ and $f(k_t) \equiv F(k_t,1)$. Market equilibrium is now defined by $f(k_t) = k_{t+1} + c_t + a_t + d_t + b_t + e_t$. Let Ω^t, $0 < \Omega < 1$ be the discount factor, and, to simplify calculations, replace μ_{t+1} by $\psi(\lambda_t, b_{t+1})$ in the objective function. The centralized program can now be written, in per capita terms, as:

$$\max_{c_t,a_t,b_t,d_t,e_t} \sum_{t=0}^{\infty} \Omega^t u(c_t, \lambda_t, d_{t+1}, \psi(\lambda_t, b_{t+1})),$$

subject to

$$\lambda_t = \phi(e_{t-1}, \lambda_{t-1}, a_t), t = 0, \ldots, \infty$$

and

$$f(k_t) = k_{t+1} + c_t + a_t + d_t + b_t + e_t, t = 0, \ldots, \infty$$

for given k_0, λ_{-1}.

This solution achieves the highest welfare. The question to which we turn now is to determine under which conditions this optimum can be decentralized as a steady-state equilibrium. The main result is stated in Proposition 1.[13]

Proposition 1 *The first-best steady-state is an equilibrium steady-state if the following conditions are satisfied:*

(a) *public cultural education e is set at its optimal level;*
(b) *art consumption by the young is subsidized at a rate* $\theta^a = \Omega\phi'_\lambda$;
(c) *art consumption by the old should not be subsidized or taxed:* $\theta^b = 0$;
(d) *lump-sum transfers* T^1 *and* T^2 *lead to the modified golden-rule capital stock.*

The proposition shows that to achieve a first-best, arts consumption of the young should be subsidized, even if the level of public cultural education to which children are exposed is chosen optimally. The rate at which this consumption should be supported is equal to the marginal influence the cultural capital of parents has on the

13 See Appendix, sections “First-order conditions of the welfare optimum”, “Steady-state conditions for consumers’ equilibrium” and “Decentralizing the welfare optimum” for detailed calculations.

cultural capital of children.[14] Moreover, if $\phi''_{\lambda,e} > 0$ (which will be the case if, as shown by Bergonzi and Smith (1996), the effects of education and transmission from parents are superadditive), then a marginal increase in public education will even strengthen the positive consequences of the transmission from parents to children.

Since we assume that the educational effect of grand-parents on their grand-children can be neglected (it is set to zero in the model), arts consumption of the old generation should not be subsidized. This is at variance with observed situations in which the arts consumption of retirees is often more subsidized than that of the young generations.

The lump-sum transfers that are needed to reach the welfare optimum have two origins. First, overlapping agents are not altruistic, and, even in the absence of culture, the marginal rate of substitution u'_d/u'_c between second and first life cycle periods may not necessarily be equal to the social discount rate Ω. This creates an imperfection the effect of which has to be removed by lump-sum transfers to make decentralization possible. Second, there is the externality due to the imperfect transmission of culture from parents to children which gives way to subsidies to education as well as to consumption and to transfers. Even in cases when, by chance, the incentives to save are consistent with the optimal level of capital, i.e., when $u'_d/u'_c = \Omega$, positive transfers $T^1 + T^2$ are needed in order to balance the government budget while preserving this optimal level. Therefore, the lump-sum transfers T^1 and T^2 have two roles, and it is difficult to disentangle them in any other way than by relying on numerical simulation.

4 Second-best analysis

We now consider the second-best problem, in which T, the government budget (for the arts) is fixed, at a smaller than the first-best steady-state budget, T^*, and seek to maximize consumers' utility.

