**DIAGNOSTICS AND ROBUSTNESS CHECKS**

Table A.1 details the estimated effect of online advertising on the comovement elasticity of total advertising spending. The empirical results are not sensitive to a number of modeling issues. First, we compute variance inflation factor (VIF) for the predictors used in meta-regression (Table A.2). The largest and smallest VIFs are 8.19 and 1.39, respectively (4.46 and 1.42 for the six cultural dimensions). The regional dummies seem to be a major source of collinearity because without them the largest and smallest VIFs reduce to 3.59 and 1.19 (2.44 and 1.99 for the cultural dimensions). We also run meta-regression without the regional dummies and, as expected, obtain sharper estimates for the Hofstede measures. Second, we experiment with four alternative values in a wide range for the smoothing parameter λ: 5, 7.5, 20, and 50. The comovement elasticities resulting from the five different values (including λ=10) are highly correlated. The smallest and largest of the 10 Pearson correlations are .943 (between λ=5 and λ=50) and .997 (between λ=7.5 and λ=10). Spearman’s rank correlations resemble closely the pattern of the Pearson correlations. We also assess the percentage absolute difference as | βλ – β10 / β10 |, where β10 is the comovement elasticity obtained with λ=10. The median percentage differences are generally low: 6.3%, 2.7%, 5.7%, and 9.9% for λ =5, 7.5, 20, and 50, respectively. The estimates of common effects and other statistics are stable across the alternative values (Table A.3). Most importantly, the sign, size, and significance of the estimates from meta-regression are robust to different values of λ, and the substantive findings remain largely unchanged (see Table A.4–A.12 for details). Thus, the results for comovement elasticity and hypothesis testing are not driven by our specific HP filter setting. Third, since our time-series of advertising expenditure spans a relatively long period (on average 31 years), we account for potential (unknown) structural breaks in the advertising and GDP series separately. Since it is beyond our ability to examine and incorporate events that might have led to structural breaks in the series, especially for advertising expenditure, for all the sample countries, we inevitably rely on a purely statistical method to examine shocks in the level $μ$ and slope $ν$ in Equation (1b) and (1c). de Jong and Penzer’s (1998) method identifies zero, one, and two break years (jointly for the state vector of level and slope) for the advertising series in 17, 39, and 3 countries; and 14, 39, and 6 countries for the GDP series, respectively. Then, we test significance of level and slope shifts separately in the suggested break years and retain only significant shift dummies (at the 5% level). This procedure results in *M*=1.327 (Table A.3). The lower value of mean elasticity is not unexpected given that incorporating structural breaks in the state equations will reduce hikes around the trend and thus magnitudes of cyclical components. Unless such removals or reductions of changes coincide in the two series, the strength of spontaneous changes in the two series must be lessened. Although interventions are detected in the state space representation of the HP filter, the substantive findings are largely unaffected by the presence of the suggested interventions. Fourth, one may wonder if the empirical findings on the culture’s effects remain valid with more recent data. Meta-regression is repeated with comovement elasticities estimated from the truncated sample (1993-2017). The conclusions for the hypotheses remain identical. Fifth, we may use per capita online spending ($) in lieu of the share (%) in meta-regression. Per capita spending is highly correlated with other predictors (e.g., r=.747 with ONLINEAD; r=.819 with INCOME; VIF>12). Thus, the variable is not used in meta-regression. Sixth, ONLINEAD has no higher-order effects. Adding its squared term produces insignificant coefficients on both linear and quadratic effects. Moreover, removing ONLINEAD leaves largely intact the substantive findings on the culture’s effect. Finally, note that we subtract total advertising expenditure from the GDP series prior to extracting cyclical components of GDP. With this extra step, the estimated comovement elasticities are less likely to be a statistical artifact.

In this Web Appendix, we use the following abbreviations to save space:

LTO = long-term orientation;

PDI = power distance index;

UAI = uncertainty avoidance index;

IDV = individualism;

MAS = masculinity; and

IVR = indulgence vs. restraint.

**REFERENCE**

de Jong, Piet, and Jeremy Penzer (1998), “Diagnosing Shocks in Time Series,” *Journal of the American Statistical Association*, 93(442), 796-806.

