*Institutions, Trade, and Growth: The Ancient Greek Case of Proxenia*

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**Online appendix**

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| Table A1 |
| Keywords for trade proxies |
| Variable | Expression | Keywords |
|   |   |   |
| Phoenicians | from Tyre | τυρι\* |
| from Sidon | σιδων\*, σιδον\* |
| from Arados | αραδ\* |
| from Berytus | βηρυτ\* |
| from Carthage | καρχαδον\*, καρχηδον\* |
|  |  |  |
| Trade mentions | trade/commerce root | εμπορ\* |
| shipowner and merchant | ναυκλερ\*, ναυκληρ\* |
| cargo | φορτηγ\* |

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| Table A2 |
| Positive attestations for trade proxies |
| Variable | Phoenicians | Trade mentions | Cargos | All trade proxies | Proxeny |
| Total attestations |  444  |  421  |  397  |  1,262  |  4,048  |
| Dated attestations |  317  |  304  |  322  |  943  |  4,002  |
| Used attestations |  231  |  189  |  191  |  611  |  2,994  |
| *Cities matched* |  *29*  |  *22*  |  *32*  |  *64*  |  *360*  |

*Source:* author’s datasets based on PNAW, PHI, Strauss (2013) and Parker (1992).

*Note*: Total attestations: for the epigraphic proxies, *Phoenicians* and *Trade mentions*, this corresponds to the number of keyword matches from PHI, cleaned from spurious findings (like personal names) or repeated entries; for *Cargos*, it reflects the number of shipwrecks with enough information on their origin, destination or cargo. Dated attestations: the number of observations that are, at least approximately, dated and thus can be matched (or not) to the range of interest, 500-0 BCE. Used attestations: how many dated observations could be matched to individual cities in IACP and 500-0 BCE: attrition is due to observations out of our time range, observations lacking geographic information, or locations that are absent in IACP (all non-Greek and late settlements). *Cities matched*: row shows how many IACP locations have positive trade attestations. For comparison, the last column reports similar entries for the dataset on proxeny grants.

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| Table A3 |
| Descriptive statistics for the main sample |
|   | Observations | Mean | Std. Dev. | Min | Max |
|   |   |   |   |   |   |
| Trade index | 1,035 | 0.015 | 0.13 | 0 | 2.74 |
| Phoenicians | 1,035 | 0.015 | 0.14 | 0 | 2.54 |
| Trade mentions | 1,035 | 0.011 | 0.13 | 0 | 3.22 |
| Cargos | 1,035 | 0.18 | 1.72 | 0 | 34 |
| Weighted EC | 360 | 0.04 | 0.08 | 0 | 1 |
| Uneighted EC | 360 | 0.09 | 0.11 | 0 | 1 |
| SR weighted EC | 360 | 0.07 | 0.10 | 0 | 1 |
| Weighted EC (EP1) | 271 | 0.04 | 0.11 | 0 | 1 |
| Weighted EC (EP0) | 185 | 0.12 | 0.17 | 0 | 1 |
| Polisity | 1035 | 2.33 | 0.78 | 1 | 3 |
| Hellenicity | 951 | 3 | 0.49 | 1 | 3 |
| Fame | 1,035 | 1.35 | 1.67 | 0.1 | 21 |
| Silver coinage | 1,035 | 1.63 | 2.37 | 0 | 6 |
| Colonies | 1035 | 0.30 | 2.04 | 0 | 39 |
| Victors | 1,035 | 0.17 | 0.65 | 0 | 4 |
| Walls | 1,035 | 0.52 | 0.50 | 0 | 1 |
| Delian league | 1,035 | 0.31 | 0.46 | 0 | 1 |
| Sanctuary | 1,035 | 0.01 | 0.11 | 0 | 1 |
| Peloponnesian War | 1,035 | 0.89 | 0.72 | 0 | 2 |
| Size | 671 | 2.41 | 1.31 | 1 | 5 |

Source: author’s dataset based on PNAW and POLIS.