4.1 The second-best problem

To simplify calculations (and save on a parameter that is difficult to assess), we assume that there is no discounting so that the discount factor is equal to 1 and $r^* = 0$.[15] We choose the golden rule capital level k^* for which $f'(k^*) = 1$ and $f(k^*) - k^* = w^*$. Given T, it is always possible to decentralize the equilibrium for any policy (θ^a, θ^b, e), as long as there is no restriction on the intergenerational distribution (T^1, T^2). Once T is given, one can compute $w^* - T$, the life-cycle budget

[14] No subsidy is needed only if $\phi'_\lambda = 0$. This will be so in a population in which the cultural level of the family has *no* action on the level of cultural appreciation of the young, i.e., if $\lambda_t = \phi(e_{t-1}, a_t)$ instead of the formulation suggested in Eq. 1, or if there is satiation in λ at the optimal level of education, or before this level is reached.

[15] See Appendix.

of consumers who take as given $w^* - T$, θ^a, θ^b, e as well as their parents cultural capital $\overline{\lambda}$ and maximize $u(c, \lambda, d, \mu)$ subject to their budget constraint

$$w^* - T = c + (1 - \theta^a)a + d + (1 - \theta^b)b, \tag{17}$$

while λ and μ must satisfy $\lambda = \phi(e, \overline{\lambda}, a)$ and $\mu = \psi(\lambda, b)$. This maximization leads to decisions $c(\cdot)$, $a(\cdot)$, $d(\cdot)$, $b(\cdot)$, $\lambda(\cdot)$, $\mu(\cdot)$ and indirect utility $v(\cdot)$ that depend on $w^*{-}T$, θ^a, θ^b, e and $\overline{\lambda}$.

Now, given T, the government's second-best problem is to choose e, θ^a and θ^b which maximize indirect utility $v(w^* - T, \theta^a, \theta^b, e, \overline{\lambda})$, subject to

$$T = e + \theta^a a(\cdot) + \theta^b b(\cdot),$$

and

$$\phi(e, \overline{\lambda}, a) = \lambda.$$

This is a problem that is difficult to tackle in its full generality. We therefore move to a Cobb-Douglas economy,[16] and to simulations of a model calibrated on the basis of French national accounts.

4.2 A Cobb-Douglas economy

We consider the formulation of the model in which both habit formation equations (1) and (2), and the utility function (3) are linear in logarithms, so that

$$\log\lambda = \rho\log e + \delta_1 \log\overline{\lambda} + \eta_1 \log a, \tag{18}$$

$$\log\mu = \delta_2 \log\lambda + \eta_2 \log b, \tag{19}$$

and

$$u(c, \lambda, d, \mu) = \log c + \alpha\log\lambda + \beta(\log d + \alpha\log\mu). \tag{20}$$

All parameters are positive and δ_1, the inherited effect of cultural accumulation, is smaller than one.

The second-best solution, as well as the calibration of the model, are described in Appendix "Second-best in a Cobb-Douglas economy". This appendix also shows the expressions for the two subsidy rates θ^a, θ^b and for arts education e as functions of the total cultural budget T and of the other given parameters (see B12–B14). The following proposition holds:

Proposition 2 *For any total budget $T < T^*$, where T^* is the first-best budget, the second-best solution is such that:*

(a) *the subsidy rate on art consumption by the old is negative (i.e., the old are taxed); θ^a, the subsidy rate on art consumption by the young is larger than θ^b;*

[16] Therefore, the results are not general. We have an example of an economy in which b, the cultural good consumed when old, is an inferior good, and the results that will be described do not hold. But our conjecture is that if all the goods in the model are normal—as they are in the Cobb-Douglas economy—the results that we derive should hold.

(b) *both rates, as well as the level of public education e are non-decreasing in T.*

The Cobb-Douglas example points to the possibility that the young may also be taxed if some conditions on the parameters are satisfied, and if T is sufficiently small.

4.3 Calibration and simulation results

The coefficients of the Cobb-Douglas economy are chosen so that the resulting consumptions of the young and of the old, both for the good and the arts, reproduce some stylized facts observed in France, which can be thought of being representative of continental European countries. Details on this calibration can be found in Appendix "Second-best in a Cobb-Douglas economy".

