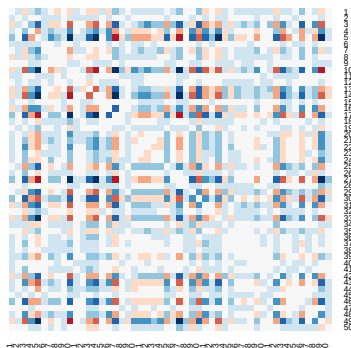
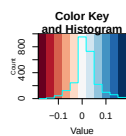


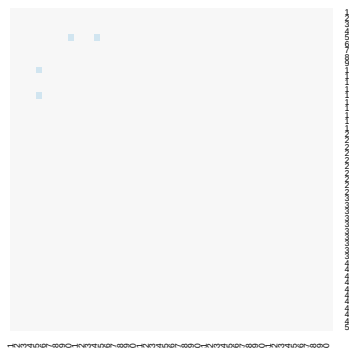
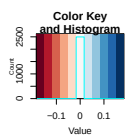
Table S-1. Interactions associated with Pantoea, Enterobacter, Plesiomonas, Klebsiella and Erwinia exclusively identified by BC-GLASSO. For each pair of genera, 1 indicates the presence of an interaction between the two genera, and 0 indicates the absence of an interaction.

	Enterobacter	Erwinia	Klebsiella	Pantoea	Plesiomonas
total_number_unique_edges	34	10	12	44	14
Bacillus	0	1	0	0	1
Geobacillus	0	0	0	1	0
Oceanobacillus	1	0	0	1	1
Virgibacillus	1	0	0	1	0
Brevibacterium	1	0	0	1	0
Ochrobactrum	1	1	1	1	0
Burkholderia	1	0	0	1	1
Brevundimonas	0	0	0	1	0
Alkalimonas	1	0	0	0	0
Comamonas	0	0	0	1	1
Leptothrix	1	1	1	1	0
Desulfovibrio	0	0	0	1	0
Citrobacter	0	0	0	1	0
Cronobacter	1	0	0	0	0
Escherichia	1	0	0	1	1
Morganella	1	0	1	1	0
Proteus	1	0	0	1	0
Providencia	0	1	0	1	0
Trabulsiella	0	0	0	1	0
Xenorhabdus	1	0	1	1	0
Enterococcus	0	0	0	1	0
Melissococcus	0	0	0	1	0
Vagococcus	1	0	1	1	0
Catenibacterium	0	0	0	1	0
Pseudoramibacter_Eubacterium	1	1	0	1	0
Gallionella	0	0	0	1	0
Leptotrichia	1	1	1	1	0
Listeria	0	0	0	0	1
Acinetobacter	1	1	0	0	0
Neisseria	1	0	0	1	1
Rhodococcus	1	0	0	1	0
Herbaspirillum	0	0	0	1	1
Paenibacillus	1	0	1	1	0
Paraprevotella	1	0	0	0	0
Methylophaga	1	0	0	0	0
Lysinibacillus	1	0	1	1	0
Paenisporosarcina	0	0	0	1	0
Solibacillus	1	0	0	1	0
Sporosarcina	1	0	0	1	1

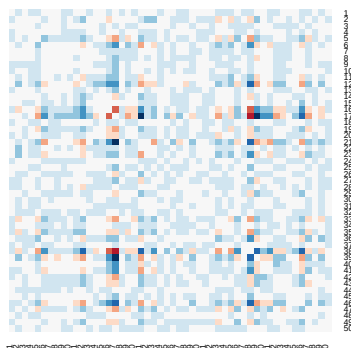
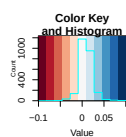
Dysgonomonas	1	1	0	0	1
Propionibacterium	1	0	1	1	1
Uliginosibacterium	0	1	0	0	0
Zoogloea	0	0	0	1	0
Reinekea	1	0	0	1	0
Sphingobacterium	1	0	0	1	1
Sphingobium	1	0	1	1	1
Lactococcus	1	0	0	1	0
Streptomyces	1	0	1	1	1
Cloacibacillus	0	0	0	1	0
Thiothrix	1	0	0	0	0
Acidaminococcus	0	0	0	1	0
Megasphaera	0	1	0	1	0
Chryseobacterium	1	0	1	1	0
Stenotrophomonas	1	0	0	1	0



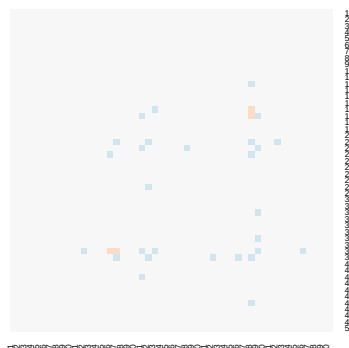
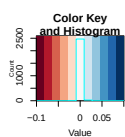
M1, SPIEC-EASI



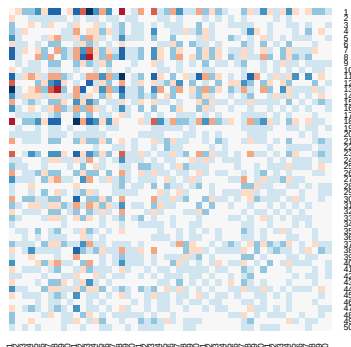
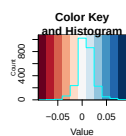
M1, BC-GLASSO