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| Table A4 |
| Descriptive statistics for the dyadic sample |
|   | Observations | Mean | Std. Dev. | Min | Max |
|   |   |   |   |   |   |
| Proxeny link | 137,270 | 0.82 | 9.04 | 0 | 100 |
| Link weight | 137,270 | 1.01 | 0.37 | 1 | 77 |
| Dyadic distance | 136,530 | 458 | 320 | 0 | 2655 |
| Same dialect | 137,270 | 0.04 | 0.19 | 0 | 1 |
| Same region | 137,270 | 0.19 | 0.39 | 0 | 1 |
| Colonized by | 137,270 | 0.00 | 0.03 | 0 | 1 |
| Colony of | 137,270 | 0.00 | 0.03 | 0 | 1 |
| Delian league ally | 137,270 | 0.58 | 0.49 | 0 | 1 |
| Peloponnesian war | 137,270 | 0.35 | 0.48 | 0 | 1 |

Source: author’s dataset based on PNAW and POLIS.

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| Table A5 |
| Regression results for different weighting schemes |
|  | *Dependent variable:* unweighted eigencentrality | *Dependent variable:* SR-weighted eigencentrality |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|  |  |  |  |  |   |  |  |  |
| Phoenicians | 0.184\*\*\* |  |  |  | 0.206\*\*\* |  |  |  |
|  | (0.026) |  |  |  | (0.039) |  |  |  |
| Trade mentions |  | 0.144\*\* |  |  |  | 0.180\*\*\* |  |  |
|  |  | (0.050) |  |  |  | (0.054) |  |  |
| Cargos |  |  | 0.114\*\* |  |  |  | 0.169\*\*\* |  |
|  |  |  | (0.040) |  |  |  | (0.025) |  |
| Trade index |  |  |  | 0.182\*\*\* |  |  |  | 0.232\*\*\* |
|  |  |  |  | (0.026) |  |  |  | (0.022) |
| Fame index | 0.400\*\*\* | 0.406\*\*\* | 0.410\*\*\* | 0.379\*\*\* | 0.384\*\*\* | 0.383\*\*\* | 0.375\*\*\* | 0.346\*\*\* |
|  | (0.044) | (0.041) | (0.065) | (0.056) | (0.062) | (0.040) | (0.055) | (0.043) |
|  |  |  |  |  |  |  |  |  |
| Controls | Y | Y | Y | Y | Y | Y | Y | Y |
| Dialect & Region FEs | Y | Y | Y | Y | Y | Y | Y | Y |
|  |  |  |  |  |  |  |  |  |
| Observations | 312 | 312 | 312 | 312 | 312 | 312 | 312 | 312 |
| *R²* | 0.69 | 0.67 | 0.67 | 0.69 | 0.69 | 0.67 | 0.69 | 0.71 |

*Source:* author’s dataset based on PNAW and POLIS.

*Note*: \*\*\* indicates significance at 1 percent level, \*\* at 5 percent level, \* at 10 percent level. Standard errors are clustered at the regional level. Controls: distance from coast, elevation, distance\*elevation, polisity, hellenicity, walls, colonies, panhellenic sanctuary, Olympic victors, earliest coinage, size.

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| Table A6 |
| Regression results for indegree |
|  | *Dependent variable:* indegree |
|  | (1) | (2) | (3) | (4) |
|  |  |  |  |  |
| Phoenicians | 0.332\*\*\* |  |  |  |
|  | (0.075) |  |  |  |
| Trade mentions |  | 0.366\*\*\* |  |  |
|  |  | (0.082) |  |  |
| Cargos |  |  | 0.264\*\*\* |  |
|  |  |  | (0.016) |  |
| Trade index |  |  |  | 0.401\*\*\* |
|  |  |  |  | (0.057) |
| Fame index | 0.211\*\* | 0.186\*\*\* | 0.203\*\* | 0.140\*\*\* |
|  | (0.072) | (0.052) | (0.075) | (0.036) |
|  |  |  |  |  |
| Controls | Y | Y | Y | Y |
| Dialect & Region FEs | Y | Y | Y | Y |
|  |  |  |  |  |
| Observations | 323 | 323 | 323 | 323 |
| *R²* | 0.72 | 0.75 | 0.70 | 0.80 |

*Source:* author’s dataset based on PNAW and POLIS.