Table 1 displays the first-best values[17] of T^*/w^* and e^*/w^* (expression (B15) and (B16) in Appendix "Second-best in a Cobb-Douglas economy") generated by the model for various choices of α, the relative preference for arts consumption in the utility function, and where, to simplify, we set $\rho = (1 - \delta_1)$ (ρ and δ_1 represent the effects of public and household arts education). The numbers in Table 1 show that (with one exception when $\alpha = 0.05$ and $\rho = 0.875$) first-best budgets are well above 5% for all reasonable choices of α and ρ.

Stylized facts suggest that T/w^* is well below 5%.[18] The current French situation is thus hardly a first-best.

Figure 1, illustrates the e/w^*, θ^a and θ^b curves as functions of T/w^*, for our best guess of the parameters $\alpha = 0.10$ and $\rho = \delta_1 = 0.5$. For these values of the parameters, Table 1 shows that the first-best total budget for arts should be equal to 9.9%, the largest part of which (8.9%) should be devoted to education. As can be checked, for T/w^* values smaller than 5% (which is probably an upper bound in most European countries), arts consumption of the young should hardly be subsidized ($\theta^a = 0$ for $T/w^* = 0.045$ and becomes negative (a tax) for lower budget shares). Arts consumption of the old generations should always be taxed, which is just the opposite of what happens in the real world, since usually, elderly people get larger discounts than other adults.

5 Conclusions

Our model suggests that even if the level of public cultural education is optimal, the first-best obtains if and only if the consumption of art by the young generation is subsidized. This result is due to the social external effect resulting from the "automatic" transmission of culture from parents to children, as stressed by Becker

[17] The theoretical results presented in the Appendix can also be expressed in terms of ratios T^*/w^* and e^*/w^*. This makes the calibration exercise easier to deal with.

[18] It is difficult to estimate the value of T/w^* with more accuracy, since arts are supported at different levels (central or federal, state, local, etc.), and no global accounts are available.

Table 1 First-best total budget for the arts (T^*/w^*) and budget for artistic education (e^*/w^*)

ρ =	0.875		0.750		0.500	
	T^*/w^*	e^*/w^*	T^*/w^*	e^*/w^*	T^*/w^*	e^*/w^*
$\alpha = 0.05$	0.048	0.047	0.051	0.047	0.057	0.046
$\alpha = 0.10$	0.091	0.089	0.093	0.089	0.099	0.089
$\alpha = 0.15$	0.130	0.129	0.132	0.128	0.137	0.127
$\alpha = 0.20$	0.166	0.164	0.167	0.164	0.173	0.163

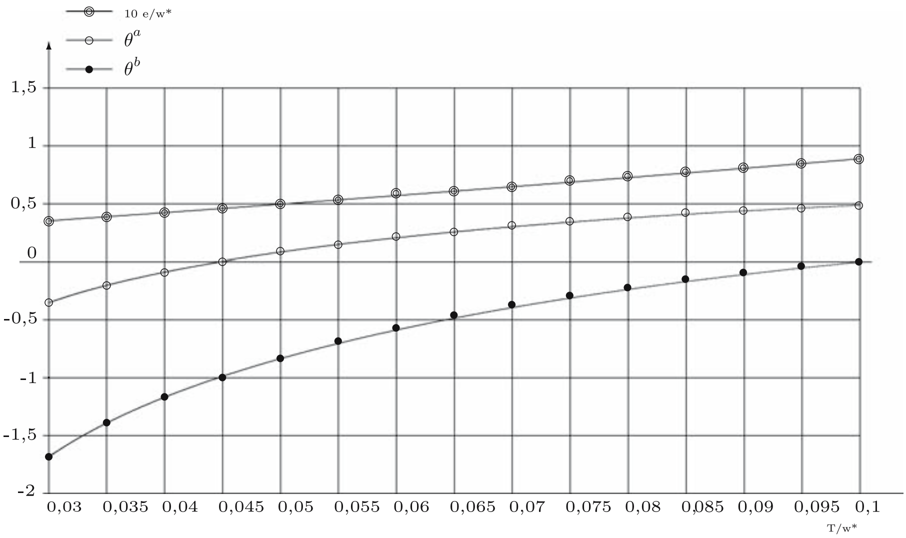

Fig. 1 Second-best solutions

and Tomes (1986), for whom "both biology and culture are transmitted from parents to children, one encoded in DNA and the other in a family's culture."

