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The Host with the Most? The Effects of the Olympic Games on Happiness

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Abstract
We show that hosting the Olympic Games in 2012 had a positive impact on the life satisfaction and happiness of Londoners during the Games, compared to residents of Paris and Berlin. Notwithstanding issues of causal inference, the magnitude of the effects is equivalent to moving from the bottom to the fourth income decile. But they do not last very long: the effects are gone within a year. These conclusions are based on a novel panel survey of 26,000 individuals who were interviewed during the summers of 2011, 2012, and 2013, i.e. before, during, and after the event. The results are robust to selection into the survey and to the number of medals won.

Keywords: subjective wellbeing, life satisfaction, happiness, Olympic Games, natural experiment
JEL Classifications: I30; I31; I38; L83; Z20; Z28

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1 Introduction

Can large scale events, such as the Olympic Games, make people happier? The original Olympic Games were staged every four years in Olympia in Ancient Greece as a religious and athletic festival from around the 8th century BC until 393AD.[1] Centuries later, Baron Pierre de Coubertin created a committee to restart the Olympic Games, and the first modern Olympiad was celebrated in Athens in 1896. The Games in Rio de Janeiro are the 28^{th} summer Games in the modern period, and there have been 22 winter Games. From the outset, the International Olympic Committee (IOC) has invited cities around the world to act as hosts of the event.

Until the 1960s, the Olympics were relatively modest affairs with limited finance and investment. The television era of watching sport, combined with the capacity to reach a global audience, however, has enhanced the prestige of the event. This has encouraged fierce competition amongst cities to host the Games, and resulted in a significant rise in expenditure on staging the event. The 1956 Summer Olympics in Melbourne cost approximately $63 million (in 2016 prices), including construction costs.[2] In contrast, the 2012 Summer Olympics in London required government subsidies of $15 billion alone to cover the direct costs (NAO, 2012).[3]

Given the public interest in the Olympics and the large public subsidies that they now require, a significant academic literature has sought to measure the economic impact of the Games. Much of this literature is devoted to rebutting the claim (often made by economic consultancies on behalf of government officials in order to justify public subsidies) that the Olympics generate substantial multiplier effects by stimulating investment and tourism. Most

[1] The widely used date for the first Olympic Games is 776 BCE. However, the first known list of champions dates from the fifth century BCE and the method of calculating the date was refined by Aristotle and Eratosthenes about 100 years after that. Other ancient writers disputed this date (Nelson, 2007).

[2] The Official Report of the Organizing Committee for the Games of the XVI Olympiad, Melbourne (1956: 35-39) reported a total cost of Australian pounds 4.5 million, including 2.4 million of construction expenditures; http://library.la84.org/6oic/OfficialReports/1956/OR1956.pdf.

[3] The NAO's post-Games review also cited several additional sources of costs not included in the official budget, including land acquisition, the costs of the legacy program, the costs of government departments and agencies incurred on Olympics-related tasks, and contributions to turning the Olympic Village into affordable housing (NAO, 2012: 26-27).

academic studies find little evidence of any tangible long-term economic impact.[4] In a recent review, Baade and Matheson (2016: 202) state that "*the overwhelming conclusion is that in most cases the Olympics are a money-losing proposition for host cities*".

Given these findings, many proponents of the Games now suggest that one of its main contributions are the intangible impact on the people who host them. The UK government's assessment of the 2012 Summer Olympics in London focused on intangibles such as "inspiring a generation of children and young people", community engagement, and enthusiasm for volunteering (DCMS, 2013). There is also evidence that citizens are willing to pay substantial sums to host these events (Atkinson et al., 2008). A national opinion poll conducted immediately after the 2012 Summer Olympics found that 55% of respondents believed that the public expenditure on the Games had been well worth the investment.[5] Arguably, an important part of the value of public expenditure is the legacy effect, i.e. the long-term benefits of the Olympics.[6]

We study the nature and the extent of the hypothesized "intangible" impact of the Olympic Games on the inhabitants of the host city. We also enquire into whether the effects, if any, persist for at least one year after the Olympics. To achieve these aims, we use measures of subjective wellbeing (SWB) that have been developed and tested by economists and psychologists for about two decades in order to assess how people think and feel about their

[4]This argument has several dimensions. The general economic principles are addressed by Crompton (1995), Porter (1999) and Siegfried and Zimbalist (2000). Computable General Equilibrium modelling has identified negligible or even negative impacts in the cases of London 2012 (Blake, 2005) and Sydney 2000 (Giesecke and Madden, 2007). Ex post studies of local employment and wages (Baade and Matheson, 2002; Coates and Humphreys, 1999, 2003) find little evidence of impact related to sports infrastructure in general, while Jasmand and Maennig (2008) find evidence of income growth effects associated with the 1972 Munich Olympics, but no employment effects. Tourism effects of major sporting events such as the Olympics and the FIFA World Cup have been studied by Fourie and Santana-Gallego (2011) who find evidence of significant increases in tourist arrivals prior to the major sporting event but no long-run impact after the event. Tiegland (1999) documents the absence of anticipated long-term tourism benefits following the 1994 Lillehammer Winter Olympics. There is some evidence that sports facilities in general and construction associated with the Olympics in particular have a positive effect on property values: on the London Games, see Kavetsos (2012a), and for other examples see Feng and Humphreys (2012), Ahlfeldt and Maennig (2010) and Ahlfeldt and Kavetsos (2014). Billings and Holladay (2012) find no significant effects of hosting the Olympics on GDP per capita. Preuss (2004) offers an economic history of financing and expenditure on the Olympics Games since Munich 1972.

[5]"A new Guardian/ICM poll has revealed that 55% of Britons say the Games are "well worth" the investment because they are doing a valuable job in cheering the country during hard times, outnumbering the 35% who regard them as a costly distraction from serious economic problems." The headline to the article reads "London 2012's Team GB success sparks feel good factor" www.theguardian.com/sport/2012/aug/10/london-2012-team-gb-success-feelgood-factor.

[6]The concept of "legacy" has become increasingly important in the rationalization and celebration of the Olympic Games, and this was particularly pronounced in the case of London 2012. The Final Report of the IOC Coordination Commission on the Games mentions the word no less than 90 times in its 127-page report. The concept was used in a number of contexts, including leaving a sporting legacy in the UK (increased participation in sport), a legacy for East London (regeneration of a depressed region), volunteering (increased community engagement of the population), growth in tourist arrivals, and increased foreign direct investment (IOC, 2013). The legacy issue is clearly important given the large public subsidy devoted to hosting the Olympics.

lives. There is an accumulation of evidence on how to measure SWB, its correlates, and some of its causes.[7] Economists are showing increasing interest in the use of SWB measures, as these might capture a richer array of intangible effects than allowed for by considering stated preferences or preferences revealed through marker behaviors. To make causal inferences, economists typically rely on clear exogenous variation. We consider the choice of the host city a natural experiment, and therefore the basis for our identification strategy.

Accordingly, we designed our own surveys and collected panel data in three European capitals, interviewing 26,000 residents over three years from 2011 to 2013, totaling up to 50,000 individual interviews. This allows us to estimate the intangible impact of the Olympics on citizens in the host city using a difference-in-differences design. Our treatment city is London, which hosted the 2012 Summer Olympics: Paris and Berlin represent our two control cities. We experiment both with pooling Paris and Berlin based on their broad similarity to London, and with treating them differently in recognition of Paris as the 'favorite', but failed, bidder for the 2012 Summer Olympics. In addition to exploiting the choice of the host city as a natural experiment, and in addition to being able to net out unobserved heterogeneity in our panel data, we randomized in all three cities the day when subjects were surveyed, i.e. before, during, or after the precise period of the Games.

Our main result is that the Olympic Games increased happiness among Londoners during the Games, relative to Parisians and Berliners. In terms of potential "legacy" effects, we find that the effect of the Olympic Games is short-lived. Whilst the effects are especially strong around the opening ceremony, we see no lasting change in happiness when we go back to our respondents the following year. These results are robust to controlling for observables, selection into the survey and attrition, and how we chose the counterfactual and the actual timing of the Olympic Games.

The paper is organized as follows. The next section describes the data collection in the three cities during the three years and the survey items. Section 3 derives the empirical model and identification strategy. Section 4 presents the main results. Section 5 examines their robustness with respect to selection into surveys, choice of control group, and extended controls. Here, we also conduct a series of placebo tests using both placebo outcomes and

[7]Earlier research defined this account of welfare as 'experienced utility' (see Kahneman et al., 1997). Since then there has been increasing interest among policymakers in using measures of SWB to monitor progress and evaluate policies (e.g., Stiglitz et al., 2009; HM Treasury, 2011; Dolan and Metcalfe, 2012; OECD, 2013; National Research Council, 2013). Economists have been interested in using SWB to measure the intangible costs and benefits of policies and events (see Di Tella et al., 2001; van Praag and Baarsma, 2005; Oswald and Powdthavee, 2008; Cattaneo et al., 2009; Luechinger and Raschky, 2009; Stevenson and Wolfers, 2009; Metcalfe et al., 2011; Ludwig et al., 2012; Bayer and Juessen, 2015; Goebel et al., 2015; Eibich et al., 2016; Krekel and Zerrahn, 2016; Krekel et al., 2016) and how people's choices link to their SWB (Rayo and Becker, 2007; Ifcher and Zarghamee, 2011; Benjamin et al., 2012, 2014a, 2014b; Adler et al., 2015; Feddersen et al., 2016). In a study in similar spirit, to ours Kavetsos and Szymanski (2010) examine the cross-sectional impact of sporting impacts on life satisfaction.

time periods. Section 6 shows heterogeneous effects with respect to socio-demographics and medals won. Finally, Section 7 discusses legacy effects, and Section 8 concludes.

2 Data

2.1 Sample

We use a quasi-experimental design, surveying an overall panel of over 26,000 individuals in London (host), Paris, and Berlin over the summer periods of 2011 (before), 2012 (during), and 2013 (after/legacy). Paris and Berlin were selected as comparable cities because: (a) they are both capital cities, with diversified economies encompassing industry, finance, education, public administration, transport, and tourism; (b) they are all located in North West Europe, and belong to the three largest nations in the region; (c) they have all hosted the Olympic Games before (London in 1908 and 1948, Paris in 1900 and 1924, and Berlin in 1936)[8]; (d) they have all expressed interest in hosting the Olympics in recent years (Berlin bid for the 2000 Games and lost to Sydney, Paris bid for the 2008 Games (losing to Beijing) and for the 2012 Games (which London won)[9]; (e) they are cities of broadly similar size and wealth (for example, a Eurostat survey in 2006 ranked London, Paris, and Berlin respectively 1^{st}, 2^{nd}, and 10^{th} among European metropolitan areas).

We survey a panel of individuals in these three cities over three periods: (a) in 2011 (8^{th} August to 30^{th} September), the year before the Games; (b) in 2012 (20^{th} July to 2^{nd} October), the year in which the Games took place (Olympics: 27^{th} July to 12^{th} August; Paralympics: 29^{th} August to 9^{th} September); and (c) in 2013 (23^{rd} July to 12^{th} September), the year after the Games, capturing legacy effects or adaptation processes. Note that the time period of our data collection in 2012 does not coincide with any other major events in the three countries around that time, such as general or local elections.

We employed a mixed methodology approach using a combination of online surveys and telephone interviews. In all cities, each surveyed individual was interviewed using the same mode in all three waves—either online or over the telephone. The online survey made use of the Ipsos Interactive Services Panel (IIS), without imposing any quotas in the first wave. The online sample was released on a rolling weekly basis in order to sustain a good level of response over the duration of a wave. The telephone sample was generated via random digit dialing. Loose quotas (+/- 30%) on age, gender, and work status were set according to the

[8]Berlin won the bid to host the 1916 Games but these were canceled due to World War One. London won the bid to host the 1944 Games but these were canceled due to World War Two.