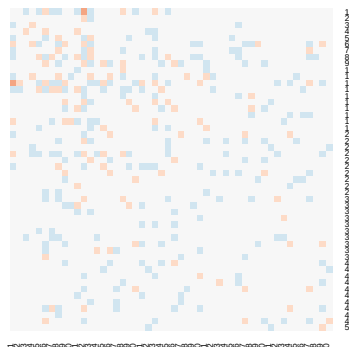
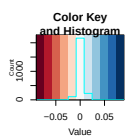
M2, SPIEC-EASI



M2, BC-GLASSO

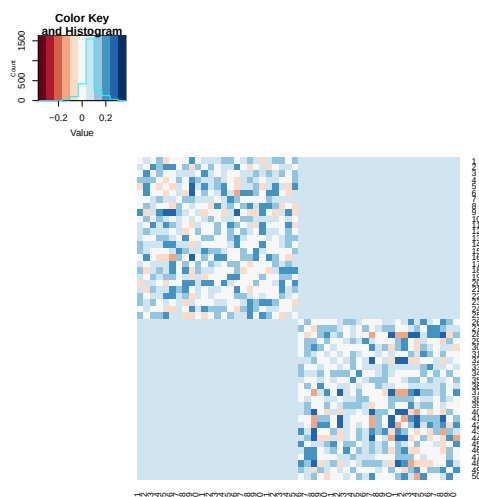


M3, SPIEC-EASI

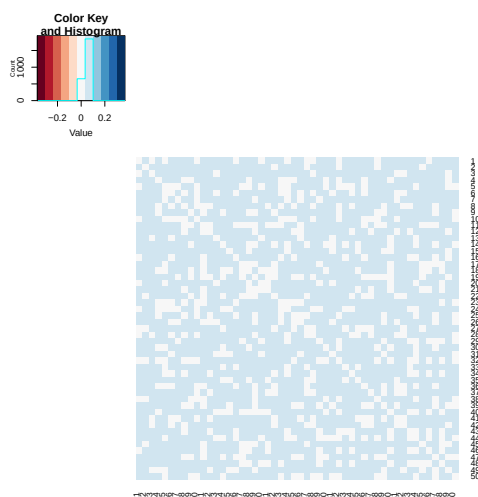


M3, BC-GLASSO

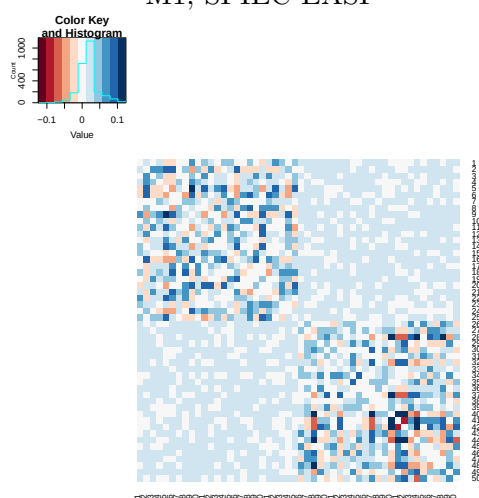
Fig. S1 Bias heatmap for random-edge network. Each row is a sequencing depth setting. Bias for SPIEC-EASI is shown on the left, and bias for BC-GLASSO is shown on the right.