Table A.1: The Effect of Online Advertising on the Comovement Elasticity

Modified Eq (2): $ADV\_{t}^{C}=β\*GDP\_{t}^{C} +δ\*I\left(t\geq τ\right)\*GDP\_{t}^{C}+e\_{t}^{}$, *τ*=when online ad($)>0

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Country | *T*:Total Ad | *T*:Online Ad | Comovement Elasticity β | Effect of Online Ad δ |
| Est | SE | *p*: β≤1d | *p*: β≤0f | Est | SE | *Z* | *p*: δ=0 |
| Argentina | 29 | 16 | 2.49 | 0.72 | \*\* | \*\*\* | 0.07 | 0.87 | 0.084 |  |
| Australia | 35 | 19 | 1.14 | 0.70 |  | \* | 3.13 | 2.01 | 1.558 |  |
| Austria | 35 | 17 | 0.62 | 1.46 |  |  | 0.35 | 1.83 | 0.189 |  |
| Belgium | 35 | 20 | 0.43 | 0.76 |  |  | 2.00 | 1.15 | 1.741 | \* |
| Brazil | 24 | 15 | 0.67 | 1.50 |  |  | 0.79 | 1.64 | 0.478 |  |
| Bulgaria | 35 | 14 | 1.35 | 1.33 |  |  | 1.33 | 2.86 | 0.465 |  |
| Canada | 34 | 21 | 0.98 | 0.47 |  | \*\* | 0.42 | 0.62 | 0.676 |  |
| Chile | 35 | 15 | 1.94 | 0.55 | \*\* | \*\*\* | -0.09 | 0.94 | -0.097 |  |
| China | 35 | 17 | -0.57 | 0.68 |  |  | 0.36 | 1.48 | 0.242 |  |
| Colombia | 26 | 13 | 2.93 | 1.43 | \* | \*\* | 2.10 | 3.03 | 0.693 |  |
| Costa Rica | 35 | 0 | 6.39 | 1.55 | \*\*\* | \*\*\* |   |   |   |   |
| Czech Republic | 35 | 19 | 1.55 | 0.46 |  | \*\*\* | 0.31 | 0.76 | 0.416 |  |
| *Denmark* | *35* | *17* | *1.93* | *0.68* | *\** | *\*\*\** | *2.09* | *0.91* | *2.308* | *\*\** |
| Egypt | 17 | 0 | 7.16 | 2.30 | \*\*\* | \*\*\* |   |   |   |   |
| *Estonia* | *28* | *20* | *7.11* | *0.68* | *\*\*\** | *\*\*\** | *-4.93* | *0.89* | *-5.527* | *\*\*\** |
| Finland | 35 | 22 | 1.18 | 0.39 |  | \*\*\* | 0.80 | 0.58 | 1.389 |  |
| *France* | *35* | *21* | *-0.79* | *0.65* |  |  | *3.38* | *0.90* | *3.754* | *\*\*\** |
| *Germany* | *35* | *20* | *-0.58* | *0.68* |  |  | *2.37* | *0.83* | *2.844* | *\*\*\** |
| Greece | 35 | 8 | 1.89 | 0.71 |  | \*\*\* | 1.45 | 0.93 | 1.568 |  |
| *Hong Kong, China* | *35* | *11* | *0.87* | *0.44* |  | *\*\** | *2.53* | *1.01* | *2.511* | *\*\** |
| *Hungary* | *35* | *14* | *1.14* | *0.29* |  | *\*\*\** | *1.54* | *0.55* | *2.799* | *\*\*\** |
| India | 35 | 19 | 0.81 | 1.16 |  |  | 0.93 | 1.58 | 0.590 |  |
| Indonesia | 22 | 7 | 6.10 | 0.56 | \*\*\* | \*\*\* | 2.78 | 7.93 | 0.351 |  |
| Ireland | 35 | 18 | -0.26 | 1.08 |  |  | 0.73 | 1.17 | 0.620 |  |
| Israel | 22 | 18 | 0.67 | 4.50 |  |  | 2.50 | 4.55 | 0.548 |  |
| Italy | 35 | 20 | 3.68 | 1.27 | \*\* | \*\*\* | -0.56 | 1.43 | -0.394 |  |
| *Japan* | *35* | *22* | *-0.40* | *0.94* |  |  | *2.71* | *1.16* | *2.340* | *\*\** |
| Kuwait | 23 | 0 | 0.22 | 0.77 |  |  |   |   |   |   |