[9]At the time of writing Paris is once again bidding to host the Summer Games, now in 2024.

population profile. Despite those quotas being fairly broad, it should be noted that the sample is not representative of the populations of these cities as a whole. In London, the quotas were set according to the London broadband population, while in Paris and Berlin they were set according to the general population. Given the challenges associated with developing and retaining participants within our own three-year panel, participants were incentivized to take part in all three waves of the survey by being automatically included in a random prize draw. Separate prize draws of a monetary sum of £/€500, £/€1,000 and £/€1,500 were offered in each of the three cities and waves, respectively.

2.2 Subjective Wellbeing Questions

The survey, specifically designed for this study, contains three different types of measures of individual SWB: (1) evaluation (i.e. life satisfaction); (2) experiences (both happiness and anxiety yesterday); and (3) eudemonia (i.e. sense of worthwhileness). To date, the SWB literature has focused on high-level evaluative measures of SWB, such as life satisfaction (Dolan et al., 2008), mainly due to data availability in large-scale surveys. Experience measures (happiness, anxiety, etc.) are close to the measure of experienced utility discussed by Kahneman et al. (1997) and Bentham's utilitarianism. Evaluation is closer to decision-utility, and is not the same as experienced utility for many reasons (Kahneman and Deaton, 2010; Dolan and Metcalfe, 2012). Some philosophers, dating back to Aristotle, argue that eudemonia (e.g., worthwhile activities and purpose in life) is the most important element of happiness. If we are to confidently show whether or not the Games have an effect on SWB, we need to tap into SWB in these various ways.

Following Dolan and Metcalfe (2012), whose recommendations are incorporated by the Office for National Statistics to measure SWB in the UK, and also in the spirit of Stiglitz et al. (2009), OECD (2013), and the National Research Council (2013), we included the following four SWB questions into our surveys:[10]

(a) *Evaluative*: Overall, how satisfied are you with your life nowadays?

(b) *Experience*: Overall, how happy did you feel yesterday?

(c) *Experience*: Overall, how anxious did you feel yesterday?

[10]The joint use of these four measures of subjective wellbeing for the purpose of impact evaluation is novel, although some of them, in particular life satisfaction, have been used for this purpose before. In fact, large national household panels like the German Socio-Economic Panel Study (SOEP) have started asking respondents about their life satisfaction as early as 1984.

(d) *Eudemonic*: Overall, how worthwhile are the things that you do in your life?

All responses are on an eleven-point scale, with zero denoting 'not at all' and ten denoting 'completely/very much'.[11]

3 Empirical Strategy

3.1 Model

To estimate the effect of the Olympic Games on subjective wellbeing, we employ a difference-in-differences (DID) design. Specifically, we employ three different models: the first model looks at the year 2012 only and compares the periods before, during, and after the Olympics in London with those in Paris and Berlin. It is specified in Equation (1):

$$\begin{aligned} SWB_i = \beta_0 + \beta_1 London \times OlympicsPeriod + \beta_2 London \times PostOlympicsPeriod + \\ + \beta_3 London + \beta_4 OlympicsPeriod + \beta_5 PostOlympicsPeriod + X_i'\gamma + \phi_d + \epsilon_i \end{aligned} \tag{1}$$

where SWB_i is the standardized self-reported subjective wellbeing of individual i; *London* is a time-invariant dummy variable that equals one if the individual was interviewed in London, and zero otherwise; and $OlympicsPeriod$ and $PostOlympicsPeriod$ are dummy variables that equal one if the individual was interviewed during and after the exact time of the Olympics (within year 2012), respectively, and zero otherwise. The base category is the 2012 pre-Olympics period in Paris and Berlin.

The second model makes use of the panel structure of the data and utilizes both years 2011 and 2012. Netting out time-invariant unobserved heterogeneity, this model compares individual-level *changes* of respondents in London with those in Paris and Berlin. Here, we estimate two types of specifications:

Equation (2) takes the entire sampling period in 2012 in London as the treatment period, both before (anticipation), during, and after (adaptation/legacy) the Games. If the main identifying assumption is fulfilled, $London \times 2012$ can be interpreted as the average treatment effect on the treated; or put differently, the average causal effect that the Olympics had on

[11] Experimental evidence has shown that zero-to-ten scales of subjective wellbeing measures are more reliable than shorter versions (Kroh, 2006).

the subjective wellbeing of individuals in the host city.

$$SWB_{it} = \beta_0 + \beta_1 London \times 2012 + \beta_2 2012 + X'_{it}\gamma + \phi_m + \phi_d + \mu_i + \epsilon_{it} \quad (2)$$

where SWB_{it} is again the standardized self-reported subjective wellbeing of individual i in year t; *London* is a time-invariant dummy variable that equals one if the individual was interviewed in London, and zero otherwise; and 2012 is a dummy variable that equals one if the individual was interviewed in the year 2012, and zero otherwise.

Equation (3) uses the panel structure in the same way as Equation (2), but follows Equation (1) in dividing the year 2012 into three time periods (before, during, and after the Olympics), each of them interacted with the *London* dummy.

$$\begin{aligned} SWB_{it} = \beta_0 + \beta_1 London \times PreOlympicsPeriod_{2012} + \beta_2 London \times OlympicsPeriod_{2012} + \\ + \beta_3 London \times PostOlympicsPeriod_{2012} + \beta_4 PreOlympicsPeriod + \\ + \beta_5 OlympicsPeriod + \beta_6 PostOlympicsPeriod + X'_{it}\gamma + \phi_m + \phi_d + \epsilon_{it} \end{aligned} \quad (3)$$

Note that these specifications pool both Paris and Berlin into a single control group, given our discussion on the broad similarities of these capital cities and our primary interest in estimating the effect of Games on host vs. non-host cities. In our robustness section, we relax this assumption by (a) excluding Paris and considering Berlin as the only control group (as Paris had an inherent interest in hosting the Games), and (b) considering Paris itself as a separate treatment group.

In all models, we control for a rich set of time-varying individual observables, X, that include demographics (age, gender, marital status), human capital characteristics (educational level), and economic conditions (employment status, log annual gross household income, home ownership). To proxy changing economic circumstances in the three cities over time (note that we are only looking at a very short time horizon of three years, and in our baseline specifications, of two years), we include each country's change in quarterly real GDP since the first quarter of 2008—that is, just before the onset of the recent economic crisis—as control. This also accounts for potentially idiosyncratic impacts of the crisis on the three countries. In our robustness section, we go one step further and include additional economic and meteorological controls to further account for divergent economic developments between cities and meteorological conditions, respectively.

By including individual fixed effects, μ_i, we routinely net out individual unobserved heterogeneity. Moreover, we control for both calendar-month and day-of-the-week fixed effects, ϕ_m and ϕ_d, as reports of SWB might differ systematically between different months of the year and different days of the week (Taylor, 2006; Kavetsos et al., 2014).[12] Finally, we control for mode of interview (online or phone).[13] Robust standard errors are clustered at the interview date level.

3.2 Identification

The main identifying assumption is that—controlling for time-varying observables, X, calendar-month and day-of-the-week fixed effects, ϕ_m and ϕ_d, and individual fixed effects, μ_i—in the absence of treatment, the SWB of Londoners would have followed the same trend as the SWB of Parisians and Berliners. As the counterfactual is not observable, the *common trend assumption* is not formally testable. One can, however, provide evidence for the plausibility of this assumption by plotting the development of SWB in all three cities prior to the Olympic Games.

Figure 1 shows the development of average SWB by calendar week in the pre-Olympics year 2011.[14] Importantly, given the design of our survey, these are SWB developments over the same summer months in 2011 as the ones the Olympics took place in 2012. A common time trend is observed for all measures. Note that differences in levels between the three cities are of minor importance, as they will be netted out by the city fixed effects.

4 Baseline Results

4.1 Descriptive Evidence

In total, our sample contains 50,262 survey responses (London: 17,170; Paris: 19,437; and Berlin: 13,655). Table A1 in Appendix A offers descriptive statistics of outcomes and covariates by city and wave. As with all panel surveys, panel attrition reduces the number

[12]Note that in Equation (1), we can only control for day-of-the-week fixed effects, as month fixed effects are almost perfectly collinear with the period during and after the Olympics.

[13]In some waves/cities we randomized the framing and ordering of the happiness, anxiety and worthwhileness measures. We routinely control for such variations in the respective regressions throughout our analysis.

[14]In this lowess iterative smoothing for 2011, controls include gender, age, age^2, employment status, education level, marital status, log annual gross household income, home ownership, and a dummy for survey mode. Standard errors clustered at the date level.

of observations over the three waves. In the first wave, in 2011, 26,142 unique respondents were interviewed in the three cities. A little bit more than half of those respondents, 56% (or 14,838), also participated in the second wave in 2012. Appendix B shows and discusses attrition rates.

Given our focus on the 2012 Olympic Games, we start by plotting the SWB measures for 2012. Figure 2 shows the fitted daily means for the four SWB measures over the period of the Games in 2012.[15] In all graphs, the first vertical line depicts the day of the opening ceremony (27 July 2012), whereas the second vertical shows the day of the closing ceremony (12 August 2012). For both life satisfaction and happiness, there seems to be a clear jump during the Olympic period in all cities. The impact is most pronounced in the case of London. There also appears to be decline in anxiety and increase in self-reported sense of purpose, although there is no clear difference between London and the other cities.

These effects appear to be strongly associated with the opening and closing ceremonies. All measures of SWB improve in the run up to the opening ceremony and fall off rapidly after the closing ceremony. The opening and closing ceremonies are both the two most watched and the two most expensive events in terms of ticket prices.[16] The apparent return to "normality" after the Olympics are completed is already suggestive of small or missing legacy effects.

In Figure 3, we present graphical evidence based on the mean difference in SWB for each individual who is observed in 2011 and 2012. The change in SWB responses is then averaged by calendar dates in 2012 and plotted.[17] This is the equivalent to the model in Equation (2). Figure 3 suggests that the SWB effects of the Olympics are restricted to life satisfaction and happiness and limited to the residents in the host city. Once again we observe a large opening ceremony and closing ceremony effect among Londoners. Here, we do not observe significant impacts on anxiety or sense of purpose.[18] While Figure 2 provided suggestive evidence that SWB increased in all three cities during the Olympics, this effect disappears in Figure 3 where we focus on individual-level changes.

[15] This is based on a linear regression of SWB measures on the controls, including gender, age, age^2, employment status, education level, marital status, log annual gross household income, home ownership, and a dummy for survey mode. Standard errors clustered at the date level. Figure 2 plots the local polynomial estimation of the predicted values for each SWB measure.

[16] See www.theguardian.com/media/2012/aug/13/top-olympics-tv-events-ceremonies and http://news.bbc.co.uk/2/shared/bsp/hi/pdfs/15_10_10_athletics.pdf, retrieved August 15, 2015.

[17] The mean differences between 2012 and 2011 are calculated as follows. First, the predicted values are obtained for each daily date and city in each year following the same linear regression described in Figure 2. Second, the mean difference is calculated as the value of the 2012 predicted daily value minus the same daily predicted value in 2011.

[18] Figure C1 and Figure C2 in Appendix C plots each city separately. The same broad picture appears.

4.2 Regression Results

Table 1 shows the regression estimates for Equation (1). This model focuses on the year 2012 and differentiates the periods before, during, and after the Games. London is the treatment city and responses of Londoners are contrasted with those in Paris and Berlin. This is the regression equivalent of Figure 2. We report two separate sets of results—with and without controls—for all four measures of SWB and display the main variables of interest.[19]

The first two columns show that, compared to the pre-Olympics period, life satisfaction increases during the Olympics in London relative to Paris and Berlin, regardless of whether or not we control for covariates. The effect size is 0.117 SDs without controls and 0.088 SDs with controls. We do not find any statistically significant effect for the post-Olympics period, suggesting that there are no immediate legacy effects of the Games as far as life satisfaction is concerned. The evidence for happiness in Columns (3) and (4) is, however, not statistically significant. The measure for anxiety (Columns (5) and (6)) increases during the Olympics, and the effect seems to be considerable: 0.118 SD (Columns (5) and (6)). One could speculate that fear of terror attacks may play a role here. Finally, the results for worthwhileness in the last two columns are small and statistically insignificant. Note, however, that there is a stable and considerable reduction in worthwhileness in the post-Olympics period in London relative to the other cities. This coincides with the fall in life satisfaction after the end of the Games, following the strong increase, and could be interpreted as a "hangover" after this big sports and social event.