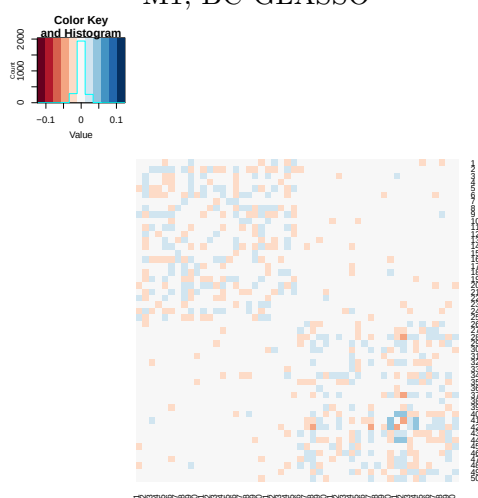
M1, SPIEC-EASI



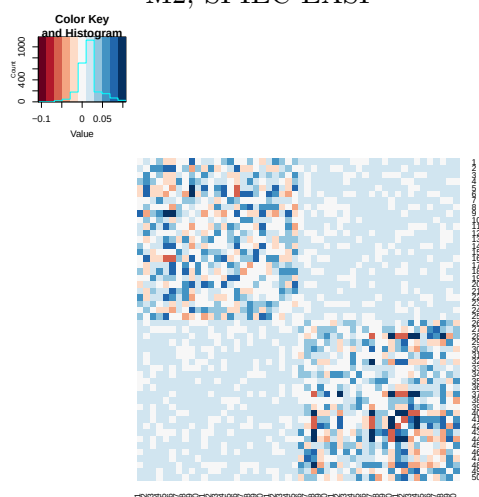
M1, BC-GLASSO



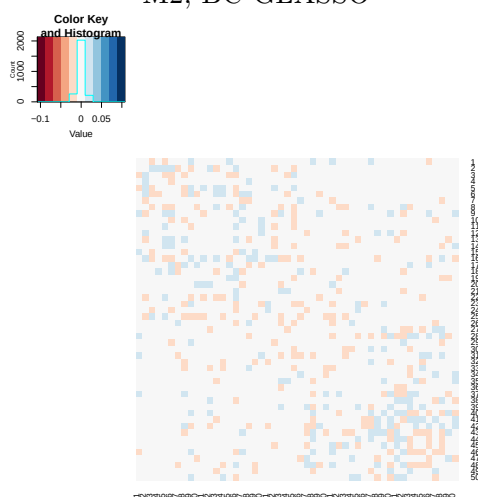
M2, SPIEC-EASI



M2, BC-GLASSO

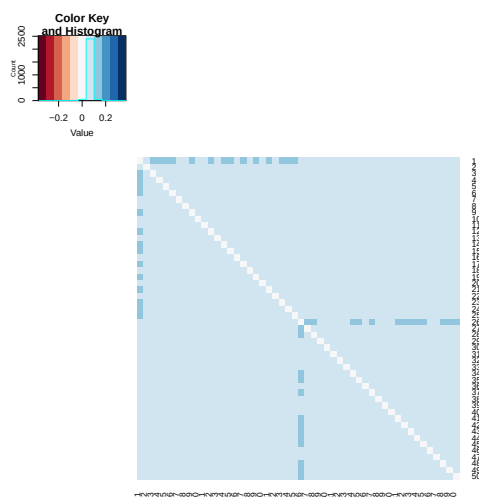


M3, SPIEC-EASI

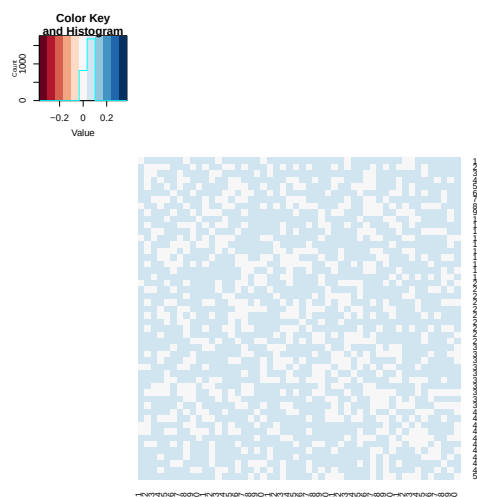


M3, BC-GLASSO

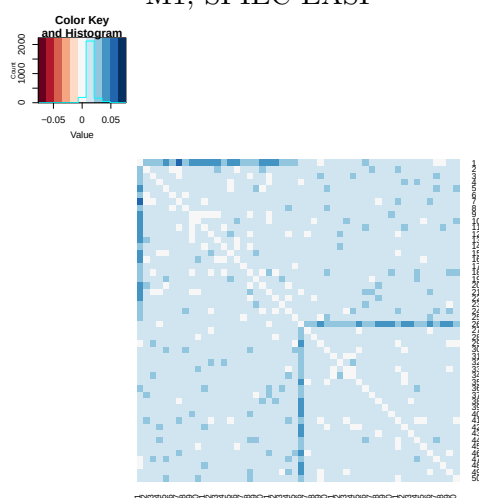
Fig. S2 Bias heatmap for cluster network. Each row is a sequencing depth setting. Bias for SPIEC-EASI is shown on the left, and bias for BC-GLASSO is shown on the right.



