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**Working Paper**

## Issues in the estimation of dynamic happiness models: A Comment on "Does childhood predict adult life satisfaction?"

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## **Issues in the estimation of dynamic happiness models: A Comment on "Does Childhood Predict Adult Life Satisfaction?"**

*Alan T. Piper and Geoffrey T. Pugh*

**Abstract**

This short note offers methodological comments on an *Economic Journal* article (Frijters, P., Johnston, D.W. and Shields, M.A. (2014). Does Childhood Predict Adult Life Satisfaction? Evidence from British Cohort Surveys. *Economic Journal* 124(580): F688–F719). The comments consider its use of a dynamic model – the inclusion of a lagged dependent variable – and its employment of General Method of Moments (GMM) estimation.

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**Keywords** Life Satisfaction; dynamic panel analysis; GMM

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## Issues in the estimation of dynamic “happiness” models: A Comment on ‘Does Childhood Predict Adult Life Satisfaction?’

Two papers published in the *Economic Journal* in 2014 have attempted to investigate the influence of the past on adult well-being (Frijters et al. 2014; Layard et al. 2014). To do so they have used two sets of British Cohort data: the National Child Development Survey (NCDS) which tracks individuals born in a particular week in 1958; and the British Cohort Survey (BCS), which follows individuals born in a particular week in 1970. Every few years, individuals (or, for the early years, parents and teachers of the individuals) are asked many questions about their development, behaviour and contextual influences; in turn, these two studies link the answers of, and for, the child with later survey responses of the individual as an adult. This comment will focus on two problems of the empirical analysis of Frijters et al. (2014).<sup>1</sup> The putative problems will be illustrated with analysis of panel data sets commonly used for the investigation of well-being, the British Household Survey (BHPS) and the German Socio-economic Panel (SOEP). Although we use different datasets for convenience – neither author has access to either the NCDS or to the BCS – the force of the critique is not thereby reduced. It is sufficient to our purpose to present evidence that the authors’ approach to estimation is unlikely to yield results that are generally valid.

The problems arise when the studies address dynamics in their analysis. In section 3.3 of Frijters et al. (2014) lagged life satisfaction is introduced as an explanatory variable, and the estimation undertaken with OLS. This is problematic because the OLS point estimates for the lags of the life satisfaction variables are biased upwards (Bond, 2002), substantially overestimating the impact of past life satisfaction on current life satisfaction. Indeed, due to this upward bias, OLS can be usefully used as the upper limit for a plausible estimate of the lagged dependent variable. The lower limit comes from fixed effects estimation of the same equation, in which the coefficient on the lagged dependent variable is biased downwards (Nickel 1981). In Table 1, we demonstrate these biases with the BHPS and SOEP, by estimating a standard life satisfaction model using OLS (following Frijters et al. 2014.), FE (for comparison) and system GMM (widely regarded as appropriate for “wide-N, shallow-T” panels).

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<sup>1</sup> Though the first problem discussed below is also shared by Appendix B of Layard et al. (2014)

Table 1: illustration of biases from estimating dynamic models with OLS and FE

	Lagged dependent variable (OLS)	Lagged dependent variable (FE)	Lagged dependent variable (GMM)
SOEP	0.409	0.033	0.093
BHPS	0.487	-0.177	0.115

The standard GMM diagnostic tests are satisfactory as is the standard check that the GMM estimate lies in between the OLS and FE estimates. The full results are available on request.

Frijters et al. (2014) do employ GMM to investigate what they call shocks to well-being. This is a simple autoregressive model regressing current life satisfaction on lagged life satisfaction with no other explanatory variables. However, the number of instruments is not reported and no diagnostic test outcomes are reported. Yet the number and type of instruments together with diagnostic outcomes affect greatly the size and validity of the reported estimates. Simple experiments with the SOEP and BHPS (see below) replicating equation 8 in Frijters et al. (2014) suggest that there may be no acceptable diagnostic outcome. Our inability to estimate their equation 8 with acceptable model diagnostics using the SOEP and the BHPS do not necessarily mean that this model cannot be estimated with validity using the BCS. Yet this comparison does illustrate the need to know (much) more about the statistical characteristics of the equation estimated. Table 2 shows that, in our estimates, using various patterns of instrumentation (1 ., all available instruments; 1 1, minimum instrumentation; and 2 3, a representative intermediate level of instrumentation) the size of the coefficient for the lagged dependent variable ranges from about 0.13 to 0.71 for the SOEP and from 0.10 to 0.55 for the BHPS, while the diagnostic tests uniformly reject the null of model validity with complete certainty.

Table 2: illustration of differing coefficients and diagnostic test results from GMM analysis

SOEP	Coefficient for lagged life satisfaction	Sargan test of overidentifying restrictions (p-values)	Diagnostic tests: (AR2) (P-values)	Number of instruments
Endogenous Lag length (1 .)	0.145 (0.005)	0.000	0.000	36
Endogenous Lag length (1 1)	0.130 (0.005)	0.000	0.000	15
Endogenous Lag length (2 3)	0.713 (0.046)	0.000	0.000	18
BHPS	Coefficient for lagged life satisfaction	Sargan test of overidentifying restrictions	Diagnostic tests: (AR2)	Number of instruments
Endogenous Lag length (1 .)	0.117 (0.006)	0.000	0.000	44
Endogenous Lag length (1 1)	0.114 (0.006)	0.000	0.000	15
Endogenous Lag length (2 3)	0.542 (0.071)	0.000	0.000	15

\* Robust SEs in brackets.

Changes in instrumentation have a sizeable impact on the estimates. A different choice in terms of instrumentation by Frijters et al. (2014) is likely to result in a different coefficient for the lagged dependent variable and, therefore, a totally different understanding of, in their terms, happiness shocks, or the influence of the past on current well-being. Overall, the results reported in Table 2 show that with no information about the instrumentation or corresponding diagnostics it is difficult to have much confidence in their results.

Our final point is that the use of GMM raises the question of the acceptability of instruments that come from data that is at least five years previous to the variables being instrumented. There is current debate in the literature about weak and strong instrumentation in the context of GMM estimation, in contrast to the better understood topic of valid and invalid instrumentation (Clemens et al 2004; Bazzi and Clemens 2009). However, this concern over weak instruments in (difference and) system GMM estimation, and particularly regarding corresponding solutions, still seems to be at a rather tentative stage, with no agreed approaches. However, this should not be an invitation to researchers to ignore the issue. Rather, this concern emphasises the need for explanation and presentation of the chosen instruments together with the available diagnostics.

This short comment has raised two concerns about part of the empirical analysis of Frijters et al. (2014) and one speculative concern about the use of GMM with cohort data. In summary, ordinary

least squares should not be used when using a lag (or lags) of the dependent variable as an explanatory variable(s). And when GMM, a more appropriate model for modelling dynamics, is used much more information is necessary to be able to judge, and have confidence in, the obtained results.<sup>2</sup> The speculative point suggests that GMM is unlikely to be appropriate with data where the waves are infrequent.

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<sup>2</sup> A recent application of dynamic modelling and GMM in the broad area of “happiness” studies is Piper (2015).

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