Next, we estimate Equation (2) which compares individual-level changes between 2011 and 2012 for respondents in London with those in Paris and Berlin. The results are shown in Table 2.[20] A central finding emerges: in line with Figure 3, two of the four SWB measures show a statistically significant and positive effect for London in 2012. The results are almost identical whether or not we include the controls, which reinforces the notion of a quasi-natural experiment and that the covariates are orthogonal to the treatment. Overall, Table 2 supports the hypothesis that the Olympics generated a rise in SWB for Londoners in 2012 in terms of the evaluative component (life satisfaction, Columns (1) and (2)) by around 0.07 SDs, an even larger increase in terms of the positive experiential component (happiness, Column (3) and (4)) by around 0.084SDs. In contrast to the finding in Table 1 above, when netting out individual-level unobserved heterogeneity, any evidence of a significant anxiety effect due to the Games disappears. Columns (7) and (8) suggest a significant reduction in worthwhileness in London. This is possibly connected to a post-Olympics social "hangover" that we observed in Table 1.

[19] Table A2 in Appendix A includes the full set of controls.
[20] Table A3 in Appendix A once again includes the full set of controls.

We now estimate Equation (3) which, as with Equation (2), compares individual-level changes between 2011 and 2012 for respondents in London with those in Paris and Berlin, but this time we use the exact cut-off dates for the Olympics in 2012 in order to identify any specific effects related to the exact period during which the Games were staged (i.e. from the opening ceremony to the closing ceremony).

The results are presented in Table 3 and show that life satisfaction increased significantly in London, and specifically during the periods of the Olympics (about 0.09 SDs); a significant, yet reduced, effect is also found in Londons post-Olympics period (about 0.03 SDs). Self-reported happiness increased in London in all three time periods within the 2012 wave (0.135 and 0.11 SDs in the pre-Olympics and Olympics periods), with again a significant, yet decreased, effect in the Post-Olympics period (0.05 SDs). For anxiety, the results show that this decreased in London in the time leading up to the Games, and increased when these were over. For our measure of purpose, the estimates show a decrease occurring in London in the post-Olympics period.

In a nutshell, our regression analysis therefore suggests two punchlines. First, there was a general increase in SWB for Londoners in 2012 relative to Parisians and Berliners, which may have been associated with the experience of hosting the Games and which encompassed both the pre- and post-Games period. Second, the Games had a positive impact of SWB among Londoners that was specific to the period during which the Games were staged. In other words, there was a general SWB effect in London that can be associated with hosting the Games, and there is evidence that this effect was at its most intense during the staging of the Games. The fact that the results do not differ much between models that control for observables and those that do not reinforces the notion of a quasi-natural experiment. We now test for the robustness of estimates.

5 Robustness

5.1 Selection into Surveys

One possible concern with our baseline results is that the identified impact of the Olympics might be driven by attrition and/or selection. Note that no question in either wave explicitly asked about the Olympics. Hence, there is no *a priori* reason to believe that respondents in London were primed, selected, or selected themselves into the panel based on a favorable disposition to hosting the Olympics. However, if more positively (or negatively) disposed individuals were more likely to respond in the second wave of the panel, there would be

potential for bias.

We check this issue in three ways. First, we estimate Equation (2) for a balanced panel. Second, we weigh respondents by the inverse probability of participating in the follow-up survey.[21] Third, we adopt a propensity-score matching (PSM) approach: here, we match respondents in the three cities one-to-one based on their likelihood to participate in the follow-up survey, which we predicted using our standard set of observables.[22] Then, we re-estimate our DID model using only the matched respondents. Using such 'statistical clones' is the most restrictive matching procedure. The results are presented in Table 4.[23] When considering the number of observations, there is clearly some overlap between the three approaches.

The results based on the balanced panel (Table 4, Panel A) are similar, both in terms of significance and size, to those of the unbalanced panel (Table 2). This is also the case for the inverse probability weights (Table 4, Panel B). Similarly, for the PSM approach (Table 4, Panel C), the contemporaneous effects of the Olympics in London in 2012 remain significant positive on both life satisfaction and happiness. The sizes of the coefficients, however, are somewhat attenuated. The specifications in Columns (5) and (6) show a significant increase in anxiety in London in 2012, which is the only difference to our baseline specification and the specification using the balanced panel. The fact that we do not find consistent results for anxiety across all specifications, however, suggests that all anxiety interpretations should be treated with caution.

5.2 Choice of Control Group

As mentioned, the city of Paris had bid for 2012 Olympics and in 2005 was favorite to be selected, only to lose to London. Parisians might therefore not be considered an appropriate control group. It is, in fact, possible that the positive life satisfaction and happiness effects identified previously are "contaminated" by a reduction in SWB in Paris. We thus re-estimate Equation (2) by (a) excluding Paris and using only the Berlin sample as the control group, and (b) including $Paris \times 2012$ as an additional treatment to $London \times 2012$.

Table 5, Panel A, presents the results comparing London to Berlin, excluding the Paris sample. We consistently find significant increases in life satisfaction and happiness in London in 2012, no significant effects for anxiety, but significant reductions in worthwhileness. However,

[21] To create inverse probability weights, we first predict the likelihood to participate in the follow-up survey based on our standard set of observables, and then weigh all regressions by the inverse of this likelihood (Kalton and Flore-Cervantes, 2003).

[22] See Table B3 in Appendix B for the balancing properties of observables after the PSM.

[23] For Table 4 and all other robustness tests the relevant specification is given by Equation (2), i.e. the model that estimates the Olympics effect over the entire 2012 summer period.

as shown above, the latter finding is very likely due to a post-Olympics reduction in worthwhileness in London. Overall, these results confirm our baseline specification. Notably, for both life satisfaction and happiness, the size of the effect is somewhat reduced compared to the baseline estimates in Tables 1 and 2. When excluding Paris from the control group, the estimates of life satisfaction nearly halve.

Table 5, Panel B, presents the results adding Paris as a separate treatment variable, $Paris \times 2012$. The $London \times 2012$ estimates are very robust and the usual interpretations hold up. Those of $Paris \times 2012$, however, suggest evidence for a significant reduction in life satisfaction and happiness in Paris in 2012. No significant effects of $Paris \times 2012$ are estimated for the measures of anxiety and worthwhileness. Overall, these results suggest that the London Olympics effect is robust to the choice of control group.

5.3 Extended Economic and Meteorological Controls

Recall that our regressions control for the quarterly real GDP change since the first quarter of 2008. To further control for potentially divergent economic developments between the three cities, we obtain data on daily stock market index closing values, and include them as additional controls into our preferred specification. For the UK, we take the FTSE100, for France the CAC40, and for Germany the DAX30, all obtained from Yahoo Finance (http://finance.yahoo.com).

Moreover, given that we have daily data, we also control for weather-related factors which have been shown to have an instantaneous effect on subjective wellbeing and could thus explain differences in responses between cities (Feddersen et al., 2016). We obtain data on daily precipitation (in inches) and daily maximum temperature (in Fahrenheit) from the National Centers for Environmental Information of the National Oceanic and Atmospheric Administration (www.ncdc.noaa.gov). We gather measurements from different weather stations in and around the three cities, and average them to obtain a daily representative measure for each city.

Table 6 replicates Table 2 including these additional controls. As can be seen, the results remain robust: the coefficients for life satisfaction and happiness have the expected sign, and are very similar in terms of size and significance the ones in our baseline specification. The same is true for worthwhileness.

5.4 Placebo Tests

Next, we conduct a series of placebo or confirmation tests. In Table 7, Columns (1) to (4) employ *placebo outcomes*, whereas Columns (5) to (7) employ *placebo time periods*. Column (1) replicates Equation (2) by using a linear probability model with a binary indicator as outcome that is equal to one if the respondent has thought about her finances the day before; Columns (2) and (3) then use our standard indicators of feelings of happiness and anxiousness the respondent reports to have had when these thoughts occurred, respectively, as outcomes. We would not expect the Olympics to affect these outcomes, and in fact, we do not find any significant effects for them. This is also *prima facie* evidence that our effects are not driven by divergent economic developments between the three cities: if this were the case, we would likely find significant effects for these outcomes.

In considering outcomes plausibly connected to the Olympics, we use a measure of national pride which has previously been related to major sports events (Kavetsos, 2012b). We find a strong, significant, and positive effect on this measure (Column 4), which offers supportive evidence that the effects we are measuring in our baseline specification are indeed Olympics-related.

Columns (5) and (6) replicate Equation (1)—originally focussing on the year 2012 only—by using placebo time periods. We use the Olympics dates in 2012 to define treatment periods in 2011 (Column 5) and 2013 (Column 6), respectively. Both specifications point towards the fact that there is no "Olympics effect" in summer 2011 or 2013. For brevity, we only show results based on the life satisfaction measure; however, similar conclusions also hold for happiness.

Column (7) replicates Equation (2) by using the years 2011 and 2013. In this specification we do not find a significant effect, which is again supportive evidence that we are indeed measuring the impact of the Olympics in our original specification of Equation (2) comparing 2012 to 2011. Finally, the results of Column (7) are once more evidence against the fact that our main effects are driven by divergent economic developments; if this were the case, significant differences between 2012 and 2011 would likely be present when considering differences between 2013 and 2011.

6 Heterogeneity

6.1 Socio-Demographics

We first focus on heterogeneous effects based on socio-demographic characteristics (gender, age, income). We follow a similar approach to previous estimations—building on Equation (2)—and interact the variables of interest with the main *London* × 2012 treatment indicator.

Table 8 reports these heterogeneity estimates. For brevity, we only report the coefficient of the main treatment coefficient (*London* × 2012) and that of its interaction with the socio-demographic characteristic in question. First, regarding gender (Panel A) and age (Panel B), there do not seem to be any heterogeneous effects. Second, the case of income (Panel C) suggests that the Olympics increased life satisfaction and worthwhileness of wealthier respondents significantly more.[24]

6.2 Medals Won

An outstanding question is the degree to which the London treatment variable captures the impact of national athletes' performance or an impact of the Games *per se*. Team Great Britain exceeded expectations in 2012 (even after having done exceptionally well in Beijing in 2008) and was ranked 3^{rd} in the medal table with a total of 65 medals (of which 29 were Gold). Its official target was to be placed 4^{th} with 48 medals.[25] It had ranked 4^{th} (47 medals) in the 2008 Beijing Games and 9th (30 medals) in the 2004 Athens Games. France's and Germany's performance was rather stable: France ranked 7^{th} in 2012 (34 medals; 11 Gold), having ranked 10^{th} in 2008 (41 medals) and 7th in 2004 (33 medals); and Germany 6th in 2012 (44 medals; 11 Gold), having ranked 5^{th} in 2008 (41 medals) and 6^{th} in 2004 (48 medals).

[24] In the 2013 wave of the online survey, we included additional questions to shed more light on heterogeneous effects. These related to the medium through which individuals in all three cities observed the Olympics (e.g., watching on TV at home; listening to the radio at home, watching/listening on the internet at home; reading the newspaper (online); watching live events on a public screen) and whether respondents in London participated in a Games-related event (e.g., attending a free Olympic event, attending a ticketed event, taking part in Games-related sports/physical activity; taking part in Games-related cultural event/activity; volunteering during the Games; taking part in a Games-related community event/activity). Estimating Equation (2)-type models and interacting these with the London treatment effect does not significantly alter our main result. We found that those who volunteered during the Games reported higher levels of happiness, although reverse causality might also be at play here. These specific results should be viewed with caution because of attrition of the sample in wave 3; e.g. engaging in these behaviors in 2012 but not being recorded as such in 2013 (see Section 7 for further discussion on the 2013 wave).

