U.S. Schooling and Health Care Revisited:

Assaying Uses of Gross Domestic Product

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ABSTRACT

In an exploratory study of certain aspects of the troubled U.S. schooling system (Melmed and Paelinck, 2002,) the authors considered the relative allocations of gross domestic product (GDP) for education and health care in the U.S. and The Netherlands for the year 1999. This led, in the present paper, to consideration of the implicit opinions and preferences of policy makers for the use of GDP for schooling and health care in the two countries for the two years, 1985 and 1999, demanding refinement in the specification of the model employed. While the calculated results are unsurprising, firm conclusions based on this original methodological approach used must await further probing with available time series data in the interval 1985 to 1999.

1. INTRODUCTION

In an earlier paper (Melmed and Paelinck, 2002,) the authors developed a theory and a method to study the possibilities for increased efficiency in the educational sector. Statistical information for the United States and The Netherlands, 1999, was used for illustrative purposes. This paper aims to refine the specification of the model; estimate its parameters, comparing results for 1985 and 1999; and evaluate changes in implicit opinions and preferences revealed by observed changes in the model parameters.

As to the latter point, it should be emphasized that the KECH model (recalled in the Appendix, section 5) includes a technical component (the growth function,) and a choice component. Based on analysis and experience, policy makers can be expected to have an implicit opinion on the relative efficiency of factors making up the technical component. Based on political and social considerations, they can also be expected to have implicit allocation preferences. Trying to infer these by confronting the model with hard facts, in casu real figures, extends the analysis much farther than the simulation approach used in the earlier paper. The relative weights of opinion and preference in decision-making can be expected to vary over time. (For further conceptual details on this approach, see Paelinck, 1976, and Ancot, Hughes-Hallet and Paelinck, 1982.)

We might initially imagine that opinions on the relative weights of factors affecting growth in the U.S. and The Netherlands, two advanced industrial countries and fellow members of OECD, would not diverge greatly; and that the same might be true of investment preferences. But it should be remembered that in the period under consideration, 1985 to 1999, the ordinarily placid waters of K-12 schooling were riled in the U.S. by politically voluble demands for multiculturalism, affirmative action and diversity, which like many other demands in democratic societies are soothed by increased expenditure that has little to do with rational expectations for economic growth and much to do with a requirement for domestic tranquility. We shall see what story the data have to tell us.

Finally, we should say why we have selected the categories we treat in this model, to wit consumption, investment, education and investment? In the first place, this already generalizes earlier policy models in which only consumption and investment are distinguished. But then, why only include education and health care, there being other interesting categories like infrastructure and defense expenditures? The answer is that each of the authors had already studied one of the two activities, education by the first author (Melmed and Fisher, 1991), health care by the second (who coined the term "medicometrics", which has become a much

practiced discipline in France and Switzerland; see Paelinck, 1984). We will return to this point in the conclusions.

2. EMPIRICAL RESULTS.

The results for the U.S. are as follows. From Melmed and Paelinck, 2002, Table 1, we have that:

c = .6337 e = .0599 h = .1288 k = .2002

where c is the part of consumption in Gross Domestic Product, e that of education, h that of health care, and k that of technical investment.

The extreme values for δ, the discount rate that reduces the future values of the variables, are .0815 and .2054 respectively. Table 1 below reproduces the results for an intermediate value δ = .15.

The computed (implicit) parameters tell a story. The technical parameters (α, β and γ, measuring the assumed impacts of technical capital, education and health care on the growth of the Gross Domestic Product) show that physical capital is thought to be more productive for growth (equation (3), Appendix, section 5.1) than education, with health care being judged of little importance. Alternatively, the preference parameters for consumption, education and heath care (ρ, σ, and τ) show high relative preferences for consumption and health care, with education occupying the low position.

We can speculate that U.S. policy makers are aware that skilled labor can be imported; and amply aware of health demands on their typically advanced age.

As for The Netherlands, 1999, the results are based on the following figures:

c = .6136 e = .0455 h = .0818 k = .2145

The minimal and maximal values for δ are .0898 and .1727 respectively. Table 2 gives again the parameter values for an intermediate value δ = .15.

The story told is largely the same as that for the U.S., except for a higher social valuation on education. Overall, this does not surprise. The two societies, belonging to Western civilization are not fundamentally different, nor the data on which the computations are based (c, e, h and k) fundamentally divergent. That education has a higher social valuation in the more mature society of The Netherlands than the U.S. does not surprise either.

The impact of the choice of r = .05, the presumed rate of growth of the Gross Domestic Product, remains to be studied, but preliminary investigation shows a (logical) increase in efficiency valuation of the technical factors.

Table 3 hereafter shows the breakdown of GDP for 1985, tables 4 and 5 reproducing the resulting revealed opinion and preference parameters (sources: same as in Melmed and Paelinck, 2002; further OECD 2000, 2001, 2002).

Again lower and upper limits for δ have been computed (U.S.: .0940-.2188; Netherlands: .0894-.1844), and again an intermediate value δ = .15 is used in Tables 4 and 5.

The stories told by comparing Tables 1, 2, 4 and 5 are much the same: (1) little overall variation in appreciation by policy makers in the U.S. and The Netherlands of the efficiency of physical capital and education; and (2) a decrease in valuation of health and an increase in valuation of education at the two time endpoints, 1985 and 1999.