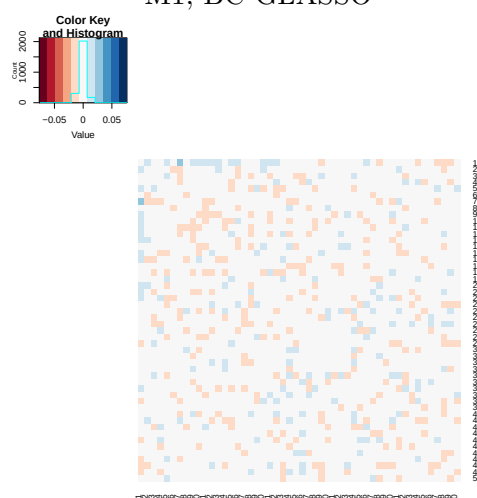
M1, SPIEC-EASI



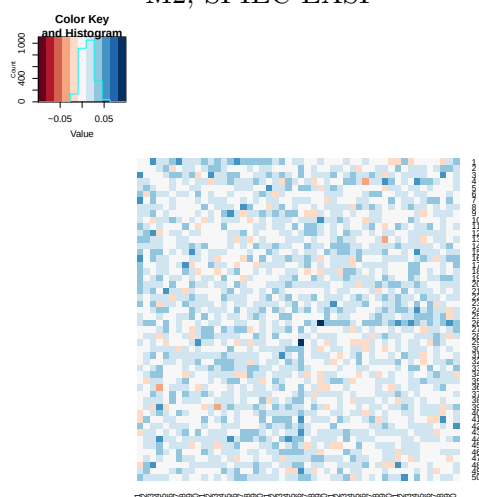
M1, BC-GLASSO



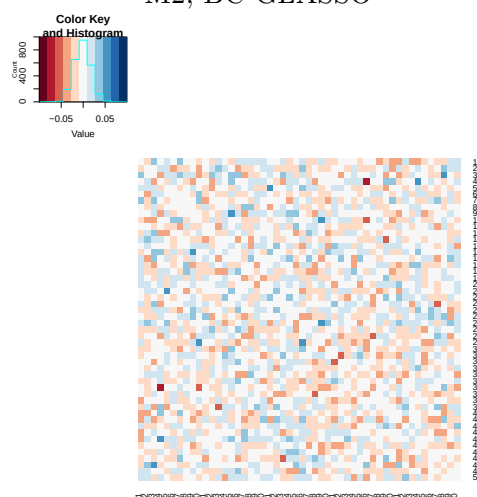
M2, SPIEC-EASI



M2, BC-GLASSO

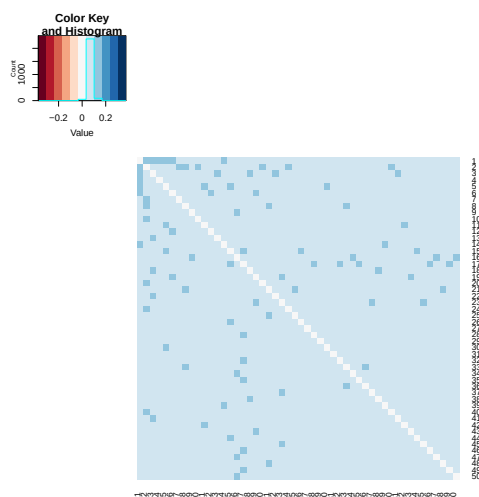


M3, SPIEC-EASI

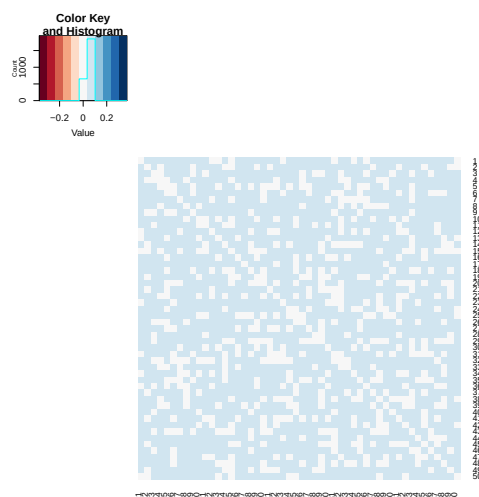


M3, BC-GLASSO

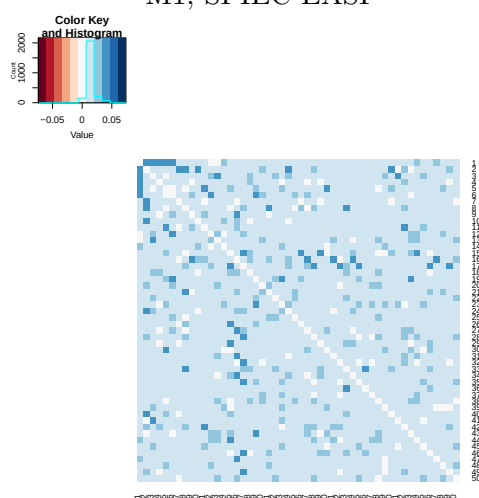
Fig. S3 Bias heatmap for hub network. Each row is a sequencing depth setting. Bias for SPIEC-EASI is shown on the left, and bias for BC-GLASSO is shown on the right.



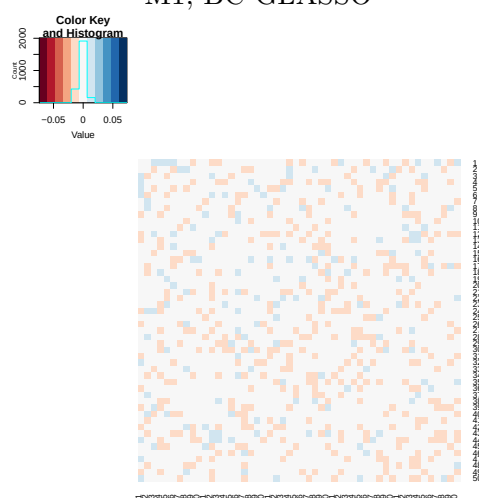
M1, SPIEC-EASI



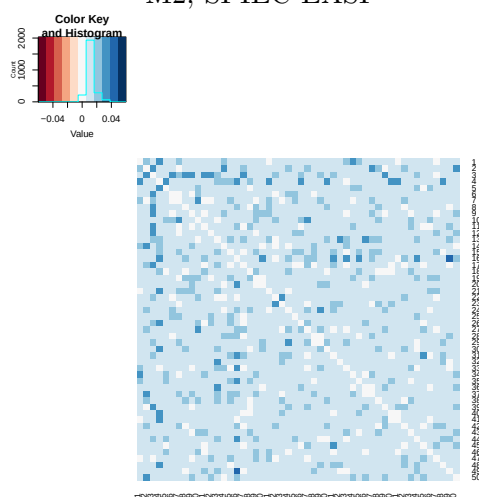
M1, BC-GLASSO



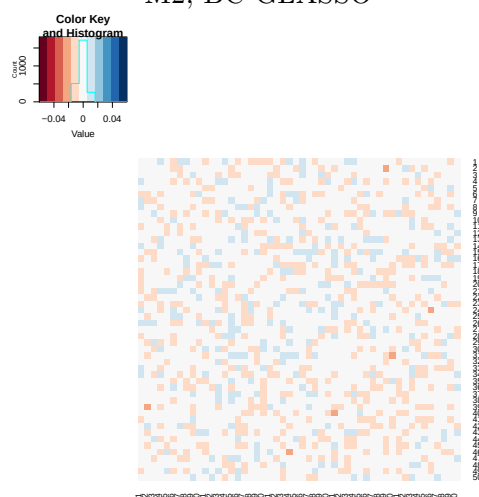
M2, SPIEC-EASI



M2, BC-GLASSO



M3, SPIEC-EASI



M3, BC-GLASSO

Fig. S4 Bias heatmap for scale-free network. Each row is a sequencing depth setting. Bias for SPIEC-EASI is shown on the left, and bias for BC-GLASSO is shown on the right.

Table S-2. Genus names corresponding to the heatmaps in Figure 6 for the P group in the AGP data and the associated phylum-level taxonomic information.