[25] See www.telegraph.co.uk/sport/olympics/9374912/Team-GB-medal-target-for-London-2012-Olympics-is-fourth-place-with-48-medals-across-12-sports.html

To address the impact of medals won on SWB, we run our baseline specification of Equation (2) and additionally interact the main effect with the daily number of medals won by respondents' nation on the day before the interview; i.e. medals won by France for Parisians, by Germany for Berliners, and by Great Britain for Londoners. In other words, we are estimating whether the positive treatment effect for London is amplified by the relative performance of British Athletes on the day before the interview.

Table 9 presents the results: Panel A considers all lagged medals irrespective of rank (i.e. gold, silver, and bronze), whereas Panel B considers lagged gold medals only, as these carry more weight in the medal table and attract considerable media attention. Our estimates for the *London* × 2012 treatment effect are robust to the inclusion of either measure of performance, showing a significant increase in both life satisfaction and happiness in London in 2012. These results continue to hold if we consider lagged (gold) medals accumulated up to the day before an interview took place.[26] This finding confirms previous research which shows, in a large sample of cross-national surveys, a significant hosting effect of major sports events on life satisfaction regardless of sporting success (Kavetsos and Szymanski, 2010). Likewise, for the Olympics, sporting success does not appear to matter for SWB.

7 Legacy

The concept of "legacy" has become increasingly important in the rationalization and celebration of the Olympic Games. On the SWB measures, however, our graphical evidence in Figures 2 and 3 suggested a limited legacy effect of the Olympics in London. Next, we incorporate the third wave of our survey collected in 2013 into our estimations to assess whether there is any statistical evidence in favor of a legacy effect in London. Despite our efforts and incentives to retain participants in the sample, attrition rates are significant in the third wave. As a result, our analyses including 2013 should be interpreted with caution.

Table 10 presents the results of a DID specification similar to that of Equation (2), the only additions being the inclusion of *London* × 2013 treatment along with a year fixed effect for 2013.

The *London* × 2012 coefficients are in line with the findings in Table 2. They show positive and statistically significant effects on life satisfaction and happiness, no statistically significant effect on anxiety, and a negative effect on worthwhileness. The *London* × 2013 coefficients imply no persistent Olympics effect in London in 2013 for life satisfaction and happiness, once all the controls are included in Columns (2) and (4). However, our model suggests there may

[26] These results are available upon request.

have been a decrease in anxiety in London in 2013 as well as a decrease in worthwhileness. As mentioned, these results should be interpreted with caution due to high attrition rates and our inability to control for year-country shocks in 2013. Overall, however, and in line with the findings in Figures 2 and 3, there seems to be little evidence for a significant legacy effect of the Games on SWB.[27]

8 Conclusion

Every time there is the prospect of hosting a future Olympic Games, potential bidders ask themselves "is it worth it?" And once the Games are over, every host city asks itself "was it really worth it?" We do not rely on imagination or memory to answer these questions, but rather on whether reports of SWB change in response to hosting the Games. We explore a novel and newly constructed international panel dataset that measures the different components of SWB. We exploit a quasi-experimental design to identify the causal effects of the 2012 Olympics on people's SWB in the host city of London. To do so, we elicit SWB from a total of 26,000 individuals in London, Paris, and Berlin over the summers of 2011, 2012, and 2013.

Our findings yield evidence that the 2012 Olympics increased the life satisfaction and happiness of Londoners in the short-run (i.e. during the Olympic period), particularly around the opening and closing ceremonies. There were no consistent changes (either positive or negative) in anxiety or worthwhileness during the Olympic period for Londoners in comparison to Berliners or Parisians. We find that these results are robust to survey attrition.

In terms of magnitude, the increases in life satisfaction are quite large compared to standard estimates in the SWB literature. Notwithstanding important issues of causal inference, according to the specifications in Equation (1) and (2), the effect is equivalent to moving from the bottom income decile to at least the fourth income decile. But the effects disappear within a year of the event.

Our study suffers from a number of limitations. Our sample is not strictly representative of the populations in London, Paris, and Berlin. We can control for observable differences between the achieved sample and the wider population, but there might be unobservables we are missing, and which would challenge any claims about generalizability. The sample is clearly of those proximate to the Games and policy makers might be interested in the impact on the broader UK, French, and German populations, so extrapolating these findings to the

[27]The same conclusion is reached if we repeat the estimations on legacy using the balanced sample, inverse probability weights, or a PSM approach, as performed in Table 4. Results are available upon request.

country-level also requires some caution.

Overall, many cities spend substantial resources attracting and then hosting the Olympic Games, but the evidence to date suggests that the Olympics do not have a significant economic benefit to the host city. This paper presents the first causal evidence of a positive wellbeing effect of the Olympic Games on local residents during the hosting of the Games. The effects do not last very long, however, and the Games show no effect on SWB a year later. The host with the most. But not for long.

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Figures

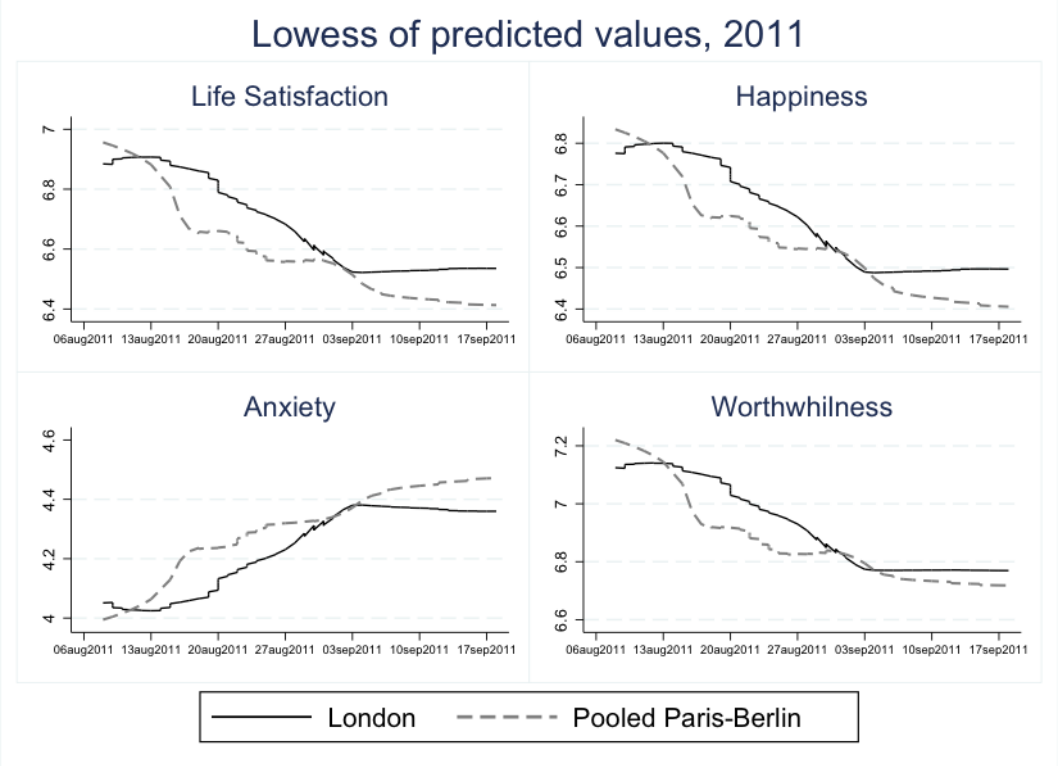

Figure 1: SWB in 2011 in London vs. Paris/Berlin

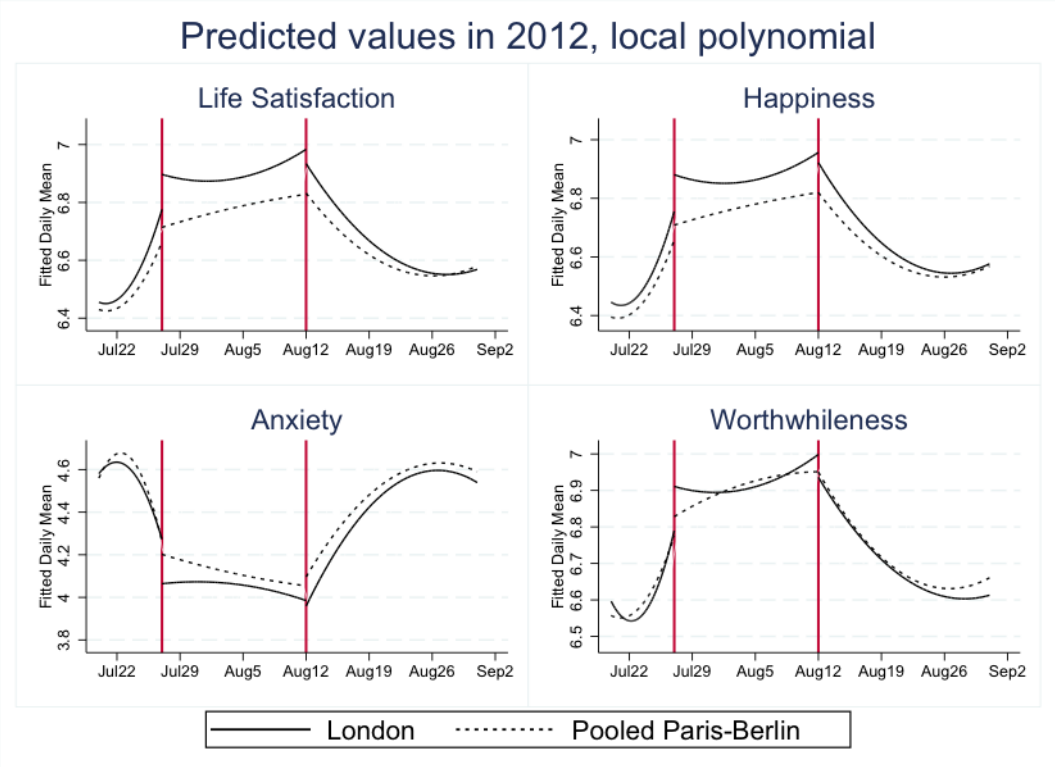

Figure 2: SWB in 2012 in London vs. Paris/Berlin

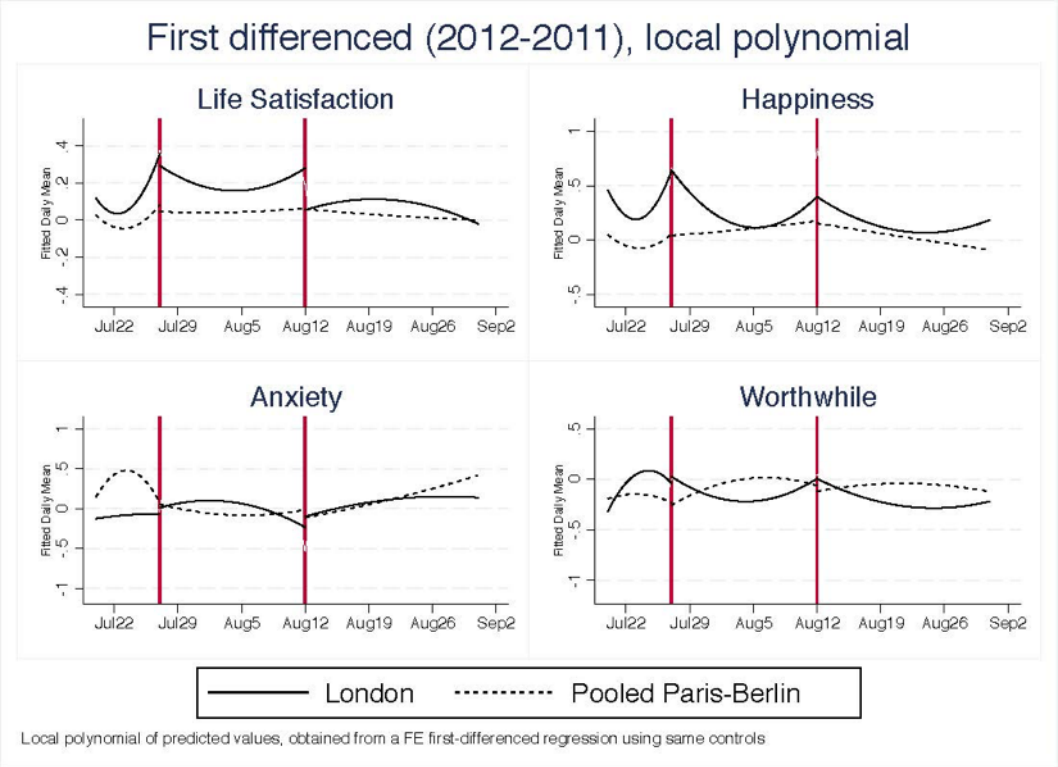

Figure 3: Changes in SWB between 2012 and 2011 in London vs. Paris/Berlin

Tables

Table 1: Impact of Olympics on SWB (2012)