Several issues need to be discussed, however. The first is concerned with altruism. With altruistic agents, the external effect generated by families transmitting culture to their posterity would disappear, and public subsidies would no longer be needed. Pure altruism is, however, conflicting with the automatic character of the transmission of culture, which has been underlined above.[19]

There may also exist social externalities, acquired either from the close community of friends and schoolmates, or from the general cultural level of the population. These externalities can be represented by the mean value of the individual λ_{t-1} appearing in the $\phi(\cdot)$ functions, and again, subsidies will be needed to reach the first-best, even if consumers are altruistic. Thus, in the more realistic

[19] Parents buy books that they want to read, and do not necessarily think of their childrens' utility when choosing. The books are of course also available for their children to read, but this is considered as paternalism, and not as altruism, and leads to external effects.

case where both family and social externalities are at play, but only family externalities can be internalized if consumers are altruistic, public intervention will still be useful.

We show that retirees should not be subsidized. This is so because, in our model, they do not transmit culture to their grand-children. Should this be the case—it is often said that grand-parents take their grand-children to museums or to concerts—then the art consumption of the old would also need to be subsidized, at a rate that corresponds to their influence, and which may be different from that of the young. This (as well as the results of the model according to which old generations should not be subsidized at all) raises the question of whether it is possible to discriminate between generations. This is obviously the case for many cultural activities where presence is required, such as concerts, movies, theater plays, etc. But there are also many activities where this is impossible to implement: books and records can be bought by the young for the old, television can be watched without any control as to who watches, etc.

Heterogeneous agents, some of whom are better exposed to art than others, possibly because they finance education within their own group, would also lead to interesting questions, since different subsidy rates would be needed to decentralize the first-best. This would be implementable only if some characteristics related to the agents' heterogeneity can be observed, such as income, or the level of schooling.

However, the use of numerical simulations to study the consequences of second-best situations shows that for plausible parameter values, and since the government budget for the arts is smaller than what is required in a first-best *and* in a second-best, arts consumption of "old" consumers should be taxed, arts consumption of the young should not be subsidized, and all the proceeds of arts public expenditure should be devoted to arts education.

Acknowledgements We are grateful to two anonymous referees for their excellent suggestions. We are grateful to David de la Croix and Louis-André Gérard-Varet for comments on previous versions. Ginsburgh gratefully acknowledges financial support from CNRS, Paris and from the Belgian Government under Contract PAI P4/01.

Appendix

First-order conditions of the welfare optimum

An interior optimal solution of the welfare optimum of Sect. 3, should satisfy all the first-order conditions as well as the transversality conditions of the Lagrangian function where $\Omega^t q_t$ and $\Omega^t p_t$ are the multipliers associated with the constraints of the program. From these first-order conditions, one can derive the following conditions that should be satisfied in the stationary state of the welfare optimum:

$$\Omega f'(k^*) = 1 \tag{A1}$$

$$u'_c = p^* \tag{A2}$$

$$u'_d = \Omega p^* \tag{A3}$$

$$q^* \phi'_a = p^* \tag{A4}$$

$$u'_\mu \psi'_b = \Omega p^* \tag{A5}$$

$$\Omega q^* \phi'_e = p^* \tag{A6}$$

$$u'_\lambda + u'_\mu \psi'_\lambda = (1 - \Omega \phi'_\lambda) q^* \tag{A7}$$

$$\lambda^* = \phi(e^*, \lambda^*, a^*) \tag{A8}$$

$$k^* + c^* + a^* + d^* + b^* + e^* = f(k^*). \tag{A9}$$

In all these expressions, the derivatives are taken in the optimum. Combining (A2) and (A3), one sees that

$$\Omega u'_c = u'_d \tag{A10}$$

Combining (A2), (A4) leeds to $q^* = u'_c / \phi'_a$. Replacing q^* by this expression in (A7), one obtains

$$(u'_\lambda + u'_\mu \psi'_\lambda)\phi'_a = (1 - \Omega \phi'_\lambda) u'_c. \tag{A11}$$