Genus	Phylum
Alkalimonas	[Chromatiaceae]
Mogibacterium	[Mogibacteriaceae]
Butyricimonas	[Odoribacteraceae]
Odoribacter	[Odoribacteraceae]
[Prevotella]	[Paraprevotellaceae]
Paraprevotella	[Paraprevotellaceae]
1-68	[Tissierellaceae]
Anaerococcus	[Tissierellaceae]
Finegoldia	[Tissierellaceae]
Parvimonas	[Tissierellaceae]
Peptoniphilus	[Tissierellaceae]
ph2	[Tissierellaceae]
WAL_1855D	[Tissierellaceae]
Chryseobacterium	[Weeksellaceae]
Actinomyces	Actinomycetaceae
Mobiluncus	Actinomycetaceae
Varibaculum	Actinomycetaceae
Facklamia	Aerococcaceae
Sutterella	Alcaligenaceae
Anoxybacillus	Bacillaceae
Bacillus	Bacillaceae
Geobacillus	Bacillaceae
Oceanobacillus	Bacillaceae
Virgibacillus	Bacillaceae
Bacteroides	Bacteroidaceae
Bifidobacterium	Bifidobacteriaceae
Gardnerella	Bifidobacteriaceae
Brevibacterium	Brevibacteriaceae
Ochrobactrum	Brucellaceae
Burkholderia	Burkholderiaceae
Campylobacter	Campylobacteraceae
Granulicatella	Carnobacteriaceae
Brevundimonas	Caulobacteraceae
Christensenella	Christensenellaceae
02d06	Clostridiaceae
Clostridium	Clostridiaceae
Sarcina	Clostridiaceae
SMB53	Clostridiaceae
Comamonas	Comamonadaceae

Leptothrix	Comamonadaceae
Limnobacter	Comamonadaceae
Adlercreutzia	Coriobacteriaceae
Atopobium	Coriobacteriaceae
Collinsella	Coriobacteriaceae
Eggerthella	Coriobacteriaceae
Slackia	Coriobacteriaceae
Corynebacterium	Corynebacteriaceae
Dehalobacterium	Dehalobacteriaceae
Bilophila	Desulfovibrionaceae
Desulfovibrio	Desulfovibrionaceae
Citrobacter	Enterobacteriaceae
Cronobacter	Enterobacteriaceae
Enterobacter	Enterobacteriaceae
Erwinia	Enterobacteriaceae
Escherichia	Enterobacteriaceae
Klebsiella	Enterobacteriaceae
Morganella	Enterobacteriaceae
Pantoea	Enterobacteriaceae
Plesiomonas	Enterobacteriaceae
Proteus	Enterobacteriaceae
Providencia	Enterobacteriaceae
Serratia	Enterobacteriaceae
Trabulsiella	Enterobacteriaceae
Xenorhabdus	Enterobacteriaceae
Enterococcus	Enterococcaceae
Melissococcus	Enterococcaceae
Vagococcus	Enterococcaceae
[Eubacterium]	Erysipelotrichaceae
Bulleidia	Erysipelotrichaceae
Catenibacterium	Erysipelotrichaceae
cc_115	Erysipelotrichaceae
Coprobacillus	Erysipelotrichaceae
Holdemania	Erysipelotrichaceae
Anaerofustis	Eubacteriaceae
Pseudoramibacter_Eubacterium	Eubacteriaceae
Fusobacterium	Fusobacteriaceae
Gallionella	Gallionellaceae
[Ruminococcus]	Lachnospiraceae
Anaerostipes	Lachnospiraceae
Blautia	Lachnospiraceae
Butyrivibrio	Lachnospiraceae
Coprococcus	Lachnospiraceae

Dorea	Lachnospiraceae
Lachnobacterium	Lachnospiraceae
Lachnospira	Lachnospiraceae
Moryella	Lachnospiraceae
Oribacterium	Lachnospiraceae
Roseburia	Lachnospiraceae
Lactobacillus	Lactobacillaceae
Pediococcus	Lactobacillaceae
Leptotrichia	Leptotrichiaceae
Leuconostoc	Leuconostocaceae
Listeria	Listeriaceae
Methanobrevibacter	Methanobacteriaceae
Rothia	Micrococcaceae
Acinetobacter	Moraxellaceae
Neisseria	Neisseriaceae
Rhodococcus	Nocardiaceae
Herbaspirillum	Oxalobacteraceae
Oxalobacter	Oxalobacteraceae
Paenibacillus	Paenibacillaceae
Aggregatibacter	Pasteurellaceae
Haemophilus	Pasteurellaceae
Peptococcus	Peptococcaceae
rc4-4	Peptococcaceae
Peptostreptococcus	Peptostreptococcaceae
Methylophaga	Piscirickettsiaceae
Lysinibacillus	Planococcaceae
Paenisporosarcina	Planococcaceae
Solibacillus	Planococcaceae
Sporosarcina	Planococcaceae
Dysgonomonas	Porphyromonadaceae
Paludibacter	Porphyromonadaceae
Parabacteroides	Porphyromonadaceae
Porphyromonas	Porphyromonadaceae
Prevotella	Prevotellaceae
Propionibacterium	Propionibacteriaceae
Pseudomonas	Pseudomonadaceae
Uliginosibacterium	Rhodocyclaceae
Zoogloea	Rhodocyclaceae
Alistipes	Rikenellaceae
Anaerotruncus	Ruminococcaceae
Faecalibacterium	Ruminococcaceae
Oscillospira	Ruminococcaceae
Ruminococcus	Ruminococcaceae