	Life Satisfaction		Happiness		Anxiety		Worthwhile	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
London×OlympicsPeriod	0.117**	0.088**	0.079	0.053	0.118**	0.118**	0.025	0.028
	(0.048)	(0.042)	(0.043)	(0.042)	(0.048)	(0.049)	(0.046)	(0.043)
London×PostOlympicsPeriod	0.03	0.053	-0.026	0.001	0.099	0.084	-0.085**	-0.081**
	(0.046)	(0.039)	(0.042)	(0.04)	(0.051)	(0.05)	(0.038)	(0.037)
London	-0.07	0.138**	-0.023	0.002	-0.134***	-0.265***	-0.028	0.521***
	(0.038)	(0.056)	(0.027)	(0.049)	(0.036)	(0.057)	(0.024)	(0.044)
OlympicsPeriod	0.17***	0.148***	0.031	0.023	-0.274***	-0.257***	0.193***	0.166***
	(0.032)	(0.032)	(0.028)	(0.024)	(0.037)	(0.033)	(0.032)	(0.026)
PostOlympicsPeriod	0.063**	0.014	0.057**	0.004	-0.068**	-0.059	0.114***	0.098***
	(0.03)	(0.033)	(0.026)	(0.024)	(0.032)	(0.034)	(0.026)	(0.029)
Constant	-0.088***	-0.009	-0.125***	-0.035	0.186***	0.126**	-0.138***	0.055
	(0.026)	(0.039)	(0.024)	(0.025)	(0.02)	(0.053)	(0.023)	(0.038)
N	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500
R^2	0.006	0.10	0.026	0.09	0.011	0.036	0.007	0.067
Controls	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Estimates for each measure of SWB based on Eq. (1), without and with controls. Regressions with controls include: gender, age, age^2, employment status, education level, marital status, log income, home ownership, change in quarterly GDP since 2008Q1, controls for interview mode, and day-of-the-week effects. Robust standard errors clustered at the date level reported in parentheses.
*** $p < 0.01$, ** $p < 0.05$

Table 2: Impact of Olympics on SWB (Panel: 2011, 2012)

	Life Satisfaction		Happiness		Anxiety		Worthwhile	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
London×2012	0.059***	0.07***	0.086***	0.084***	0.009	0.024	-0.051***	-0.044***
	(0.01)	(0.011)	(0.014)	(0.015)	(0.017)	(0.019)	(0.015)	(0.016)
2012	0.013**	0.005	0.083***	0.043	0.045***	0.022	-0.052***	-0.054***
	(0.006)	(0.013)	(0.017)	(0.022)	(0.009)	(0.015)	(0.008)	(0.013)
Constant	-0.026***	-0.098	-0.129***	-1.228***	-0.014**	0.484	0.015***	-0.409
	(0.003)	(0.30)	(0.021)	(0.448)	(0.005)	(0.428)	(0.003)	(0.336)
N	40,458	40,458	40,458	40,458	40,458	40,458	40,458	40,458
R^2	0.002	0.012	0.008	0.017	0.002	0.007	0.004	0.007
N of People	26,030	26,030	26,030	26,030	26,030	26,030	26,030	26,030
Controls	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Estimates for each measure of SWB based on Eq. (2), without and with controls. Regressions with controls include: gender, age, age^2, employment status, education level, marital status, log income, home ownership, change in quarterly GDP since 2008Q1, controls for interview mode, day-of-the-week and calendar-month effects. Robust standard errors clustered at the date level reported in parentheses.

*** $p < 0.01$, ** $p < 0.05$

Table 3: Impact of Olympics on SWB (Panel: 2011, 2012) — Exact Cut-Off Dates

	Life Satisfaction		Happiness		Anxiety		Worthwhile	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
London×PreOlympicsPeriod$_{2012}$	0.038	0.049	0.142***	0.135***	-0.161***	-0.146***	0.049	0.062
	(0.033)	(0.035)	(0.044)	(0.046)	(0.048)	(0.048)	(0.041)	(0.04)
London×OlympicsPeriod$_{2012}$	0.093***	0.105***	0.107***	0.111***	0.019	0.029	-0.027	-0.019
	(0.016)	(0.017)	(0.024)	(0.023)	(0.027)	(0.028)	(0.021)	(0.021)
London×PostOlympicsPeriod$_{2012}$	0.033**	0.046***	0.059***	0.053***	0.029	0.042**	-0.088***	-0.08***
	(0.013)	(0.014)	(0.017)	(0.018)	(0.019)	(0.02)	(0.02)	(0.021)
PreOlympicsPeriod$_{2012}$	-0.006	-0.003	0.057**	0.018	0.14***	0.089**	-0.112***	-0.076***
	(0.018)	(0.032)	(0.027)	(0.039)	(0.024)	(0.037)	(0.016)	(0.023)
OlympicsPeriod$_{2012}$	0.024**	0.017	0.082***	0.039	-0.009	-0.035**	-0.048***	-0.043**
	(0.01)	(0.017)	(0.018)	(0.022)	(0.012)	(0.018)	(0.012)	(0.017)
PostOlympicsPeriod$_{2012}$	0.007	-0.002	0.065***	0.036	0.071***	0.054***	-0.049***	-0.059***
	(0.008)	(0.013)	(0.02)	(0.024)	(0.012)	(0.017)	(0.011)	(0.014)
Constant	-0.026***	-0.149	-0.114***	-1.284***	-0.014***	0.651	0.015***	-0.481
	(0.003)	(0.294)	(0.022)	(0.447)	(0.005)	(0.435)	(0.003)	(0.325)
N	40,458	40,458	40,458	40,458	40,458	40,458	40,458	40,458
R^2	0.003	0.013	0.008	0.017	0.004	0.009	0.005	0.008
N of People	26,030	26,030	26,030	26,030	26,030	26,030	26,030	26,030
Controls	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Estimates for each measure of SWB based on Eq. (3), without and with controls. Regressions with controls include: gender, age, age^2, employment status, education level, marital status, log income, home ownership, change in quarterly GDP since 2008Q1, controls for interview mode, day-of-the-week and calendar-month effects. Robust standard errors clustered at the date level reported in parentheses.
*** $p < 0.01$, ** $p < 0.05$

Table 4: Robustness for Attrition (Panel: 2011, 2012)

	Life Satisfaction		Happiness		Anxiety		Worthwhile	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: Balanced Panel							
London×2012	0.059***	0.07***	0.086***	0.084***	0.009	0.024	-0.051***	-0.044***
	(0.01)	(0.011)	(0.014)	(0.015)	(0.017)	(0.019)	(0.015)	(0.016)
2012	0.013**	0.005	0.083***	0.043	0.045***	0.022	-0.052***	-0.054***
	(0.006)	(0.013)	(0.017)	(0.022)	(0.009)	(0.015)	(0.008)	(0.013)
Constant	-0.016***	-0.076	-0.119***	-1.253***	-0.022***	0.476	0.013***	-0.414
	(0.004)	(0.308)	(0.021)	(0.463)	(0.008)	(0.439)	(0.005)	(0.346)
N	29,248	29,248	29,248	29,248	29,248	29,248	29,248	29,248
R^2	0.002	0.012	0.008	0.017	0.002	0.007	0.004	0.007
N of People	14,820	14,820	14,820	14,820	14,820	14,820	14,820	14,820
Controls	No	Yes	No	Yes	No	Yes	No	Yes
	Panel B: Inverse Probability Weights							
London×2012	0.062***	0.072***	0.07***	0.079***	0.009	0.022	-0.047***	-0.041**
	(0.01)	(0.011)	(0.014)	(0.015)	(0.018)	(0.018)	(0.016)	(0.016)
2012	0.011	-0.001	0.082***	-0.034	0.038***	0.03**	-0.04***	-0.049***
	(0.007)	(0.013)	(0.015)	(0.023)	(0.011)	(0.015)	(0.009)	(0.013)
Constant	-0.036***	-0.167	-0.042	-1.601***	-0.066***	0.594	-0.046***	-0.28
	(0.013)	(0.316)	(0.026)	(0.493)	(0.023)	(0.441)	(0.013)	(0.377)
N	28,956	28,956	28,956	28,956	28,956	28,956	28,956	28,956
R^2	0.003	0.011	0.013	0.017	0.004	0.007	0.005	0.007
N of People	14,528	14,528	14,528	14,528	14,528	14,528	14,528	14,528
Controls	No	Yes	No	Yes	No	Yes	No	Yes
	Panel C: Propensity Score Matching							
London×2012	0.034**	0.051***	0.062***	0.06***	0.046**	0.063***	-0.056***	-0.038***
	(0.013)	(0.014)	(0.015)	(0.014)	(0.03)	(0.023)	(0.018)	(0.019)
2012	0.02***	-0.019	0.085***	0.014	0.02	0.009	-0.054***	-0.091***
	(0.008)	(0.015)	(0.02)	(0.028)	(0.011)	(0.018)	(0.01)	(0.019)
Constant	-0.003	-0.298	-0.20***	-1.694	-0.025***	0.595	0.034***	-1.064
	(0.003)	(0.451)	(0.026)	(0.684)	(0.007)	(0.629)	(0.004)	(0.587)
N	40,458	40,458	40,458	40,458	40,458	40,458	40,458	40,458
R^2	0.002	0.012	0.008	0.017	0.002	0.007	0.004	0.007
N of People	26,030	26,030	26,030	26,030	26,030	26,030	26,030	26,030
Controls	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Regressions are based on Eq. (2). Panel A estimates coefficients based on the balanced sample; Panel B weights responses with the inverse probability of participating in wave two of the survey (i.e. 2012); Panel C matches respondents in the three cities one-to-one based on their likelihood to participate in the follow-up survey and estimates Equation (2) for those respondents. Regressions with controls include: gender, age, age^2, employment status, education level, marital status, log income, home ownership, change in quarterly GDP since 2008Q1, controls for interview mode, day-of-the-week and calendar-month effects. Robust standard errors clustered at the date level reported in parentheses.
*** $p < 0.01$, ** $p < 0.05$

Table 5: Robustness for Berlin as Control Group (Panel: 2011, 2012)

	Life Satisfaction		Happiness		Anxiety		Worthwhile	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: London Treatment							
London×2012	0.033**	0.041***	0.048***	0.071***	0.003	0.015	-0.062***	-0.058***
	(0.013)	(0.015)	(0.018)	(0.02)	(0.018)	(0.019)	(0.019)	(0.019)
2012	0.039***	0.052***	0.122***	0.095***	0.05***	0.033	-0.048***	-0.037**
	(0.01)	(0.017)	(0.025)	(0.025)	(0.015)	(0.021)	(0.011)	(0.017)
Constant	-0.043***	0.169	-0.132***	-1.066	-0.031***	0.322	0.082***	0.076
	(0.003)	(0.40)	(0.032)	(0.583)	(0.007)	(0.535)	(0.004)	(0.427)
N	24,884	24,884	24,884	24,884	24,884	24,884	24,884	24,884
R^2	0.004	0.013	0.011	0.022	0.002	0.011	0.006	0.011
N of People	16,379	16,379	16,379	16,379	16,379	16,379	16,379	16,379
Controls	No	Yes	No	Yes	No	Yes	No	Yes
	Panel B: London and Paris Treatment							
London×2012	0.033**	0.044***	0.048***	0.06***	0.003	0.007	-0.061***	-0.055***
	(0.013)	(0.015)	(0.018)	(0.019)	(0.018)	(0.019)	(0.019)	(0.019)
Paris×2012	-0.043***	-0.033**	-0.062***	-0.031	-0.01	-0.022	-0.018	-0.015
	(0.014)	(0.016)	(0.016)	(0.019)	(0.017)	(0.02)	(0.013)	(0.016)
2012	0.039***	0.039**	0.117***	0.074***	0.05***	0.044**	-0.042***	-0.039***
	(0.01)	(0.015)	(0.021)	(0.024)	(0.015)	(0.019)	(0.01)	(0.015)
Constant	-0.026***	-0.149	-0.088***	-1.274***	-0.014**	0.451	0.015***	-0.432
	(0.003)	(0.297)	(0.021)	(0.447)	(0.005)	(0.422)	(0.003)	(0.335)
N	40,458	40,458	40,458	40,458	40,458	40,458	40,458	40,458
R^2	0.003	0.012	0.008	0.017	0.002	0.007	0.004	0.007
N of People	26,030	26,030	26,030	26,030	26,030	26,030	26,030	26,030
Controls	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Regressions based on Eq. (2). Panel A excludes the Paris sample entirely; Panel B includes the Paris sample as an additional treatment as performed for the case of London. Regressions with controls include: gender, age, age^2, employment status, education level, marital status, log income, home ownership, change in quarterly GDP since 2008Q1, controls for interview mode, day-of-the-week and calendar-month effects. Robust standard errors clustered at the date level reported in parentheses.