Finally, from (A3) and (A5)

$$u'_\mu \psi'_b = u'_d. \tag{A12}$$

Steady-state conditions for consumers' equilibrium

In the steady-state, the following first-order conditions hold (for an interior solution):

$$u'_c = (1 + r) u'_d \tag{A13}$$

$$(1 - \theta^a) u'_c = (u'_\lambda + u'_\mu \psi'_\lambda)\phi'_a \tag{A14}$$

$$(1 - \theta^b) u'_d = u'_\mu \psi'_b, \tag{A15}$$

and the budget constraints

$$c = w - T^1 - (1 - \theta^a) a - s \tag{A16}$$

$$d = (1 + r)s - T^2 - (1 - \theta^b) b \tag{A17}$$

are satisfied.

Decentralizing the welfare optimum

We now check whether and how the first-best can be decentralized as a steady-state equilibrium solution. The steady-state resource constraints of the centralized problem are obviously satisfied in every equilibrium. With competitive producers, lump-sum transfers to consumers make it possible to reach the optimal capital stock for which, by (A1), $f'(k^*) = \Omega^{-1}$. Therefore, it is sufficient (a) to verify that the first-best satisfies the steady-state first-order conditions (A13)–(A15) of the consumers' problem, (b) to compute the necessary lump-sum transfers in order to satisfy the consumers' budget constraints (A16)–(A17) and (c) to verify whether the government's budget is in equilibrium.

(a) By (15) and (A1), $r^* = \Omega^{-1}-1$, and (A13) coincides with (A10). So do (A14) and (A11) iff $\theta^a = \Omega\phi'_{\lambda}$. Finally, (A15) coincides with (A12) iff $\theta^b = 0$.
(b) Setting $s = k^*$, $r = \Omega^{-1}-1$, $w = f(k^*) - k^* f'(k^*) = f(k^*) - \Omega^{-1} k^*$, equilibrium values for the transfers can be computed as:

$$T^1 = f(k^*) - \Omega^{-1}k^* - (c^* + (1-\theta^a)a^* + k^*) \tag{A18}$$

$$T^2 = \Omega^{-1}k^* - (d^* + b^*), \tag{A19}$$

using (A16) and (A17).
(c) Finally, adding (A18) and (A19) and using (A9), it is straightforward to check that:

$$T^* = T^1 + T^2 = e^* + \theta^a a^*,$$

which shows that the government budget (8) is also in equilibrium.

Second-best in a Cobb-Douglas economy[20]

The Marshallian demand functions and calibration

We substitute (18) and (19) in (20), and obtain

$$u = \log c + \beta \log d + \alpha_1 \log a + \alpha_2 \log b + \alpha_3 \log e + \alpha_4 \log \overline{\lambda}, \tag{B1}$$

where

$$\alpha_1 = \alpha\eta_1(1+\beta\delta_2), \alpha_2 = \beta\alpha\eta_2, \alpha_3 = \alpha\rho(1+\beta\delta_2), \alpha_4 = \alpha\delta_1(1+\beta\delta_2). \tag{B2}$$

To compute the indirect utility function, we first maximize (B1) under the budget constraint (17). This leads to the following Marshallian demand functions:

$$c = \gamma(w^* - T), \tag{B3}$$

$$d = \beta\gamma(w^* - T), \tag{B4}$$

$$(1-\theta^a)a = \alpha_1\gamma(w^* - T), \tag{B5}$$

$$(1-\theta^b)b = \alpha_2\gamma(w^* - T), \tag{B6}$$

where $\gamma = 1/(1 + \beta + \alpha_1 + \alpha_2)$.

Using French national accounts, as well as the results of a survey on cultural expenditures of French households carried out in 1995,[21] one can compute the

[20] Recall that, for simplicity, we assume that $\Omega = 1$.

[21] See Maresca and Pouquet (2000).