*Note*: \*\*\* indicates significance at 1 percent level, \*\* at 5 percent level, \* at 10 percent level. Standard errors are clustered at the regional level. Controls: distance from coast, elevation, distance\*elevation, polisity, hellenicity, walls, colonies, panhellenic sanctuary, Olympic victors, earliest coinage, size.

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| Table A7 |
| Regression results for weighted eigencentrality – robustness to top cities |
|  | *Dependent variable:* indegree |
| *City removed:* | Kaunos | Tomis | Lindos | Samos | Chios |
|  |  |  |  |  |  |
| Trade index | 0.237\*\*\* | 0.235\*\*\* | 0.232\*\*\* | 0.234\*\*\* | 0.235\*\*\* |
|  | (0.021) | (0.021) | (0.022) | (0.021) | (0.021) |
| Fame index | 0.338\*\*\* | 0.345\*\*\* | 0.346\*\*\* | 0.339\*\*\* | 0.357\*\*\* |
|  | (0.042) | (0.043) | (0.043) | (0.042) | (0.051) |
|  |   |   |   |   |   |
| Observations | 311 | 311 | 312 | 311 | 311 |
| *R²* | 0.71 | 0.71 | 0.71 | 0.71 | 0.70 |
|  |  |  |  |  |  |
| *City removed:* | Korinthos | Kos | Delos | Rhodos | Athens |
|  |  |  |  |  |  |
| Trade index | 0.239\*\*\* | 0.255\*\*\* | 0.232\*\*\* | 0.207\*\*\* | 0.189\*\*\* |
|  | (0.024) | (0.030) | (0.022) | (0.039) | (0.047) |
| Fame index | 0.327\*\*\* | 0.341\*\*\* | 0.346\*\*\* | 0.348\*\*\* | 0.341\*\*\* |
|  | (0.052) | (0.047) | (0.043) | (0.043) | (0.046) |
|  |   |   |   |   |   |
| Observations | 311 | 311 | 312 | 311 | 311 |
| *R²* | 0.71 | 0.71 | 0.71 | 0.69 | 0.61 |
|  |  |  |  |  |  |
| Controls | Y | Y | Y | Y | Y |
| Dialect & Region FEs | Y | Y | Y | Y | Y |

*Source:* author’s dataset based on PNAW and POLIS.

*Note*: \*\*\* indicates significance at 1 percent level, \*\* at 5 percent level, \* at 10 percent level. Standard errors are clustered at the regional level. Controls: distance from coast, elevation, distance\*elevation, polisity, hellenicity, walls, colonies, panhellenic sanctuary, Olympic victors, earliest coinage, size.

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| Table A8 |
| Regression results for weighted eigencentrality, different EP definitions |
|  | *Dependent variable:* Weighted eigencentrality |
|  | *Subsample:* EP=1 | *Subsample:* EP=0 |
|  | Def. 4 | Def. 2 | Def. 3 | Def. 4 | Def. 2 | Def. 3 |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
|  |  |  |  |  |  |  |
| Trade index | 0.243\*\*\* | 0.218\*\*\* | 0.218\*\*\* | 0.172\*\* | 0.185\*\*\* | 0.187\*\*\* |
|  | (0.035) | (0.062) | (0.063) | (0.053) | (0.025) | (0.026) |
| Fame index | -0.046 | -0.050 | -0.053 | 0.243\*\*\* | 0.263\*\*\* | 0.272\*\*\* |
|  | (0.072) | (0.046) | (0.046) | (0.060) | (0.058) | (0.058) |
|  |  |  |  |  |  |  |
| Controls | Y | Y | Y | Y | Y | Y |
| Dialect & Region FEs | Y | Y | Y | Y | Y | Y |
|  |  |  |  |  |  |  |
| Observations | 254 | 247 | 246 | 164 | 205 | 208 |
| *R²* | 0.50 | 0.60 | 0.60 | 0.55 | 0.51 | 0.52 |

*Source:* author’s dataset based on PNAW and POLIS.