*** $p < 0.01$, ** $p < 0.05$

Table 6: Impact of Olympics on SWB (Panel: 2011, 2012) — Additional Controls

	Life Satisfaction	Happiness	Anxiety	Worthwhile
London×2012	0.073***	0.087***	0.023	-0.048***
	(0.011)	(0.015)	(0.018)	(0.016)
2012	0.002	0.039	0.049**	-0.06***
	(0.017)	(0.024)	(0.022)	(0.018)
Constant	-0.20	-1.376***	1.021***	-0.469
	(0.378)	(0.508)	(0.458)	(0.405)
N	40,458	40,458	40,458	40,458
R^2	0.012	0.017	0.007	0.008
N of People	26,030	26,030	26,030	26,030
Controls	Yes	Yes	Yes	Yes

Notes: Estimates for each measure of SWB based on Eq. (2) with controls, including: gender, age, age^2, employment status, education level, marital status, log income, home ownership, change in quarterly GDP since 2008Q1, controls for interview mode, day-of-the-week and calendar-month effects. They also include the daily stock market index closing value in each country, as well as the daily amount of rain and the daily maximum temperature in each city. Robust standard errors clustered at the date level reported in parentheses.
*** $p < 0.01$, ** $p < 0.05$

Table 7: Placebo and Confirmation Tests

	Thoughts about Finances	When Thinking about Finances: Happy	When Thinking about Finances: Anxious	National Pride	Life Satisfaction		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
London×2012	0.022	0.027	-0.046	0.177***			
	(0.02)	(0.022)	(0.026)	(0.017)			
2012	-0.07**	0.064	-0.06	0.008			
	(0.034)	(0.035)	(0.043)	(0.019)			
London×OlympicsPeriod					0.056	0.071	
					(0.05)	(0.06)	
London×PostOlympicsPeriod						0.034	
						(0.061)	
London					-0.135***	-0.147***	
					(0.025)	(0.055)	
OlympicsPeriods					0.145***	0.024	
					(0.034)	(0.038)	
PostOlympicsPeriods						-0.029	
						(0.042)	
London×2013							-0.041
							(0.024)
2013							-0.02
							(0.018)
Constant	-0.899	0.303	-1.405	-1.906***	-1.515***	-1.968***	-0.34
	(0.752)	(0.828)	(1.041)	(0.539)	(0.121)	(0.226)	(0.192)
N	37,400	28,453	28,468	30,778	25,958	9,070	35,028
R^2	0.008	0.016	0.013	0.024	25,958	9,070	0.018
N of People	25,988	21,145	21,158	24,062	0.107	0.116	26,006
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Estimates in Columns 1-4 based on Eq. (2); in Columns 5-7 on Eq. (1). Column (1) estimates a linear probability model using a binary indicator equal to one if the respondent has thought about her finances the day before, and zero otherwise, as outcome; Columns (2) and (3) then use feelings of happiness and anxiousness (0-10 scale), respectively, which the respondent reports to have had when thinking about her finances, as outcomes respectively. Column (4) uses national pride (0-10 scale) as outcome. Columns (5) and (6) replicate Eq. (1) in 2011 and 2013, respectively; Column (7) replicates Eq. (2) by using the years 2011 and 2013 only. Note that the difference between Column (5) and (6) arises due to the fact that the observation period in 2011 starts later compared to that in 2013. Controls include: gender, age, age^2, employment status, education level, marital status, log income, home ownership, change in quarterly GDP since 2008Q1, controls for interview mode,, day-of-the-week and calendar-month effects. Robust standard errors clustered at the date level reported in parentheses.

*** $p < 0.01$, ** $p < 0.05$

Table 8: Heterogeneity — Demographic Characteristics

	Life Satisfaction	Happiness	Anxiety	Worthwhile
	Panel A: Gender			
London×2012×Men	-0.001	-0.019	0.024	0.002
	(0.018)	(0.02)	(0.026)	(0.019)
London×2012	0.057***	0.087***	0.008	-0.05***
	(0.013)	(0.016)	(0.022)	(0.018)
N	40,458	40,458	40,458	40,458
R^2	0.011	0.009	0.004	0.006
N of People	26,030	26,030	26,030	26,030
Controls	Yes	Yes	Yes	Yes
	Panel B: Age			
London×2012×Age	-0.001	0.001	-0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
London×2012	0.089***	0.062	0.047	-0.084**
	(0.026)	(0.038)	(0.036)	(0.033)
N	40,458	40,458	40,458	40,458
R^2	0.011	0.009	0.004	0.006
N of People	26,030	26,030	26,030	26,030
Controls	Yes	Yes	Yes	Yes
	Panel C: Income			
London×2012×Income	0.018**	0.018	0.022	0.026**
	(0.009)	(0.014)	(0.014)	(0.012)
London×2012	-0.134	-0.105	-0.207	-0.316**
	(0.098)	(0.152)	(0.149)	(0.134)
N	40,458	40,458	40,458	40,458
R^2	0.011	0.009	0.004	0.006
N of People	26,030	26,030	26,030	26,030
Controls	Yes	Yes	Yes	Yes

Notes: Regressions based on Eq. (2), with heterogeneous effects included as an additional treatment. Panel A includes gender treatment; Panel B age treatment; and Panel C income treatment. Regressions controls include: gender, age, age^2, employment status, education level, marital status, log income, home ownership, change in quarterly GDP since 2008Q1, controls for interview mode, day-of-the-week and calendar-month effects. Robust standard errors clustered at the date level reported in parentheses.
*** $p < 0.01$, ** $p < 0.05$

Table 9: The Impact of Medals on SWB

	Life Satisfaction		Happiness		Anxiety		Worthwhile	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: Lagged Daily Medals							
London×2012×Medals	-0.006	-0.005	-0.004	-0.003	0.012***	0.011***	-0.014***	-0.013***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)
Medals	0.003	0.002	-0.005	-0.005	-0.002	-0.002	0.009***	0.008***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
London×2012	0.074***	0.083***	0.103***	0.101***	-0.027	-0.009	-0.019	-0.014
	(0.012)	(0.013)	(0.018)	(0.018)	(0.021)	(0.022)	(0.018)	(0.019)
2012	0.007	0.002	0.092***	0.049**	0.049***	0.024	-0.068***	-0.064***
	(0.008)	(0.014)	(0.019)	(0.023)	(0.011)	(0.016)	(0.009)	(0.014)
Constant	-0.026***	-0.097	-0.093***	-1.228***	-0.014***	0.484	0.015***	-0.406
	(0.003)	(0.298)	(0.021)	(0.449)	(0.005)	(0.43)	(0.003)	(0.334)
N	40,458	40,458	40,458	40,458	40,458	40,458	40,458	40,458
R^2	0.002	0.013	0.008	0.017	0.002	0.007	0.005	0.008
N of People	26,030	26,030	26,030	26,030	26,030	26,030	26,030	26,030
Controls	No	Yes	No	Yes	No	Yes	No	Yes
	Panel B: Lagged Daily Gold Medals							
London×2012×Gold	-0.009	-0.008	-0.021	-0.021	0.032**	0.031**	-0.04***	-0.038***
	(0.01)	(0.01)	(0.012)	(0.012)	(0.013)	(0.012)	(0.01)	(0.009)
Gold	0.008	0.007	0.001	0.003	-0.018	-0.017	0.028***	0.025***
	(0.009)	(0.009)	(0.01)	(0.01)	(0.011)	(0.01)	(0.008)	(0.008)
London×2012	0.064***	0.075***	0.109***	0.106***	-0.016	0.001	-0.024	-0.018
	(0.011)	(0.012)	(0.016)	(0.017)	(0.02)	(0.021)	(0.017)	(0.018)
2012	0.01	0.002	0.083***	0.043	0.052***	0.028	-0.065***	-0.063***
	(0.007)	(0.013)	(0.019)	(0.023)	(0.01)	(0.015)	(0.008)	(0.014)
Constant	-0.026***	-0.098	-0.13***	-1.169**	-0.014**	0.482	0.015***	-0.407
	(0.003)	(0.299)	(0.022)	(0.45)	(0.005)	(0.43)	(0.003)	(0.334)
N	40,458	40,458	40,458	40,458	40,458	40,458	40,458	40,458
R^2	0.002	0.012	0.008	0.017	0.002	0.007	0.005	0.008
N of People	26,030	26,030	26,030	26,030	26,030	26,030	26,030	26,030
Controls	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Regressions based on Eq. (2), with medals included as an additional treatment. Panel A considers daily lagged medals; Panel B considers daily lagged Gold medals only. Regressions controls include: gender, age, age^2, employment status, education level, marital status, log income, home ownership, change in quarterly GDP since 2008Q1, controls for interview mode, day-of-the-week and calendar-month effects. Robust standard errors clustered at the date level reported in parentheses.

*** $p < 0.01$, ** $p < 0.05$

Table 10: Legacy (Panel: 2011, 2012, 2013)

	Life Satisfaction		Happiness		Anxiety		Worthwhile	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
London×2012	0.057***	0.067***	0.084***	0.077***	0.006	0.019	-0.05***	-0.044***
	(0.01)	(0.011)	(0.015)	(0.014)	(0.018)	(0.02)	(0.016)	(0.016)
London×2013	0.036***	-0.01	0.062***	0.005	-0.075***	-0.098***	-0.035**	-0.065**
	(0.012)	(0.022)	(0.019)	(0.027)	(0.024)	(0.032)	(0.018)	(0.026)
2012	0.013**	-0.01	0.084***	0.069***	0.046***	0.018	-0.052***	-0.056***
	(0.006)	(0.01)	(0.021)	(0.019)	(0.011)	(0.013)	(0.009)	(0.012)
2013	0.036***	-0.003	0.056***	0.026	0.084***	0.054***	-0.066***	-0.074***
	(0.009)	(0.015)	(0.021)	(0.022)	(0.013)	(0.02)	(0.012)	(0.019)
Constant	-0.021***	-0.32	-0.128***	-0.02	-0.02***	0.128	0.065***	0.191
	(0.003)	(0.17)	(0.024)	(0.184)	(0.007)	(0.171)	(0.011)	(0.164)
N	49,528	49,528	49,528	49,528	49,528	49,528	49,528	49,528
R^2	0.002	0.011	0.007	0.014	0.002	0.006	0.003	0.005
N of People	26,036	26,036	26,036	26,036	26,036	26,036	26,036	26,036
Controls	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Regressions based on Eq. (2), with London×2013 included as an additional treatment along with a 2013 fixed effect. Regressions with controls include: gender, age, age^2, employment status, education level, marital status, log income, home ownership, change in quarterly GDP since 2008Q1, controls for interview mode, day-of-the-week and calendar-month effects. Robust standard errors clustered at the date level reported in parentheses.