(inclusive taxes and subsidies) expenditure shares reproduced in Table A, which also shows the corresponding parameters to which they correspond in the Marshallian demand functions (B3)–(B6).

These are the basic parameters for the Cobb-Douglas economy, from which most of the other parameters will be deduced. See Sect. 4.3.

Computation of the indirect utility function

To derive the indirect utility function, we replace in (B1) c, d, a and b by their expressions in (B3)–(B6), also taking into account that, in the fixed point, $\lambda = \overline{\lambda}$ and that the government budget constraint $e = T - \theta^a a - \theta^b b$ has to be satisfied. This leads to the following expression of the indirect utility function:

$$\begin{aligned} V(\theta^a, \theta^b, w^* - T) =& (1/\gamma + \beta_1)\log(w^* - T) + (\alpha_1 + \beta_1)\log(1 - \theta^a)^{-1} \\ &+ \alpha_2\log(1 - \theta^b)^{-1} + \beta_2\log\Big[T - (\alpha_1\theta^a(1 - \theta^a)^{-1} \\ &+ \alpha_2\theta^b(1 - \theta^b)^{-1})\gamma(w^* - T)\Big] + \text{const.} \end{aligned}$$

where

$$\beta_1 = \alpha_4\eta_1/(1 - \delta_1), \beta_2 = \alpha_3 + \alpha_4\rho/(1 - \delta_1). \tag{B7}$$

To check for the concavity properties of this function, in $\theta^a < 1$, $\theta^b < 1$ for any $T \geq 0$, $w^* - T > 0$, $e > 0$, it is convenient to make the following substitution:

$$x^a = -\theta^a/(1 - \theta^a), x^b = -\theta^b/(1 - \theta^b), \tag{B8}$$

which leads to the following expression for the indirect utility function:

$$\begin{aligned} V(x^a, x^b, w^* - T) =& (1/\gamma + \beta_1)\log(w^* - T) + (\alpha_1 + \beta_1)\log(1 - x^a) + \alpha_2\log(1 - x^b) \\ &+ \beta_2\log\big[T + (\alpha_1 x^a + \alpha_2 x^b)\gamma(w^* - T)\big]. \end{aligned}$$

It is easy to check that this function is concave in x^a, $x^b < 1$ (which is true when to values θ^a, $\theta^b < 1$). Therefore, its maximum is characterized by the following first-order conditions:

$$\begin{aligned} \partial V/\partial x^a =& -(\alpha_1 + \beta_1)/(1 - x^a) \\ &+ \alpha_1\beta_2\gamma(w^* - T)/[T + (\alpha_1 x^a + \alpha_2 x^b)\gamma(w^* - T)] = 0, \end{aligned} \tag{B9}$$

and

$$\begin{aligned} \partial V/\partial x^b =& -\alpha_2/(1 - x^b) \\ &+ \alpha_2\beta_2\gamma(w^* - T)/[T + (\alpha_1 x^a + \alpha_2 x^b)\gamma(w^* - T)] = 0. \end{aligned} \tag{B10}$$

In the solution, the government budget constraint $e = T - \theta^a a - \theta^b b$ must also hold. Replacing a and b by (B5) and (B6), and using (B8), this constraint can be rewritten as:

$$e = T + (\alpha_1 x^a + \alpha_2 x^b)\gamma(w^* - T). \tag{B11}$$

Solving for the second-best optimum

Solving the system of three equation (B9), (B10) and (B11) in three unknowns x^a, x^b and e leads to:

$$e = \beta_2[T + \gamma(\alpha_1 + \alpha_2)(w^* - T)]/(\alpha_1 + \beta_1 + \alpha_2 + \beta_2), \tag{B12}$$

$$(1 - x^a)^{-1} = (1 - \theta^a) = \frac{\alpha_1(\alpha_1 + \beta_1 + \alpha_2 + \beta_2)}{(\alpha_1 + \beta_1)[(\alpha_1 + \alpha_2) + T/\gamma(w^* - T)]}, \tag{B13}$$

$$(1 - x^b)^{-1} = (1 - \theta^b) = \frac{(\alpha_1 + \beta_1 + \alpha_2 + \beta_2)}{(\alpha_1 + \alpha_2) + T/\gamma(w^* - T)}. \tag{B14}$$

Using (B12)–(B14), it is easy to check that:

(a) e is increasing in T since $\gamma(\alpha_1 + \alpha_2) < 1$,
(b) θ^a and θ^b are increasing in T,
(c) $\theta^a > \theta^b$.