| Latvia | 24 | 18 | 2.55 | 1.67 |  | \* | -0.57 | 1.72 | -0.335 |  |
| *Lithuania* | *25* | *18* | *5.90* | *1.51* | *\*\*\** | *\*\*\** | *-3.58* | *1.80* | *-1.986* | *\*\** |
| *Malaysia* | *35* | *13* | *1.87* | *0.29* | *\*\*\** | *\*\*\** | *-1.63* | *0.71* | *-2.286* | *\*\** |
| Mexico | 24 | 12 | 1.11 | 0.37 |  | \*\*\* | 0.10 | 0.63 | 0.155 |  |
| *Netherlands* | *35* | *19* | *0.58* | *1.06* |  |  | *2.67* | *1.20* | *2.216* | *\*\** |
| *New Zealand* | *35* | *14* | *0.91* | *0.57* |  | *\** | *2.52* | *1.28* | *1.967* | *\*\** |
| Norway | 35 | 18 | 1.93 | 1.45 |  | \* | 2.28 | 2.44 | 0.934 |  |
| Pakistan | 35 | 13 | 2.86 | 0.94 | \*\* | \*\*\* | -1.11 | 1.70 | -0.653 |  |
| Peru | 26 | 11 | 2.89 | 0.59 | \*\*\* | \*\*\* | -1.03 | 1.04 | -0.990 |  |
| Philippines | 35 | 12 | 2.30 | 0.62 | \*\* | \*\*\* | -1.92 | 2.33 | -0.826 |  |
| Poland | 35 | 17 | 5.52 | 1.32 | \*\*\* | \*\*\* | -2.58 | 3.63 | -0.710 |  |
| *Portugal* | *35* | *20* | *-0.74* | *0.69* |  |  | *4.50* | *1.11* | *4.068* | *\*\*\** |
| Qatar | 23 | 0 | 0.68 | 0.82 |  |  |   |   |   |   |
| Romania | 23 | 15 | 1.81 | 1.73 |  |  | 1.72 | 1.99 | 0.861 |  |
| *Russia* | *24* | *19* | *-2.84* | *1.47* |  |  | *6.97* | *1.83* | *3.798* | *\*\*\** |
| Saudi Arabia | 22 | 0 | 1.90 | 0.56 | \* | \*\*\* |   |   |   |   |
| Singapore | 35 | 11 | 0.41 | 0.30 |  | \* | 0.19 | 0.52 | 0.362 |  |
| *Slovenia* | *28* | *14* | *3.81* | *0.90* | *\*\*\** | *\*\*\** | *-3.44* | *1.13* | *-3.050* | *\*\*\** |
| *South Africa* | *35* | *17* | *0.72* | *0.46* |  | *\** | *4.28* | *0.84* | *5.073* | *\*\*\** |
| South Korea | 35 | 17 | 4.00 | 0.53 | \*\*\* | \*\*\* | 0.56 | 1.56 | 0.359 |  |
| Spain | 34 | 20 | 4.25 | 1.05 | \*\*\* | \*\*\* | -0.51 | 1.28 | -0.395 |  |
| Sweden | 35 | 21 | 0.99 | 0.70 |  | \* | 1.66 | 0.88 | 1.892 | \* |
| Switzerland | 35 | 20 | 1.24 | 0.94 |  | \* | 1.66 | 1.22 | 1.364 |  |
| Taiwan | 35 | 18 | -1.39 | 1.93 |  |  | 1.39 | 2.24 | 0.619 |  |
| *Thailand* | *35* | *10* | *2.43* | *0.32* | *\*\*\** | *\*\*\** | *-2.32* | *0.85* | *-2.733* | *\*\*\** |
| Turkey | 33 | 17 | 3.93 | 0.67 | \*\*\* | \*\*\* | -1.07 | 0.80 | -1.340 |  |
| United Arab Emirates | 22 | 0 | 3.63 | 1.08 | \*\*\* | \*\*\* |   |   |   |   |
| *United Kingdom* | *35* | *21* | *0.29* | *0.53* |  |  | *2.38* | *0.78* | *3.071* | *\*\*\** |
| USA | 35 | 23 | 2.76 | 0.41 | \*\*\* | \*\*\* | 0.38 | 0.49 | 0.780 |  |
| Venezuela | 22 | 8 | -0.23 | 1.09 |  |  | 3.15 | 2.11 | 1.489 |  |
| Vietnam | 22 | 15 | 3.40 | 3.12 |  |  | -4.48 | 4.77 | -0.939 |  |

