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Experience sampling in and around airports. Momentary subjective wellbeing, airports, and aviation noise in England

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ABSTRACT

We explore the wellbeing of people in and around English airports using real-time data from a large spatial positioning experience sampling dataset (Mappiness). We analyze the association between subjective wellbeing reported in the moment and aviation, in terms of airport location, aircraft noise, and activities within airports. This is the first time that a large Experience Sample Method (ESM) of momentary wellbeing measurements has been used to quantify the associations between aviation and subjective wellbeing. Being within areas of high levels of aircraft noise is associated with lower levels of happiness and relaxation. Those surveyed in proximity to airports report significantly lower levels of relaxation. These findings have important implications to policy. Exploiting the panel nature of the ESM data provides the strongest causal claims to date of the negative association between aviation activities and subjective wellbeing. The Mappiness application also allows us to assess the association between airports and wellbeing on those inside them, and divide activities within airports between those who work there and those who are passing through for travel purposes, as well as the effects of aircraft noise beyond airports. This gives us a broader insight into the range of impacts, both positive and negative, that aviation has on peoples' momentary wellbeing, which may be used to inform aviation noise mitigation and compensation policies in the future.

1. Introduction

Aviation provides a range of economic and social benefits, ranging from jobs and employment at the local and national level, to the individual leisure benefits of foreign holidays (Airports Commission, 2013; Caves, 2003; Reynolds et al., 2007). However, aviation noise is also a leading environmental complaint in the European Union (European Parliament, 2002), and an issue of intense public debate for residents in affected areas around airports (Howarth and Griggs, 2013). Aviation noise and pollution are associated with negative health and wellbeing effects (Black et al., 2007; Clark and Stansfeld, 2011; Franssen et al., 2004), and environmental damages (Wolfe et al., 2014), all of which are associated with lower levels of individual welfare (Frey and Stutzer, 2010; MacKerron and Mourato, 2009; Welsch, 2006).

In recent years there have been calls for alternative metrics to the standard monetary national GDP and cost-benefit analysis (CBA) to be used for estimating the impacts of policies and interventions (Stiglitz et al., 2009). The trend to date in academic and policy discourse on aviation impacts has focused on objective list measures and preferences, for example noise, health and GDP

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(Dolan et al., 2011; Navrud, 2002). However, increasing attention is being placed on subjective wellbeing (SWB) data in policy decisions and academic research, evidenced by the growing number of academic publications and recent government-level guidance on using wellbeing metrics in policy evaluation (Fujiwara and Campbell, 2011; OECD, 2013). Traditional preference-based accounts of welfare are based on the premise that we can infer welfare from looking at people's choices and market behaviour (Parfit, 1984). However, this approach relies on perfect functioning markets to signal the effects that non-market externalities have on welfare. In contrast, SWB accounts refer to people's subjective experiences of their own wellbeing. They look at how the individual feels and thinks about their life, measuring what conditions make people feel their lives are going better or worse. This provides a more direct account of the effects that a non-market good, like environmental noise, has on peoples' welfare. In addition, the SWB approach is particularly attractive because it excludes the possibility of framing effects and response bias that arise when asking people directly about their experience living with noise (Kahneman and Tversky, 1984).