*** $p < 0.01$, ** $p < 0.05$

Appendix A: Descriptive Statistics

Table A1: Descriptive Statistics

	London			Paris			Berlin		
	2011	2012	2013	2011	2012	2013	2011	2012	2013
Life Satisfaction	6.515	6.690	6.756	6.668	6.675	6.724	6.681	6.733	6.846
	(2.00)	(1.951)	(1.951)	(1.794)	(1.748)	(1.753)	(1.993)	(1.977)	(1.939)
Happiness	6.448	6.683	6.791	6.724	6.710	6.803	6.497	6.632	6.771
	(2.15)	(2.07)	(2.10)	(1.873)	(1.812)	(1.812)	(2.236)	(2.166)	(2.165)
Anxiousness	4.252	4.296	4.064	4.324	4.436	4.464	4.197	4.328	4.402
	(2.722)	(2.667)	(2.686)	(2.564)	(2.512)	(2.531)	(2.685)	(2.583)	(2.582)
Worthwhileness	6.865	6.716	6.822	6.699	6.594	6.611	7.226	7.181	7.273
	(2.048)	(2.087)	(2.081)	(1.752)	(1.704)	(1.754)	(1.93)	(1.892)	(1.861)
Age	28.925	32.515	35.124	28.140	30.390	32.240	26.532	29.482	31.876
	(14.929)	(14.379)	(14.259)	(15.20)	(14.981)	(14.984)	(14.688)	(14.613)	(14.452)
Male	0.407	0.413	0.431	0.472	0.476	0.465	0.429	0.436	0.450
	(0.491)	(0.493)	(0.495)	(0.499)	(0.499)	(0.499)	(0.495)	(0.496)	(0.498)
Annual Income (log)	10.386	10.434	10.446	10.310	10.396	10.398	10.006	10.076	10.163
	(0.786)	(0.755)	(0.748)	(0.694)	(0.661)	(0.643)	(0.83)	(0.832)	(0.812)
Married	0.418	0.451	0.483	0.356	0.371	0.375	0.332	0.367	0.396
	(0.493)	(0.498)	(0.50)	(0.479)	(0.483)	(0.484)	(0.471)	(0.482)	(0.489)
With Partner	0.146	0.135	0.115	0.213	0.202	0.190	0.167	0.169	0.159
	(0.353)	(0.342)	(0.319)	(0.409)	(0.402)	(0.392)	(0.373)	(0.374)	(0.365)
Separated	0.023	0.020	0.014	0.022	0.019	0.020	0.029	0.024	0.023
	(0.15)	(0.141)	(0.119)	(0.146)	(0.135)	(0.139)	(0.167)	(0.152)	(0.149)
Divorced	0.071	0.082	0.084	0.083	0.089	0.098	0.100	0.112	0.115
	(0.256)	(0.274)	(0.277)	(0.276)	(0.285)	(0.297)	(0.299)	(0.316)	(0.3199)
Widowed	0.029	0.035	0.039	0.026	0.030	0.034	0.022	0.027	0.031
	(0.168)	(0.185)	(0.192)	(0.16)	(0.17)	(0.182)	(0.146)	(0.162)	(0.174)
In School	0.053	0.021	0.012	0.084	0.060	0.042	0.126	0.089	0.069
	(0.224)	(0.142)	(0.107)	(0.278)	(0.237)	(0.201)	(0.332)	(0.285)	(0.253)
Professional Degree	0.148	0.141	0.174	0.153	0.033	0.185	0.052	0.319	0.316
	(0.355)	(0.348)	(0.379)	(0.36)	(0.177)	(0.388)	(0.223)	(0.466)	(0.465)
University Degree	0.429	0.442	0.416	0.102	0.522	0.000	0.436	0.400	0.429
	(0.495)	(0.497)	(0.493)	(0.303)	(0.50)	(0.00)	(0.496)	(0.49)	(0.495)
Other Higher	0.200	0.181	0.178	0.515	0.242	0.631	0.234	0.212	0.188
Education Degree	(0.40)	(0.385)	(0.383)	(0.50)	(0.428)	(0.483)	(0.423)	(0.409)	(0.391)
Part-Time Employed	0.120	0.126	0.127	0.071	0.064	0.062	0.128	0.128	0.130
	(0.325)	(0.332)	(0.333)	(0.257)	(0.244)	(0.24)	(0.334)	(0.334)	(0.337)
Self-Employed	0.096	0.092	0.104	0.036	0.030	0.026	0.091	0.083	0.087
	(0.294)	(0.289)	(0.305)	(0.187)	(0.17)	(0.158)	(0.288)	(0.276)	(0.282)
Unemployed:	0.059	0.041	0.036	0.049	0.043	0.042	0.056	0.046	0.047
Looking for Job	(0.235)	(0.199)	(0.187)	(0.216)	(0.202)	(0.201)	(0.229)	(0.21)	(0.212)
Unemployed:	0.085	0.088	0.073	0.038	0.036	0.036	0.044	0.041	0.034
Permanently	(0.278)	(0.284)	(0.259)	(0.191)	(0.187)	(0.187)	(0.206)	(0.198)	(0.181)
Retired	0.134	0.170	0.205	0.172	0.200	0.244	0.123	0.161	0.187
	(0.341)	(0.376)	(0.404)	(0.377)	(0.40)	(0.429)	(0.328)	(0.367)	(0.39)
Lives: Flat Share	0.346	0.301	0.261	0.422	0.389	0.375	0.719	0.702	0.680
	(0.476)	(0.459)	(0.439)	(0.494)	(0.488)	(0.484)	(0.449)	(0.458)	(0.467)
Lives: Relatives	0.077	0.048	0.039	0.058	0.053	0.041	0.034	0.027	0.022
	(0.266)	(0.214)	(0.194)	(0.233)	(0.225)	(0.198)	(0.180)	(0.161)	(0.147)
Lives: Other	0.013	0.012	0.014	0.025	0.002	0.013	0.038	0.034	0.043
	(0.115)	(0.108)	(0.119)	(0.157)	(0.045)	(0.115)	(0.191)	(0.181)	(0.203)
N	9,402	4,663	2,857	9,629	5,945	3,672	6,927	3,892	2,541

Notes: Averages (proportions for the case of binary variables). Standard deviations in parentheses.

Table A2: Table 1 with Full Set of Controls

	Life Satisfaction	Happiness	Anxiety	Worthwhileness
London×OlympicsPeriod	0.088**	0.053	0.118**	0.028
	(0.042)	(0.042)	(0.049)	(0.043)
London×PostOlympicsPeriod	0.053	0.001	0.084	-0.081**
	(0.039)	(0.04)	(0.05)	(0.037)
London	0.138**	0.002	-0.265***	0.521***
	(0.056)	(0.05)	(0.057)	(0.044)
OlympicsPeriod	0.148***	0.023	-0.257***	0.166***
	(0.032)	(0.024)	(0.033)	(0.026)
PostOlympicsPeriod	0.014	0.004	-0.059	0.098***
	(0.033)	(0.024)	(0.034)	(0.029)
Age	-0.036***	-0.026***	0.016***	-0.01**
	(0.004)	(0.004)	(0.003)	(0.004)
Age^2	0.001***	0.001***	-0.001***	0.001***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Male	-0.051***	-0.04**	-0.103***	-0.121***
	(0.018)	(0.017)	(0.022)	(0.016)
Annual Income (log)	0.209***	0.162***	-0.106***	0.098***
	(0.011)	(0.011)	(0.013)	(0.013)
Married	0.26***	0.272***	0.031	0.28***
	(0.024)	(0.026)	(0.028)	(0.024)
With Partner	0.188***	0.246***	-0.009	0.16***
	(0.02)	(0.023)	(0.024)	(0.027)
Separated	-0.052	-0.074	0.047	0.045
	(0.056)	(0.055)	(0.066)	(0.055)
Divorced	0.061	0.08	-0.015	0.115***
	(0.041)	(0.041)	(0.033)	(0.038)
Widowed	0.075	0.124**	-0.038	0.134**
	(0.042)	(0.052)	(0.062)	(0.06)
In School	0.082**	0.059	0.001	0.136***
	(0.04)	(0.04)	(0.045)	(0.045)
Professional Degree	-0.011	-0.045	0.074**	0.042
	(0.03)	(0.032)	(0.033)	(0.031)
University Degree	0.036	-0.024	0.083***	0.08***
	(0.025)	(0.024)	(0.026)	(0.02)
Other Higher Education Degree	0.045	-0.001	0.017	0.099***
	(0.032)	(0.033)	(0.025)	(0.026)
Part-Time Employed	0.005	0.007	-0.026	0.005
	(0.032)	(0.027)	(0.029)	(0.029)
Self-Employed	0.061	0.017	-0.076**	0.163***
	(0.034)	(0.03)	(0.037)	(0.033)
Unemployed: Looking for Job	-0.361***	-0.265***	0.16***	-0.283***
	(0.049)	(0.047)	(0.045)	(0.06)
Unemployed: Permanently	-0.221***	-0.188***	0.113***	-0.284***
	(0.05)	(0.043)	(0.032)	(0.044)
Retired	0.045	0.068	-0.05	-0.027
	(0.04)	(0.04)	(0.036)	(0.033)
Lives: Flat Share	-0.149***	-0.087***	0.064***	-0.029
	(0.019)	(0.018)	(0.023)	(0.024)
Lives: Relatives	-0.249***	-0.171***	0.116**	-0.11***
	(0.038)	(0.039)	(0.047)	(0.04)
Lives: Other	-0.171**	-0.117	0.03	0.044
	(0.028)	(0.025)	(0.038)	(0.026)
Change in Quarterly GDP	-0.04	-0.054**	0.156***	-0.016
since 2008Q1	(1.887)	(2.215)	(2.262)	(1.809)
Constant	-0.009	-0.035	0.126**	0.055
	(0.039)	(0.025)	(0.053)	(0.038)
N	14,500	14,500	14,500	14,500
R^2	0.10	0.09	0.036	0.067
Controls	Yes	Yes	Yes	Yes

Notes: Estimates for each measure of SWB based on Eq. (1). Regressions routinely include controls for interview mode, and day-of-the-week and calendar-month effects. Robust standard errors clustered at the date level reported in parentheses.
*** $p < 0.01$, ** $p < 0.05$

Table A3: Table 2 with Full Set of Controls

	Life Satisfaction	Happiness	Anxiety	Worthwhileness
London×2012	0.07***	0.084***	0.024	-0.044***
	(0.011)	(0.015)	(0.019)	(0.016)
2012	0.005	0.043	0.022	-0.054***
	(0.013)	(0.022)	(0.015)	(0.013)
Age	-0.03**	0.04	0.003	-0.005
	(0.014)	(0.02)	(0.017)	(0.016)
Age^2	0.001**	-0.001	-0.001	0.001
	(0.0001)	(0.002)	(0.001)	(0.001)
Annual Income (log)	0.068***	0.037***	-0.051***	0.044***
	(0.012)	(0.014)	(0.014)	(0.012)
Married	0.111***	0.227***	-0.072	-0.026
	(0.039)	(0.037)	(0.042)	(0.047)
With Partner	0.059**	0.131***	-0.041	0.015
	(0.026)	(0.028)	(0.03)	(0.022)
Separated	0.126***	0.193***	0.114**	0.027
	(0.042)	(0.054)	(0.052)	(0.051)
Divorced	0.157***	0.02	0.003	0.022
	(0.05)	(0.062)	(0.053)	(0.045)
Widowed	-0.028	0.021	-0.163	-0.105
	(0.085)	(0.116)	(0.095)	(0.073)
In School	-0.017	-0.021	0.035	0.026
	(0.031)	(0.044)	(0.046)	(0.036)
Professional Degree	0.021	0.025	-0.003	0.012
	(0.019)	(0.019)	(0.021)	(0.019)
University Degree	0.008	-0.015	0.045	0.009
	(0.021)	(0.021)	(0.023)	(0.019)
Other Higher Education Degree	0.005	-0.009	-0.001	0.005
	(0.02)	(0.019)	(0.024)	(0.017)
Part-Time Employed	-0.055**	-0.041	0.028	-0.067**
	(0.023)	(0.025)	(0.027)	(0.028)
Self-Employed	-0.037	-0.067	0.075	-0.072**
	(0.033)	(0.036)	(0.039)	(0.035)
Unemployed: Looking for Job	-0.287***	-0.176***	0.124***	-0.117***
	(0.031)	(0.035)	(0.034)	(0.032)
Unemployed: Permanently	-0.104***	-0.044	0.131***	-0.151***
	(0.033)	(0.042)	(0.049)	(0.033)
Retired	0.002	-0.036	0.095**	0.017
	(0.042)	(0.057)	(0.043)	(0.047)
Lives: Flat Share	0.001	-0.036	-0.035	0.0255
	(0.025)	(0.026)	(0.03)	(0.028)
Lives: Relatives	-0.081**	-0.033	-0.013	0.006
	(0.039)	(0.041)	(0.045)	(0.039)
Lives: Other	0.005	-0.031	0.039	0.046
	(0.037)	(0.035)	(0.043)	(0.035)
Change in Quarterly GDP	3.859**	3.517	2.502	1.731
since 2008Q1	(1.887)	(2.215)	(2.262)	(1.809)
Constant	-0.098	-1.228***	0.484	-0.409
	(0.30)	(0.448)	(0.428)	(0.336)
N	40,458	40,458	40,458	40,458
R^2	0.012	0.017	0.007	0.007
N of People	26,030	26,030	26,030	26,030
Controls	Yes	Yes	Yes	Yes