Table 1. Parametric results for the United States, 1999.

⇓δ Par.⇒	α	β	γ	ρ	σ	τ
.15	.1956	.1811	.0000	.4821	.0358	.4821

Table 2. Parametric results for The Netherlands, 1999.

δ⇓ Par.⇒	α	β	γ	ρ	σ	τ
.15	.2088	.1144	.0000	.4087	.1841	.4072

Table 3. Relative GDP use, 1985.

Country	c	e	h	k
U.S.	.6668	.0587	.1000.	.1958
The Netherlands	.6180	.0621	.0780	.2056

Table 4. Parametric results for the United States, 1985.

$\delta\Downarrow$ Par. $\Rightarrow$	α	β	γ	ρ	σ	τ
.15	.1958	.1958	.0016	.5021	.0000	.4979

Table 5. Parametric results for The Netherlands, 1985.

$\delta\Downarrow$ Par.$\Rightarrow$	α	β	γ	ρ	σ	τ
.15	.2075	.1181	.0000	.4113	.1773	4113

3 CONCLUSIONS

It is too soon to draw hard conclusions about implicit opinions and preferences of policy makers from the results thus far obtained, but it should be said that the model specification and the implicit parameter computations rest on an original and valid approach which should be more generally applied.

The results found need to be confirmed by a larger sample of observations; indeed, and in the first place, in order to confirm the validity of the approach, the parameters should be computed as a complete series over intervals of time, to check whether jumps or discontinuities (so-called "ratchet-effects"; see Merkies and Weitenberg, 1970, pp.114-115) have been present at some time. In the second place, more countries should be investigated, an obvious candidate being Finland, as knowledge about the underlying decision processes is known to be available. Finally, the categories used in the analysis should be expanded, as already hinted at earlier in the Introduction.

Last but not least, feedback to political decision makers is in order, to inform them about how the ways they choose to tread come implicitly about; much political decision making is still "ad hoc", and should gain in quality and democratic character by being made more consciously; econometrics can support that objective.

4. REFERENCES

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5. MATHEMATICAL APPENDIX

5.1. The KECH-model revisited

To repeat, the name of the model originates from its four components: technical capital (K), educational expenditures (E), private and public consumption (C), and expenditures for health care (H).

Reflecting on its initial specification (Melmed and Paelinck, 2002, equation (2), Appendix), it is more transparent to rewrite the instantaneous equation of the model as:

$$\psi = y_o \exp(rt)\ \varphi \qquad (1)$$

where y_o is initial GDP, r its instantaneous rate of growth and φ the (implicit) preference function. Then:

$$y_t = y_o \exp(rt) \qquad (2)$$

And the variables r and φ are defined as follows:

$$r = \alpha k + \beta e + \gamma h \qquad (3)$$

where k, e and h are the shares in GDP (percentages divided by 100) of physical investment, education and health care respectively; α, β and γ are the parameters that measure their influence on the rate of growth, r; and,

$$\varphi = \rho c + \sigma e + \tau h \qquad (4)$$

where c is the share of consumption (private plus public) in GDP.

Of course, one further has the accounting identity:

$$c + k + e + h \equiv 1 \qquad (5)$$

i.e. it has always to be true, as GDP (apart from the trade balance and inventory changes, neglected here) is always consumed in this way.

The discounted instantaneous preference function at time t is defined logarithmically, as in Melmed and Paelinck, 2002:

$$\ln \varphi \exp(-\delta t) = (\ln y_o + rt + \ln \varphi)\exp(-\delta t) \qquad (6)$$

and the discounted preference function over an infinite interval of time as:

$$\omega = \int_0^\infty \ln \varphi \exp(-\delta t) = \delta^{-1}(\ln yo + \delta^{-1} r + \ln \varphi) \qquad (7)$$

or a concave function. Deriving, in order to obtain the first-order conditions for its maximum, with respect to k, e and I, taking into account (5), and equating the result to zero, we obtain:

$$\delta\rho = \alpha\varphi \qquad (8)$$

$$\delta\sigma = (\alpha-\beta)\varphi \qquad (9)$$

$$\delta\tau = (\alpha-\gamma)\varphi \qquad (10)$$

One can observe that the resulting values of c, e and h increase with δ - at the expense of k -, the reason being that they are the only variables present in the φ-function. This explains also that $(\alpha-\beta)$ and $(\alpha-\gamma)$ appear in (9) and (10) as positive terms, otherwise k would be zero.

5.2 Implicit opinions and preferences.

We next derive the implicit values of α, β, γ, ρ, σ, τ and δ. The meaning thereof is the following. If political decision makers handled a function like (7) to decide about the allocation of GDP, and given the resulting (observed) values of c, e, h (and via (5) of k), one should be able to compute how they estimated the set of seven parameters.

Equations (8) through (10) are used in the exercise, together with equation (3) in which the growth rate has (provisionally) been put equal to .05. Moreover:

$$\rho + \sigma + \tau = 1 \qquad (11)$$

as non-negativity conditions have to be imposed.

As the system is obviously underdetermined (seven unknowns, five equations) a maximal and minimal value for δ was computed, and the system of equations solved for some intermediate values, by means of maximizing φ.