To date, few studies have addressed the impacts of airport proximity or noise on SWB, or have been limited to surveying the impact of aviation at the global or household level on those that live around airports or within aircraft noise contours (Lawton and Fujiwara, 2016; Navrud, 2002; Van Praag and Baarsma, 2005). This is the first study to explore the relationships between airports and SWB using a large Experience Sampling Method (ESM) dataset for the United Kingdom (UK). The Mappiness survey provides over a million observations taken in real-time during different moments of the day. ESM surveys allow us to explore issues of causality in a more robust way than standard regression analysis (which is the method typically used to assess the drivers of wellbeing in the academic literature). This is because our ESM survey collects data from the same individuals over short periods of time (usually around a few months). The structure of the ESM surveys means that most other drivers of an individual's wellbeing are controlled for as individual fixed effects, meaning that we can better single out the impact of an activity or event on someone's wellbeing. ESM methods provide the closest estimate to causal effects that can be achieved with wellbeing data, excluding the use of randomised control trials (Csikszentmihalyi and Hunter, 2003; Stone and Shiffman, 1994). This means that the level of causal inference are stronger than in existing studies of aviation and SWB which use cross-sectional data (Lawton and Fujiwara, 2016; Navrud, 2002; Van Praag and Baarsma, 2005), providing greater certainty for policy-makers. Furthermore, the Mappiness application provides a more fine-grained alternative to analyzing SWB than national household datasets as peoples' responses are more closely aligned with specific locations and activities undertaken at the time of the survey.

Our analysis using the Mappiness data considers three potential impacts: (1) the association between being near an airport and affective wellbeing (at the time of the survey); (2) the association between being in an airport noise contour and affective wellbeing (at the time of the survey); and (3) the association between working in an airport and non-work activities (leaving/departing/picking up or dropping off people for non-work reasons) and affective wellbeing.

Mappiness provides a number of insights of relevance for practitioner and policy purposes. Since SWB responses in Mappiness are more closely aligned with the activity of interest and provide longitudinal data for each individual over the course of a day, we are able to make more robust inferences about the direction of cause and effect between aviation and SWB (Kahneman et al., 2004). This gives us a broader insight into the range of impacts, both positive and negative, that airports have on the wellbeing of those in and around them. It allows us to divide activities within airports between those who work there and those who are passing through for what we assume are travel purposes, as well as capture the effects of aircraft noise beyond airports, in ways which have not been explored in previous cross-sectional analysis. This provides important insights on the impacts of aviation noise on wellbeing, and the aviation features that have most affect, positive and negative, on individual wellbeing. In the final analysis, we outline how these analytical insights may be used to quantify potential mitigation and compensation measures required to offset the impacts of aviation activities on those whose wellbeing is negatively affected.

2. Literature review

The use of SWB data for academic and policy purposes has tended to focus on two broad categories of wellbeing (Di Tella and MacCulloch, 2006; Diener et al., 1999; Dolan et al., 2008; Frey and Stutzer, 2002; Kahneman et al., 2003). Evaluative SWB data, such as life satisfaction, are usually measured in annual national surveys, such as the Annual Population Survey (APS) in the UK. The most commonly used measure of evaluative SWB taps into a cognitive assessment of one's life, which incorporate an assessment of how well one's life measures up to aspirations, goals, and peers, as well as a reflection on how one feels now (Diener, 1984; Kahneman and Krueger, 2006).

The majority of studies on aviation and SWB to date have explored evaluative measures of SWB. Lawton and Fujiwara (2016) merge English population statistics on 189,162 individuals at the postcode level, provided by the APS, with noise measurement maps for seventeen English airports to test for associations between aviation noise and airport proximity within 5 km of an airport. They find a consistent negative association between the presence of daytime aviation noise at and above 55 dB and five SWB measures, including evaluative measures of life satisfaction, eudemonic sense of worthwhile, and affective measures of happiness (yesterday) and anxiety (yesterday), as well as positive affect balance (PAB). The magnitude of the impact is equivalent to around half the effect of being a smoker for some wellbeing measures, with a marginal negative association detected with every additional decibel of aircraft noise. Notably, the study finds no significant association between wellbeing and living in close airport proximity. The study also finds no significant association between SWB and living within night-time noise contours.

The Lawton and Fujiwara (2016) study is limited in the geographical level at which it captures the effects of aircraft noise or airport proximity. Household surveys record SWB at the residential postcode level. Furthermore, data in the APS is cross-sectional, meaning that it captures a one-off measure of an individual's SWB, and is therefore unable to capture factors operating on the individual at the time the survey is conducted. For this reason, the results of analysis on large-scale national cross-sectional datasets

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