Notes: Estimates for each measure of SWB based on Eq. (2). Regressions routinely include controls for interview mode, and day-of-the-week effects. Robust standard errors clustered at the date level reported in parentheses. *** $p < 0.01$, ** $p < 0.05$

Appendix B: Attrition

Attrition across the three years is important as only 35% of wave one respondents were also interviewed in the last wave — see Table B1. Attrition was somewhat more pronounced in London, where 31% of the initial sample was interviewed in the last year; compared to 38% and 37% in Paris and Berlin, respectively.

Is attrition selective? To enquire we estimate the four SWB outcomes of interest conditional on staying in the sample. This is tantamount to asking whether 'happier' individuals are more likely to remain in the sample or to drop out of it, and whether this differs in London compared to the other two cities. Any of these results would likely bias our results.

As shown by Table B2, some selection bias is actually at play. Individuals who are happier and less anxious are more likely to stay in the sample. There is, however, no evidence of a selection bias that would differ across countries (although life satisfaction is weakly correlated to remaining in the sample in London).

Table B1: Number of Individuals Interviewed

	Wave 1	Wave 2	Wave 3
	Sample Attrition: Entire Sample		
Only Wave 1	11,165		
Only Waves 1 & 2	5,695	5,695	
Only Waves 1 & 3	139		139
All Waves	9,143	9,143	9,143
Total	26,142	14,838	9,282
% of Initial	100	56.76	35.51
	Sample Attrition: London		
Only Wave 1	4,679		
Only Waves 1 & 2	1,879	1,879	
Only Waves 1 & 3	42		42
All Waves	2,883	2,883	2,883
Total	9,483	4,762	2,925
% of Initial	100	50.22	30.84
	Sample Attrition: Paris		
Only Wave 1	3,541		
Only Waves 1 & 2	2,402	2,402	
Only Waves 1 & 3	62		62
All Waves	3,656	3,656	3,656
Total	9,661	6,058	3,718
% of Initial	100	62.71	38.48
	Sample Attrition: Berlin		
Only Wave 1	2,945		
Only Waves 1 & 2	1,414	1,414	
Only Waves 1 & 3	35		35
All Waves	2,604	2,604	2,604
Total	6,998	4,018	2,639
% of Initial	100	57.42	37.71

Table B2: Testing for Differences in Attrition

	Life Satisfaction	Happiness	Anxiety	Worthwhile
Present (in all 3 Waves)	0.031	0.060**	-0.062**	0.030
	(0.026)	(0.027)	(0.025)	(0.025)
London	-0.106***	-0.027	0.031	-0.195***
	(0.021)	(0.021)	(0.020)	(0.020)
Paris	-0.013	0.123***	0.034	-0.263***
	(0.020)	(0.021)	(0.020)	(0.019)
Present×London	0.066	0.018	-0.047	0.032
	(0.035)	(0.036)	(0.034)	(0.034)
Present×Paris	0.012	-0.034	0.040	-0.033
	(0.032)	(0.033)	(0.033)	(0.031)
Constant	-0.007	-0.093***	-0.014	0.176***
	(0.016)	(0.017)	(0.015)	(0.015)
N	26,135	26,115	26,113	26,094
R^2	0.002	0.004	0.002	0.012
Controls	Yes	Yes	Yes	Yes

Notes: "Present"=1 when individual is present in all three waves; =0 otherwise. Regressions controls include: gender, age, age^2, employment status, education level, marital status, log income, home ownership, change in quarterly GDP since 2008Q1, controls for interview mode, day-of-the-week and calendar-month effects. Robust standard errors clustered at the date level reported in parentheses.
*** $p < 0.01$, ** $p < 0.05$

Table B3: Balancing Properties of Observables after Propensity-Score Matching

	Mean London	Mean Paris & Berlin Pooled	Scale-free Normalised Difference
Age	31.65	30.492	0.056
Male	0.415	0.46	0.065
Annual Income (log)	10.448	10.246	0.188
Married	0.446	0.378	0.097
With Partner	0.14	0.185	0.087
Separated	0.019	0.021	0.01
Divorced	0.076	0.10	0.06
Widowed	0.033	0.031	0.008
In School	0.026	0.07	0.146
Professional Degree	0.149	0.142	0.014
University Degree	0.514	0.432	0.116
Other Higher Education Degree	0.142	0.255	0.202
Part-Time Employed	0.117	0.091	0.061
Self-Employed	0.084	0.052	0.091
Unemployed: Looking for Job	0.046	0.043	0.01
Unemployed: Permanently	0.084	0.04	0.129
Retired	0.166	0.191	0.047
Lives: Flat Share	0.308	0.524	0.318
Lives: Relatives	0.053	0.039	0.047
Lives: Other	0.01	0.014	0.026
N	10,438	18,624	—

Notes: The last column shows the normalised difference, calculated as $\Delta x = (\bar{x}_t - \bar{x}_c) \div \sqrt{\sigma_t^2 + \sigma_c^2}$, where $\bar{x}_t$ and $\bar{x}_c$ denote the sample mean of the covariate of the treatment and control group, respectively, and σ^2 denotes the variance. As a rule of thumb, a normalised difference greater than 0.25 indicates a non-balanced covariate, which might lead to sensitive results (Imbens and Wooldridge, 2009).

Appendix C: Additional Figures

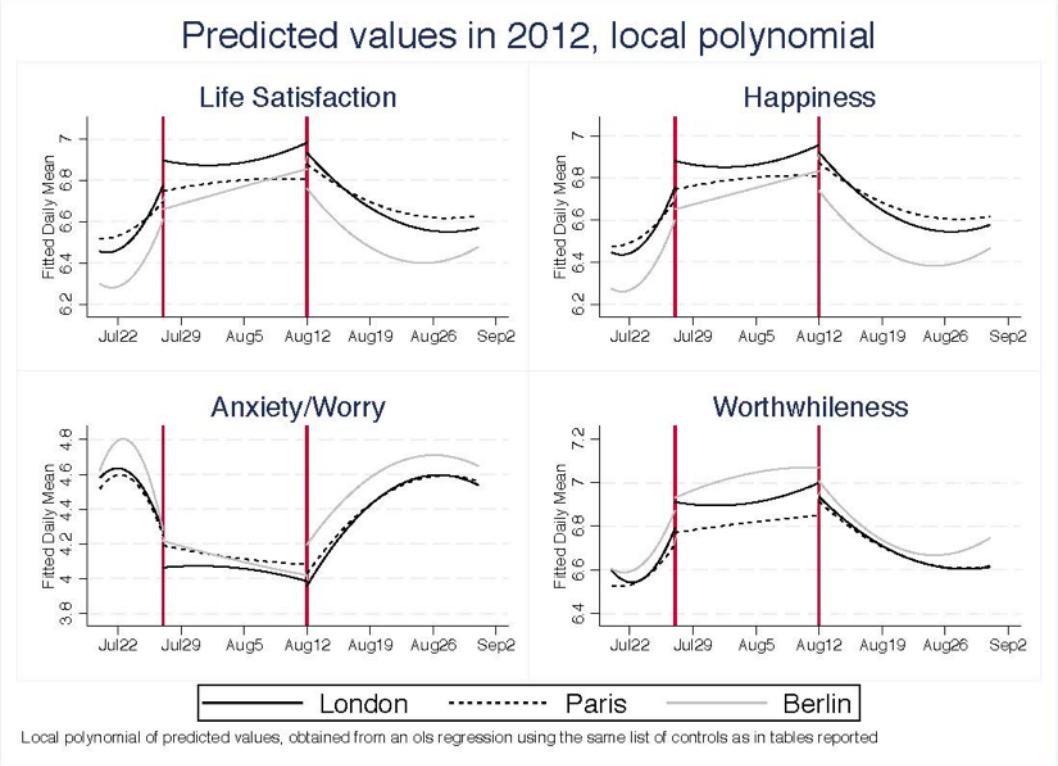

Figure C1: SWB in 2012 in London, Paris, Berlin

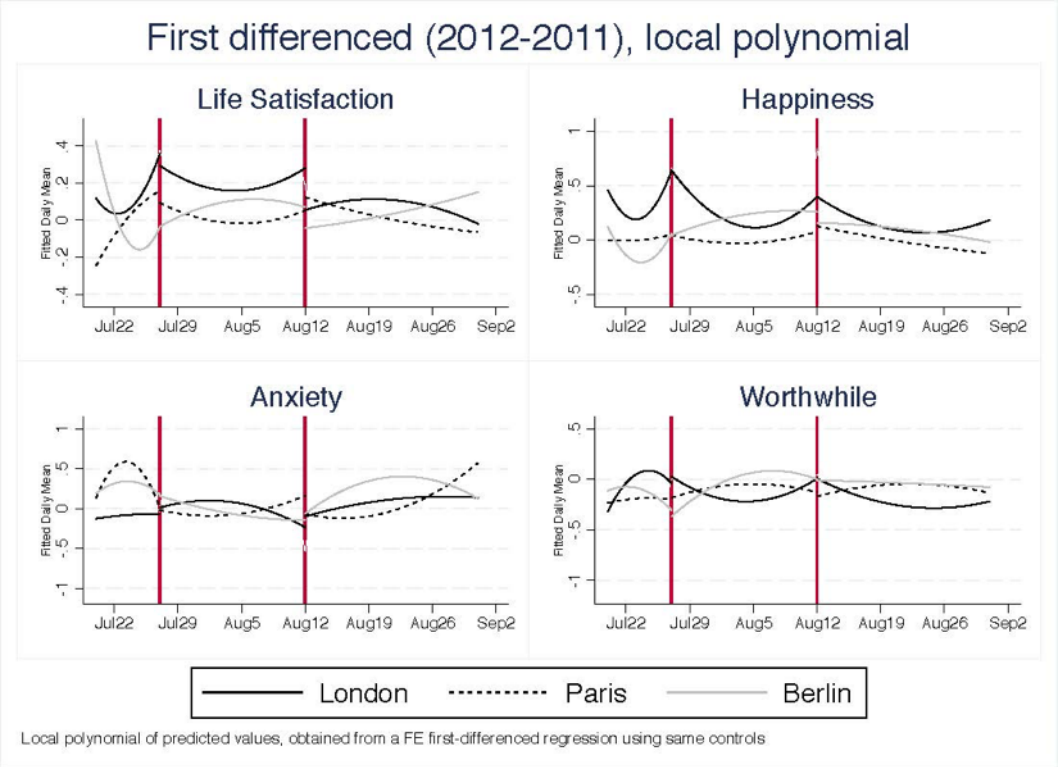

Figure C2: Changes in SWB between 2012 and 2011 in London, Paris, Berlin

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