*Note*: \*\*\* indicates significance at 1 percent level, \*\* at 5 percent level, \* at 10 percent level. Standard errors are clustered at the regional level. Controls: distance from coast, elevation, distance\*elevation, polisity, hellenicity, walls, colonies, panhellenic sanctuary, Olympic victors, earliest coinage.

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| Table A9 |
| Regression results for weighted eigencentrality, EP subsamples – robustness |
|  | *Dependent variable:* Eigencentrality |  |
|  | *Subsample:* EP=1 | *Subsample:* EP=0 |
|  | Unweighted | SR-weighted | Pre 166 BCE | Unweighted | SR-weighted | Pre 166 BCE |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
|  |  |  |  |  |  |  |
| Trade index | 0.208\*\*\* | 0.228\*\*\* | 0.208\*\* | 0.103\*\* | 0.131\*\*\* | 0.053 |
|  | (0.056) | (0.054) | (0.073) | (0.043) | (0.033) | (0.097) |
| Fame index | -0.021 | -0.007 | -0.004 | 0.355\*\* | 0.332\*\*\* | 0.235\*\*\* |
|  | (0.070) | (0.061) | (0.041) | (0.120) | (0.088) | (0.056) |
|  |  |  |  |  |  |  |
| Controls | Y | Y | Y | Y | Y | Y |
| Dialect & Region FEs | Y | Y | Y | Y | Y | Y |
|  |  |  |  |  |  |  |
| Observations | 262 | 262 | 242 | 177 | 177 | 159 |
| *R²* | 0.38 | 0.47 | 0.48 | 0.48 | 0.49 | 0.40 |

*Source:* author’s dataset based on PNAW and POLIS.

*Note*: \*\*\* indicates significance at 1 percent level, \*\* at 5 percent level, \* at 10 percent level. Standard errors are clustered at the regional level. Controls: distance from coast, elevation, distance\*elevation, polisity, hellenicity, walls, colonies, panhellenic sanctuary, Olympic victors, earliest coinage.

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| Table A10 |
| Dyadic regression results for proxeny link |
|  | *Dependent variable:* Proxeny link |
|  | *Subsample:* EP=1 | *Subsample:* EP=0 |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|  |  |  |  |  |   |  |  |  |
| Phoenicians (T) | 0.92\*\* |  |  |  | 0.57\*\* |  |  |  |
|  | (0.33) |  |  |  | (0.21) |  |  |  |
| Phoenicians (S) | 0.83 |  |  |  | 0.95\* |  |  |  |
|  | (0.49) |  |  |  | (0.49) |  |  |  |
| Trade mentions (T) |  | 1.16\*\* |  |  |  | 0.59\*\* |  |  |
|  |  | (0.45) |  |  |  | (0.20) |  |  |
| Trade mentions (S) |  | -0.49 |  |  |  | 1.33\*\*\* |  |  |
|  |  | (0.44) |  |  |  | (0.18) |  |  |
| Cargos (T) |  |  | 0.76\*\*\* |  |  |  | 0.58\*\* |  |
|  |  |  | (0.22) |  |  |  | (0.19) |  |
| Cargos (S) |  |  | -0.48 |  |  |  | 0.11 |  |
|  |  |  | (0.61) |  |  |  | (0.23) |  |
| Trade index (T) |  |  |  | 1.18\*\* |  |  |  | 0.72\*\*\* |
|  |  |  |  | (0.40) |  |  |  | (0.22) |
| Trade index (S) |  |  |  | -0.00 |  |  |  | 0.87\* |
|  |  |  |  | (0.51) |  |  |  | (0.45) |
| Fame index (T) | 0.32\*\* | 0.22 | 0.32\*\* | 0.15 | 0.71\* | 0.70\* | 0.68\* | 0.61 |
|  | (0.13) | (0.15) | (0.12) | (0.13) | (0.37) | (0.37) | (0.31) | (0.35) |
| Fame index (S) | 3.15\* | 3.62\* | 3.63\* | 3.44\* | 1.64\* | 1.47\* | 1.95\* | 1.61\* |
|  | (1.61) | (1.82) | (1.82) | (1.78) | (0.77) | (0.78) | (0.89) | (0.83) |
|  |  |  |  |  |  |  |  |  |
| Controls | Y | Y | Y | Y | Y | Y | Y | Y |
| Dialect & Region FEs | Y | Y | Y | Y | Y | Y | Y | Y |
|  |  |  |  |  |  |  |  |  |
| Observations | 68,107 | 68,107 | 68,107 | 68,107 | 40,099 | 40,099 | 40,099 | 40,099 |
| *R²* | 0.28 | 0.28 | 0.27 | 0.27 | 0.07 | 0.08 | 0.07 | 0.07 |