Table A.2: Variance Inflation Factor

|  |  |  |
| --- | --- | --- |
| Predictor | Used for Total Advertising  | Used for Online Advertising |
| Asia Pacific | 8.23 |  |  6.51  |   |
| Eastern Europe | 6.39 |  |  9.84  |   |
| Latin America | 6.97 |  |  |   |
| Middle East | 2.33 |  |  6.92  |   |
| Western Europe | 7.74 |  |  7.37  |   |
| INCOME | 5.90 | 3.61 |  5.82  |  3.87  |
| LTO | 2.56 | 2.15 |  2.06  |  1.87  |
| PDI | 2.72 | 2.38 |  3.76  |  2.91  |
| UAI | 2.31 | 1.53 |  3.27  |  2.41  |
| IDV | 4.70 | 2.45 |  4.17  |  2.48  |
| MAS | 1.47 | 1.24 |  1.62  |  1.40  |
| IVR | 4.65 | 2.53 |  9.76  |  6.37  |
| STOCKM | 2.11 | 1.79 |  7.83  |  3.09  |
| FOS | 1.40 | 1.19 |  1.97  |  1.70  |
| NOATS | 2.28 | 1.57 |  2.92  |  1.58  |
| INTENSITY | 2.38 | 1.59 |  2.70  |  1.95  |
| ONLINEAD | 2.00 | 1.75 |  2.42  |  2.16  |
| *All predictors* |  |  |  |   |
| Max VIF | 8.23 | 3.61 |  9.84  |  6.37  |
| Min VIF | 1.40 | 1.19 |  1.62  |  1.40  |
| *Hofstede variables* |  |  |   |   |
| Max VIF | 4.70 | 2.53 |  9.76  |  6.37  |
| Min VIF | 1.47 | 1.24 |  1.62  |  1.40  |

Table A.3: Comovement Elasticity with Different λ

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Group | *N* | *M* | *SEM* | 95% LowerBound | 95% UpperBound | *Q* | *τ2* | *I2* |
| λ=10 | 59 | 1.914 | .062 | 1.792 | 2.036 | 299.6 | .970 | 80.6% |
| λ=10: with breaks | 59 | 1.327 | .066 | 1.197 | 1.456 | 199.2 | .639 | 70.9% |
| λ=5 | 59 | 1.936 | .061 | 1.817 | 2.055 | 304.8 | .944 | 81.0% |
| λ=7.5 | 59 | 1.954 | .061 | 1.836 | 2.073 | 312.1 | .969 | 81.4% |
| λ=20 | 59 | 1.903 | .061 | 1.783 | 2.022 | 333.5 | 1.055 | 82.6% |
| λ=50 | 59 | 1.956 | .060 | 1.839 | 2.073 | 366.0 | 1.138 | 84.2% |

*N* is the number of countries. *M* is the summary effect of estimated comovement elasticities.

*SEM* is the standard error of *M*. All *Q* statistics are significant (*p*<.01).

*τ2* is an estimate of the between-study (country) variance.

**Meta-Regression with Different Filter Specifications and Structural Breaks**

Table A.4: No structural breaks in the level and slope –Model 3 in the main text



*p*-values are two-tailed.

Estimates with *p*<.10 are in bold and red.

Table A.5: No structural breaks in the level and slope – Model 4 in the main text



Table A.6: Structural breaks in the level and slope – Model 3 in the main text



Table A.7: Structural breaks in the level and slope – Model 4 in the main text



Table A.8: No structural breaks in the level and slope – Model 3 in the main text: last 25 years



Table A.9: No structural breaks in the level and slope – Model 4 in the main text: last 25 years



Table A.10: Model 4 without ONLINEAD – No structural breaks



Table A.11: Model 4 without ONLINEAD – Structural breaks



Table A.12: Model 4 without ONLINEAD – No structural breaks with last 25 years

