



Thermostat settings in English houses: No evidence of change between 1984 and 2007

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ABSTRACT

Rising demand temperatures are widely blamed for UK home energy use not declining over time despite the increased efficiency of dwelling envelopes and heating technologies. The hypothesis that thermostat settings have risen over time is tested using a repeated cross-sectional social survey of owners of centrally heated English houses. No statistical evidence for changes in reported thermostat settings between 1984 and 2007 is found.

Why, then, has home energy use not declined over time, despite homes apparently becoming more efficient? There is evidence that the energy efficiency of homes has not improved as much as previously assumed. Improvements in dwelling energy efficiency and increased penetration of central heating would have increased internal temperatures without occupants *demanding* higher temperatures. Dwelling area heated, or duration of heating, or window opening during the heating season may have increased over time, increasing temperatures or energy use.

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1. Introduction

The UK government blames rises in heating temperatures for residential energy use not declining despite improved energy efficiency. If that blame has been misdirected, it may have delayed the identification of other reasons for home energy use not declining, and may thus have delayed effective action to reduce home energy use.

Space heating accounts for around a half of UK household carbon emissions, which are responsible for about a quarter of UK carbon emissions [1]. Under the Kyoto Protocol, the UK government is committed to reducing greenhouse gas emissions to 12.5% below 1990 levels by 2012 [2].

Many UK government policy documents e.g. [1,3–5] claim that increasingly warm homes are partly to blame for dwelling energy efficiency improvements not realising their predicted energy and carbon savings. The source of these claims is Utley and Shorrocks, who blame increasing ‘standards of comfort’ for space heating energy consumption not declining despite the reduction in heat loss from the average home over the last few decades [6, p.133]. They suggest that average winter internal temperatures rose more than 4 °C between 1984 and 2004 – from 13.6 °C to 18.0 °C. However, a closer reading of this work suggests that they may have *assumed* winter internal temperatures have risen over time to explain average home energy use not decreasing despite home energy efficiency increasing [7,8]. The problem they and others have faced is that very few

empirical studies have measured whether winter internal dwelling temperatures have changed over time.

Average English living room temperatures increased between 1986 and 1996 from 18.0 °C to 19.1 °C, and average hall temperatures increased from 16.3 °C to 17.9 °C [9]. However, in a small sample of centrally heated houses, living room and bedroom temperatures (standardised to external temperatures of 5 °C) did *not* increase between 1990 and 2005 [10]. This sample was, however, a small non-probability sample of low-energy houses and not selected to enable generalisation to the population [11]. Their study design was a longitudinal *panel*, appropriate for measuring change in individual dwellings over time, but not for estimating change in the population over time unless a rotating panel design is used [12–15]. In contrast, repeated cross-sectional studies sample the entire population at two or more points in time [12–14]. As the population changes over time, the new samples remain representative of that population. Thus repeated cross-sectional studies are good at estimating net change in the whole population [13–15].

This paper uses empirical data from a repeated cross-sectional study of households to test the claim that households’ comfort requirements have increased over time.

2. Method

2.1. INT84: Intensive 1984 home energy use survey

INT84 was a study of home energy use in South Eastern England in winter 1984 [16]. The population of interest was owner-occupied

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