*Source:* author’s dataset based on PNAW and POLIS.

*Note*: \*\*\* indicates significance at 1 percent level, \*\* at 5 percent level, \* at 10 percent level. (T) indicates the coefficient of the target node, (S) indicates that of the source. Standard errors are clustered at the regional level of the source. Controls: distance from coast, elevation, distance\*elevation, polisity, hellenicity, walls, colonies, panhellenic sanctuary, Olympic victors, earliest coinage, dyadic distance, same dialect, same region, colony of, colonized by, same side in Peloponnesian war, Delian league ally, size.

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| Table A11 |
| Panel regression results for trade attestations, 25-year bins |
|  | *Dependent variable:* Trade (t) |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|  |  |  |  |  |  |  |  |
| Indegree (t-1) | 0.100\* |  |  | 0.101\* | 0.111\* | 0.113\*\* |  |
|  | (0.055) |  |  | (0.058) | (0.058) | (0.055) |  |
| Indegree (t) |  | 0.015 |  | -0.017 | -0.020 |  |  |
|  |  | (0.011) |  | (0.020) | (0.023) |  |  |
| Indegree (t+1) |  |  | 0.011 | -0.008 | -0.003 |  |  |
|  |  |  | (0.011) | (0.015) | (0.014) |  |  |
| Outdegree (t-1) |  |  |  |  |  | 0.072\* |  |
|  |  |  |  |  |  | (0.040) |  |
| Degree (t-1) |  |  |  |  |  |  | 0.097\* |
|  |  |  |  |  |  |  | (0.058) |
|   |   |   |   |   |   |   |  |
| City & Time FEs | Y | Y | Y | Y | Y | Y | Y |
| Time x Fame FE | Y | Y | Y | Y | Y | Y | Y |
| Time x Coinage FE | N | N | N | N | Y | Y | Y |
| Time x Size FE | N | N | N | N | Y | Y | Y |
|  |  |  |  |  |  |  |  |
| Observations | 8,257 | 8,257 | 8,257 | 7,898 | 7,040 | 7,360 | 7,360 |
| *R²* | 0.17 | 0.16 | 0.16 | 0.17 | 0.22 | 0.23 | 0.22 |
| Number of *poleis* | 359 | 359 | 359 | 359 | 320 | 320 | 320 |

*Source:* author’s dataset based on PNAW and POLIS.

*Note*: \*\*\* indicates significance at 1 percent level, \*\* indicates at 5 percent level, \* at 10 percent level. Standard errors are clustered at each *polis*.

