**S2 Table.** All possible genotypes in our explicit model where the pleiotropic link takes the form of a universal regulator (i.e., regulating simultaneously the private and cooperation trait).

| Regulator A (private) | Regulator B (cooperation) | Private loci | Cooperation loci | Phenotype     | Genotype number |
|-----------------------|---------------------------|--------------|------------------|---------------|-----------------|
| 0                     | 0                         | 0            | 0                | unviable      | g1              |
| 0                     | 0                         | 0            | 1                | unviable      | g2              |
| 0                     | 0                         | 1            | 0                | unviable      | g3              |
| 0                     | 1                         | 0            | 0                | unviable      | g4              |
| 0                     | 1                         | 0            | 1                | unviable      | g5              |
| 0                     | 1                         | 1            | 0                | unviable      | g6              |
| 0                     | 1                         | 1            | 1                | unviable      | g7              |
| 1                     | 0                         | 0            | 0                | unviable      | g8              |
| 1                     | 0                         | 0            | 1                | unviable      | g9              |
| 1                     | 0                         | 1            | 0                | Cheat         | g10             |
| 1                     | 1                         | 0            | 0                | Cheat         | g11             |
| 1                     | 1                         | 0            | 1                | unviable      | g12             |
| 1                     | 1                         | 1            | 0                | Cheat         | g13             |
| 1                     | 1                         | 1            | 1                | Cooperator    | g14             |
| 2                     | 0                         | 0            | 0                | unviable      | g15             |
| 2                     | 0                         | 1            | 0                | Pleiotropic cheat | g16         |
| 2                     | 0                         | 0            | 1                | Pleiotropic cooperator | g17     |
| 2                     | 1                         | 0            | 0                | unviable      | g18             |
| 2                     | 1                         | 0            | 1                | Pleiotropic cheat | g19         |
| 2                     | 1                         | 1            | 0                | Pleiotropic cooperator | g20     |
| 2                     | 1                         | 1            | 1                | Pleiotropic cheat | g21         |

0: absent; 1: present; 2: universal/pleiotropic regulator