Annex B. Supply chains with 2 and 4 agents

Supply chains with 2 agents

Figure 1B shows the supply chain that just consists of a bilateral link. The two possibilities are that the customer is

- an individual or
- aggregated (mass market).

The characteristic function has the following structure for 2 agents: $v = (A; B; AB)$. The profit is distributed by 50% – 50%, as none of the agents has any advantageous alternative to this outcome. This is in accordance with the Shapley-rule with 2 agents $Sh_2 : Sh_2 = (50\%; 50\%)$.

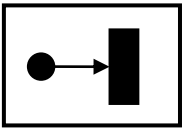
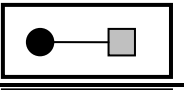
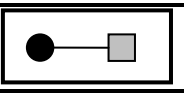
Connections		Supply chain	Allocation
1	**S – M**		Backward induction
2	**S –I**		50% – 50%
2	**S –I**		50% – 50%

Fig. 1B. Supply chains with 2 agents with individual customer and mass market

Supply chains with 4 agents

Figure 2B depicts the set of all supply chains with 4 agents.

The preconditions are that the supply chain must not be interrupted, i. e.

- the first and the last segment of the supply chain must be in the productive component,
- these agents must be connected at least indirectly, there must be the referring links.

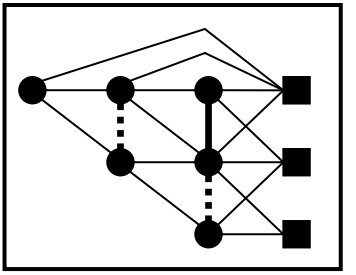
	Set of all 4 agents' supply chains
Suppliers: Complementors or competitors	

Fig. 2B. Sets of all supply chains with 4 agents

Figure 3B depicts systematically all supply chains that consist of 4 agents. Networks that do not fulfill these conditions are excluded and not depicted.

The cases 1-6 show systematically groups of supply chains with different constellations:

Case 1 (3 customers):

- There are no restricted grand coalitions.
- The distinction of individual or aggregated customers allows 4 combinations in each case.

Case 2 (2 direct suppliers):

- The number of restricted grand coalitions is 3 (in dependence of the number of links).
- The distinction of individual or aggregated customers allows 3 combinations in each case.

Case 3 (1 supplier, 1 pre-supplier):

- The number of restricted grand coalitions is 3.
- The distinction of individual or aggregated customers allows 3 combinations in each case.

Case 4 (3 suppliers):

- The number of restricted grand coalitions is 4.
- The distinction of individual or aggregated customers allows 2 combinations in each case.

Case 5 (1 pre-supplier, 2 suppliers):

- The number of restricted grand coalitions is 8.
- The distinction of individual or aggregated customers allows 2 combinations in each case.

Case 6 (2 pre-suppliers, 1 supplier):

- The number of restricted grand coalitions is 7.
- The distinction of individual or aggregated customers allows 2 combinations in each case.

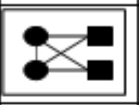
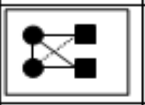
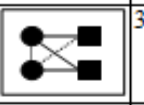
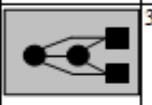
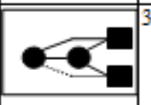
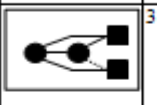
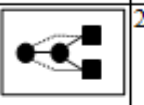
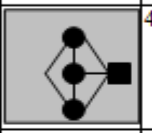
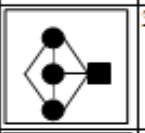
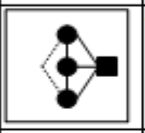
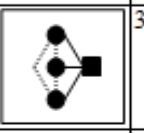
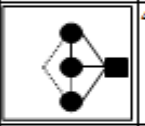
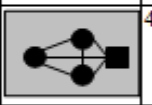
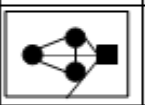
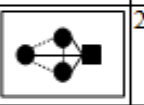
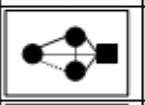
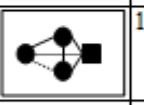
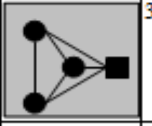
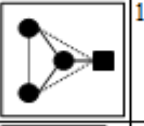
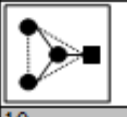
		GC	CS	RGC	CS	RGC	CS	RGC	CS
1	3 customers 1 supplier		2						
2	2 customers 2 suppliers		3		3		3		3
3	2 customers 1 supplier 1 pre-supplier		3		3		3		2
4	1 customer, 3 suppliers		4		3		4		3
					4				
5	1 customer, 2 suppliers, 1 pre-supplier		4		3		2		2
					1		1		1
					3		2		
6	1 customer, 1 supplier, 2 pre-suppliers		3		2		3		1
					3		1		3
					1				
	Sums:	6	19	10	26	8	19	7	15

Fig. 3B. Sets of all supply chains with 4 agents, depiction as basis for the calculation of the number of (restricted) grand coalitions

Table 1B summarizes the relevant grand coalitions, coalition structures, restricted grand coalitions and restricted coalition structures. Additionally the number of possibilities with mass markets is calculated.

Table 1B. Calculation of the possible supply chains with 4 agents with the combinations of mass markets and individual customers

Case	GC	CS	RGC	RCS	Factors: Mass markets, individual customers	P-GC	P-CS	P-RGC	P-RCS
	1	2	-	-	4				
2	1	3	3	9	3	3	9	9	27
3	1	3	3	8	3	3	9	9	24
4	1	4	4	14	2	2	8	8	28
5	1	4	8	15	2	2	8	16	30
6	1	3	7	14	2	2	6	14	28
Sum	6	19	25	60		12	40	56	137