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| Table A12 |
| Regression results for trade proxies |
| *Dependent variable:* | Trade index | Phoenicians | T. mentions | Cargos |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|  |  |  |  |  |  |  |  |  |
| Trade access | 0.016 | -0.205\* | -0.133 | -0.278 | -0.201 | -0.255 | -0.012 | -0.208 |
|  | (0.176) | (0.094) | (0.167) | (0.280) | (0.273) | (0.247) | (0.260) | (0.310) |
| Trade access via proxeny |  | 1.263\*\*\* |  | 1.337\*\*\* | 1.098\*\*\* | 1.049\*\* | 1.063\*\*\* | 0.746\*\* |
|  |  | (0.306) |  | (0.286) | (0.309) | (0.431) | (0.172) | (0.237) |
| Trade access via dialect |  |  | -0.225 | 0.004 | -0.054 | -0.117 | -0.468\*\* | 0.360 |
|  |  |  | (0.366) | (0.345) | (0.291) | (0.294) | (0.205) | (0.313) |
| Trade access via alliance |  |  | 0.332 | -0.009 | -0.055 | 0.099 | -0.020 | -0.232 |
|  |  |  | (0.288) | (0.206) | (0.186) | (0.172) | (0.251) | (0.169) |
| Trade access via colony |  |  | 0.135 | 0.293\*\*\* | 0.290\*\*\* | 0.246\*\*\* | 0.026 | 0.431\*\*\* |
|  |  |  | (0.121) | (0.079) | (0.057) | (0.068) | (0.034) | (0.083) |
| Proxeny EC |  |  |  |  | 0.420\*\*\* | 0.184 | 0.290 | 0.617\* |
|  |  |  |  |  | (0.065) | (0.140) | (0.183) | (0.283) |
| Fame index | 0.455\* | 0.185 | 0.453\* | 0.151 | 0.041 | 0.030 | 0.095 | -0.006 |
|  | (0.244) | (0.153) | (0.237) | (0.143) | (0.119) | (0.142) | (0.155) | (0.161) |
|  |  |  |  |  |  |  |  |  |
| Controls | Y | Y | Y | Y | Y | Y | Y | Y |
| Dialect & Region FEs | Y | Y | Y | Y | Y | Y | Y | Y |
|  |  |  |  |  |  |  |  |  |
| Observations | 323 | 323 | 323 | 323 | 303 | 303 | 303 | 303 |
| *R²* | 0.41 | 0.66 | 0.42 | 0.68 | 0.71 | 0.59 | 0.69 | 0.56 |

*Source:* author’s dataset based on PNAW and POLIS.

*Note*: \*\*\* indicates significance at 1 percent level, \*\* at 5 percent level, \* at 10 percent level. Standard errors are clustered at the regional level. Controls: distance from coast, elevation, distance\*elevation, polisity, hellenicity, walls, colonies, panhellenic sanctuary, Olympic victors, earliest coinage.

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| Table A13 |
| Regression results for trade proxies |
| *Dependent variable:* | Phoenicians | T. mentions | Cargos |
|  | (1) | (2) | (3) |
|  |  |  |  |
| Trade access | -0.300 | 0.214 | -0.206 |
|  | (0.302) | (0.252) | (0.461) |
| Trade access via proxeny | 0.675\*\* | 0.989\*\*\* | 0.477\*\*\* |
|  | (0.285) | (0.160) | (0.112) |
| Trade access via dialect | -0.137 | -0.811\*\* | 0.679 |
|  | (0.332) | (0.346) | (0.451) |
| Trade access via alliance | 0.366 | 0.155 | -0.421 |
|  | (0.359) | (0.433) | (0.358) |
| Trade access via colony | -0.135 | -0.152 | 0.239 |
|  | (0.093) | (0.130) | (0.245) |
| Proxeny EC | 0.335\* | 0.308 | 0.764\* |
|  | (0.162) | (0.185) | (0.351) |
| Fame index | 0.076 | 0.133 | 0.059 |
|  | (0.139) | (0.154) | (0.145) |
|  |  |  |  |
| Controls | Y | Y | Y |
| Dialect & Region FEs | Y | Y | Y |
|  |  |  |  |
| Observations | 303 | 303 | 303 |
| *R²* | 0.53 | 0.70 | 0.50 |

*Source:* author’s dataset based on PNAW and POLIS.

*Note*: \*\*\* indicates significance at 1 percent level, \*\* at 5 percent level, \* at 10 percent level. Standard errors are clustered at the regional level. Controls: distance from coast, elevation, distance\*elevation, polisity, hellenicity, walls, colonies, panhellenic sanctuary, Olympic victors, earliest coinage.



Figure A1

Spatial distribution of the trade index

*Source:* author’s dataset.



Figure A2

Spatial distribution of the fame index

*Source:* POLIS dataset.

*Note:* near-zero entries are omitted.