Reinekea	Saccharospirillaceae
Sphingobacterium	Sphingobacteriaceae
Sphingobium	Sphingomonadaceae
Staphylococcus	Staphylococcaceae
Lactococcus	Streptococcaceae
Streptococcus	Streptococcaceae
Streptomyces	Streptomycetaceae
Cloacibacillus	Synergistaceae
Thiothrix	Thiotrichaceae
Turicibacter	Turicibacteraceae
Acidaminococcus	Veillonellaceae
Dialister	Veillonellaceae
Megasphaera	Veillonellaceae
Phascolarctobacterium	Veillonellaceae
Veillonella	Veillonellaceae
Akkermansia	Verrucomicrobiaceae
Stenotrophomonas	Xanthomonadaceae

Table S-3. Genus names corresponding to the heatmaps in Fig. S7 for the B group in the AGP data and the associated phylum-level taxonomic information.

Genus	Phylum
Alkalimonas	[Chromatiaceae]
Mogibacterium	[Mogibacteriaceae]
Butyricimonas	[Odoribacteraceae]
Odoribacter	[Odoribacteraceae]
[Prevotella]	[Paraprevotellaceae]
Paraprevotella	[Paraprevotellaceae]
1-68	[Tissierellaceae]
Anaerococcus	[Tissierellaceae]
Finegoldia	[Tissierellaceae]
Parvimonas	[Tissierellaceae]
Peptoniphilus	[Tissierellaceae]
ph2	[Tissierellaceae]
WAL_1855D	[Tissierellaceae]
Chryseobacterium	[Weeksellaceae]
Actinomyces	Actinomycetaceae
Mobiluncus	Actinomycetaceae
Varibaculum	Actinomycetaceae
Facklamia	Aerococcaceae
Sutterella	Alcaligenaceae
Anoxybacillus	Bacillaceae
Bacillus	Bacillaceae
Geobacillus	Bacillaceae
Oceanobacillus	Bacillaceae
Virgibacillus	Bacillaceae
Bacteroides	Bacteroidaceae
Bifidobacterium	Bifidobacteriaceae
Gardnerella	Bifidobacteriaceae
Brevibacterium	Brevibacteriaceae
Ochrobactrum	Brucellaceae
Burkholderia	Burkholderiaceae
Campylobacter	Campylobacteraceae
Granulicatella	Carnobacteriaceae
Brevundimonas	Caulobacteraceae
Christensenella	Christensenellaceae
02d06	Clostridiaceae
Clostridium	Clostridiaceae
Sarcina	Clostridiaceae
SMB53	Clostridiaceae

Comamonas	Comamonadaceae
Leptothrix	Comamonadaceae
Limnobacter	Comamonadaceae
Adlercreutzia	Coriobacteriaceae
Atopobium	Coriobacteriaceae
Collinsella	Coriobacteriaceae
Eggerthella	Coriobacteriaceae
Slackia	Coriobacteriaceae
Corynebacterium	Corynebacteriaceae
Dehalobacterium	Dehalobacteriaceae
Bilophila	Desulfovibrionaceae
Desulfovibrio	Desulfovibrionaceae
Citrobacter	Enterobacteriaceae
Cronobacter	Enterobacteriaceae
Enterobacter	Enterobacteriaceae
Erwinia	Enterobacteriaceae
Escherichia	Enterobacteriaceae
Klebsiella	Enterobacteriaceae
Morganella	Enterobacteriaceae
Pantoea	Enterobacteriaceae
Plesiomonas	Enterobacteriaceae
Proteus	Enterobacteriaceae
Providencia	Enterobacteriaceae
Serratia	Enterobacteriaceae
Trabulsiella	Enterobacteriaceae
Xenorhabdus	Enterobacteriaceae
Enterococcus	Enterococcaceae
Melissococcus	Enterococcaceae
Vagococcus	Enterococcaceae
[Eubacterium]	Erysipelotrichaceae
Bulleidia	Erysipelotrichaceae
Catenibacterium	Erysipelotrichaceae
cc_115	Erysipelotrichaceae
Coprobacillus	Erysipelotrichaceae
Holdemania	Erysipelotrichaceae
Pseudoramibacter_Eubacterium	Eubacteriaceae
Fusobacterium	Fusobacteriaceae
Gallionella	Gallionellaceae
[Ruminococcus]	Lachnospiraceae
Anaerostipes	Lachnospiraceae
Blautia	Lachnospiraceae
Butyrivibrio	Lachnospiraceae
Coprococcus	Lachnospiraceae

Dorea	Lachnospiraceae
Lachnobacterium	Lachnospiraceae
Lachnospira	Lachnospiraceae
Moryella	Lachnospiraceae
Oribacterium	Lachnospiraceae
Roseburia	Lachnospiraceae
Lactobacillus	Lactobacillaceae
Pediococcus	Lactobacillaceae
Leptotrichia	Leptotrichiaceae
Leuconostoc	Leuconostocaceae
Listeria	Listeriaceae
Methanobrevibacter	Methanobacteriaceae
Rothia	Micrococcaceae
Acinetobacter	Moraxellaceae
Neisseria	Neisseriaceae
Rhodococcus	Nocardiaceae
Herbaspirillum	Oxalobacteraceae
Oxalobacter	Oxalobacteraceae
Paenibacillus	Paenibacillaceae
Aggregatibacter	Pasteurellaceae
Haemophilus	Pasteurellaceae
Peptococcus	Peptococcaceae
rc4-4	Peptococcaceae
Peptostreptococcus	Peptostreptococcaceae
Methylophaga	Piscirickettsiaceae
Lysinibacillus	Planococcaceae
Paenisporosarcina	Planococcaceae
Solibacillus	Planococcaceae
Sporosarcina	Planococcaceae
Dysgonomonas	Porphyromonadaceae
Paludibacter	Porphyromonadaceae
Parabacteroides	Porphyromonadaceae
Porphyromonas	Porphyromonadaceae
Prevotella	Prevotellaceae
Propionibacterium	Propionibacteriaceae
Pseudomonas	Pseudomonadaceae
Uliginosibacterium	Rhodocyclaceae
Zoogloea	Rhodocyclaceae
Alistipes	Rikenellaceae
Anaerotruncus	Ruminococcaceae
Faecalibacterium	Ruminococcaceae
Oscillospira	Ruminococcaceae
Ruminococcus	Ruminococcaceae