Since θ^b is increasing in T and equal to zero in the first-best, we necessarily have $\theta^b < 0$ in the second-best. The condition $\theta^a > 0$ is equivalent to $(\alpha_1 \beta_2 - \beta_1 \alpha_2) \gamma (w^* - T) < (\alpha_1 + \beta_1)T$. There are thus two possibilities. Either $\alpha_1\beta_2 - \beta_1\alpha_2 \leq 0$ so that $\theta^a > 0$ for all $T > 0$. Or $\alpha_1\beta_2 - \beta_1\alpha_2 > 0$ and then $\theta^a < 0$ for small T, i.e., for T such that $T < \gamma(\alpha_1\beta_2 - \beta_1\alpha_2)/[\alpha_1 + \beta_1 + \gamma(\alpha_1\beta_2 - \beta_1\alpha_2)]w^*$.

Some first-best results

To compare first-best and second-best results, we need T^*, the first-best value of the government budget. This is obtained as follows. The first-best is the maximal value of the utility, obtained by substituting λ and μ by (18) and (19) in (20) and, in the fixed-point, setting $\overline{\lambda} = \lambda$, so that

$$u^* = \log c + \beta \log d + (\alpha_1 + \beta_1)\log a + \alpha_2 \log b + \beta_2 \log e.$$

The maximum of u^* subject to the golden rule resources constraint $f(k^*) - k^* = c + a + d + b + e$, leads to

$$e^* = \beta_2 w^*/(1 + \beta + \alpha_1 + \beta_1 + \alpha_2 + \beta_2), \tag{B15}$$

$$a^* = (\alpha_1 + \beta_1)w^*/(1 + \beta + \alpha_1 + \beta_1 + \alpha_2 + \beta_2),$$

since $f(k^*) - k^* = w^*$. Using the fact that the values of the optimal subsidy rates are $\theta^a = \delta_1$, $\theta^b = 0$, we obtain $T^* = e^* + \delta_1 a^*$, and

$$T^* = [\beta_2 + \delta_1(\alpha_1 + \beta_1)]w^*/(1 + \beta + \alpha_1 + \beta_1 + \alpha_2 + \beta_2). \tag{B16}$$

Table A Values of the main parameters

	Expenditure shares	
	Values	Parameters
Young generations		
Consumption good	0.654	γ
Culture	0.012	$\alpha_1 \gamma$
Old generations		
Consumption good	0.330	$\beta \gamma$
Culture	0.004	$\alpha_2 \gamma$

Parameterization of the Cobb-Douglas economy

From the values in Table A, it is easy to compute $\beta \simeq 0.5$, $\alpha_1 = 0.018$, and $\alpha_2 = 0.006$. We assume that the effect on the cultural stock of consuming arts is the same when young or old, which implies $\eta_1 = \eta_2$. Using (B2), one can check that $\alpha_1/\alpha_2 = (1 + \beta\delta_2)/\beta = 3$ and $\delta_2 \simeq 1$, which can be interpreted as "nothing is lost" in the transmission of cultural capital to oneself (when "switching" from young to old). We also assume that the effect of education (ρ) on the stock of culture of the young is equal to $(1 - \delta_1)$, to represent in a parametric way, the relative effects of education and family transmission.

Since it is hard to find values for α and δ_1, we shall, in the simulations, parameterize α for values ranging from 0.05 to 0.2 and δ_1 for values between 0.125 and 0.50.

Now the values of all the other parameters (α_3, α_4, β_1, β_2, η_1, η_2, ρ) can be computed as functions of α and δ_1, using (B2) and (B7).

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