Reinekea	Saccharospirillaceae
Sphingobacterium	Sphingobacteriaceae
Sphingobium	Sphingomonadaceae
Staphylococcus	Staphylococcaceae
Lactococcus	Streptococcaceae
Streptococcus	Streptococcaceae
Streptomyces	Streptomycetaceae
Cloacibacillus	Synergistaceae
Thiothrix	Thiotrichaceae
Turicibacter	Turicibacteraceae
Acidaminococcus	Veillonellaceae
Dialister	Veillonellaceae
Megasphaera	Veillonellaceae
Phascolarctobacterium	Veillonellaceae
Veillonella	Veillonellaceae
Akkermansia	Verrucomicrobiaceae
Stenotrophomonas	Xanthomonadaceae

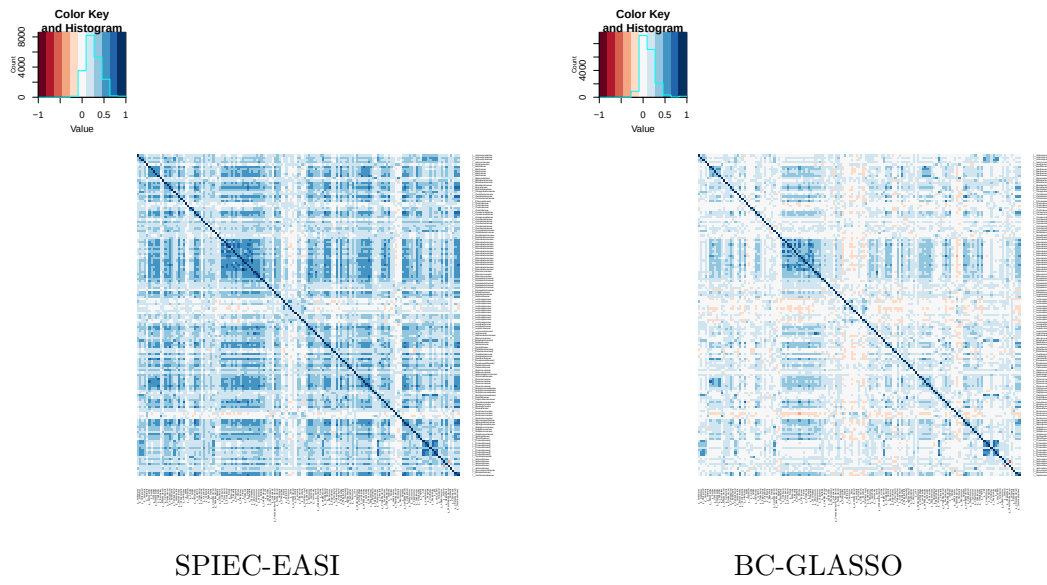
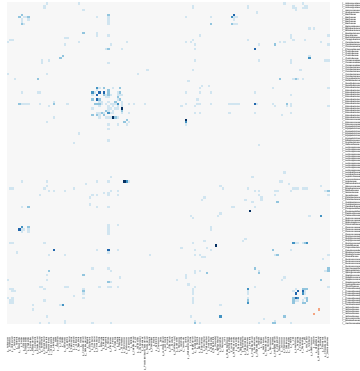
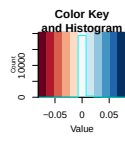
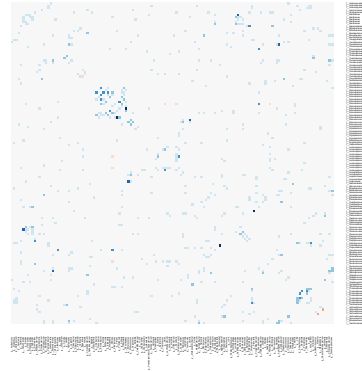
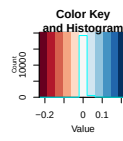


Fig. S5 Estimated correlation matrices for the B group in the AGP data based on BC-GLASSO and SPIEC-EASI. The correlation matrices are obtained based on the estimated covariance matrix used in the two methods. Columns are indexed by genus names. Rows are indexed by the names of families that the genera belong to individually.



BC-GLASSO



SPIEC-EASI

Fig. S6 Estimated inverse covariance matrices for the B group in the AGP data based on BC-GLASSO and SPIEC-EASI, on the negative scale. Diagonal entries are omitted. Columns are indexed by genus names. Rows are indexed by the names of families that the genera belong to individually.

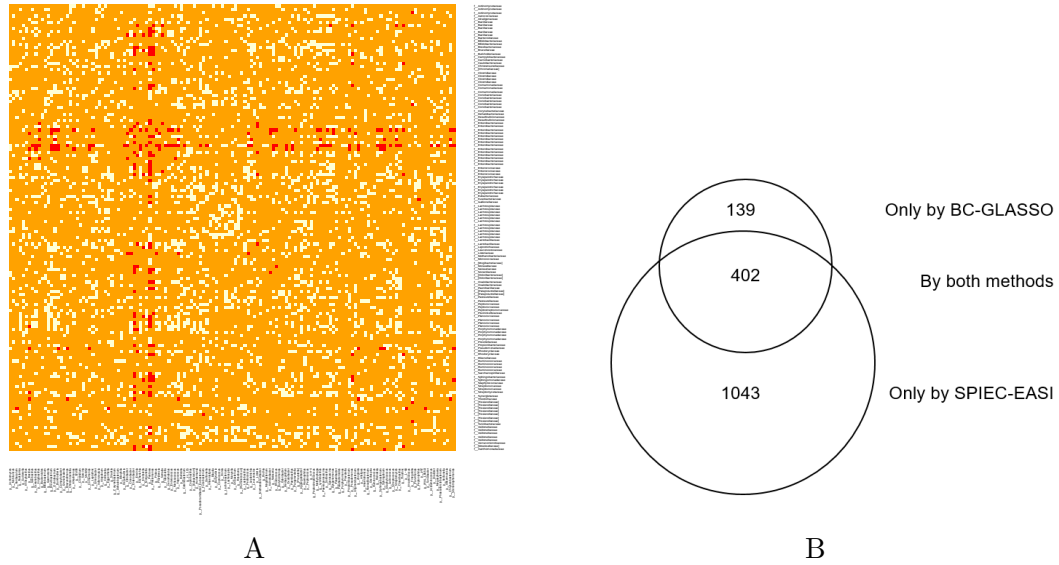


Fig. S7 Comparing the microbial networks based on BC-GLASSO and SPIEC-EASI for the B group in the AGP data. Panel A, network difference between two methods. Red - edges identified by BC-GLASSO but not by naive; White - edges identified by naive but not by BC-GLASSO; Orange - edges identified by either both or neither. Columns are indexed by genus names. Rows are indexed by the names of families that the genera belong to individually. Panel B, numbers of common and unique edges detected by BC-GLASSO and/or SPIEC-EASI.

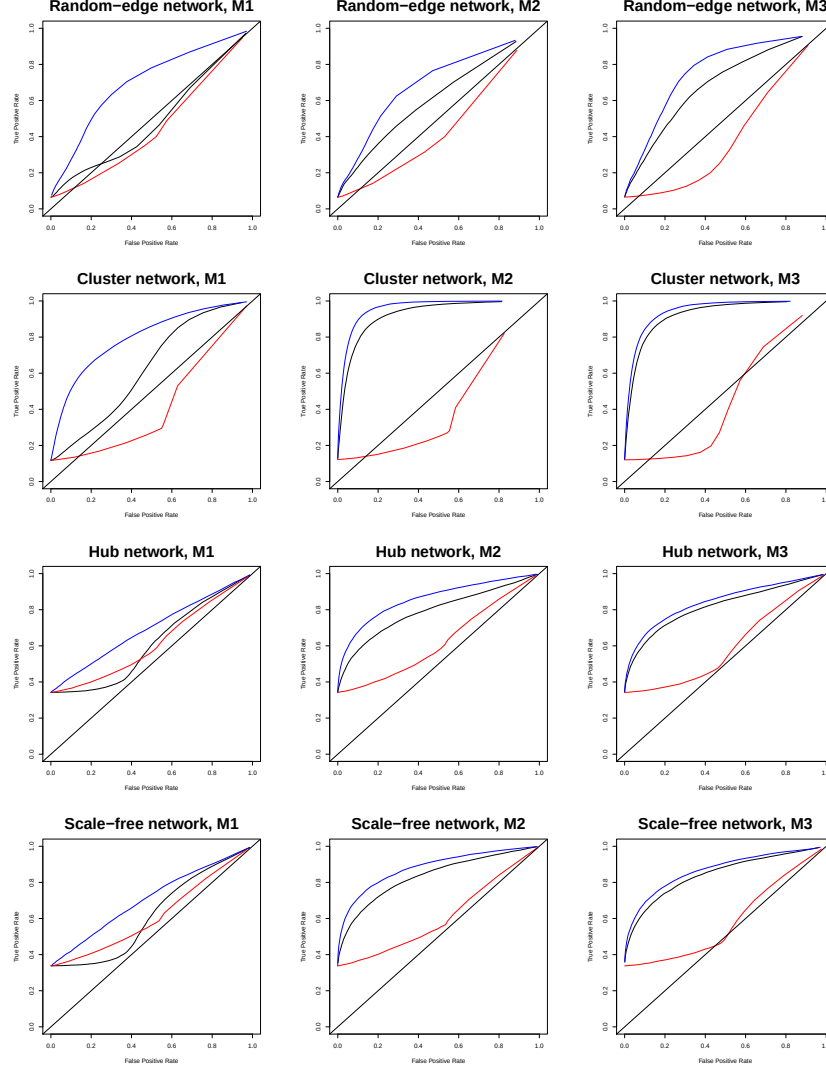


Fig. S8 BC-GLASSO enjoys more accurate network recovery than SPIEC-EASI in simulations. ROC curves for BC-GLASSO and SPIEC-EASI are compared for each simulation setting. Blue: BC-GLASSO. Black: SPIEC-EASI without rarefaction. Red: SPIEC-EASI with rarefaction. Each row is a network structure. Each column is a configuration for the sequencing depth.