



# Direct and indirect contacts in the trade network of the pork supply chain

## Predecessors and successors in comparison with the in- and the out-degree

### Data basis

- ◆ 483 premises from a producer community in Northern Germany
- ◆ 4,635 animal movements in an observation period from 2006 – 2009  
→ 926 different trade connections
- ◆ Abattoirs are removed from the network (irrelevant for the spread of diseases)

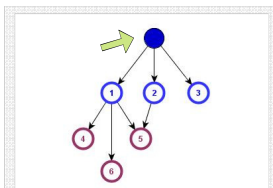
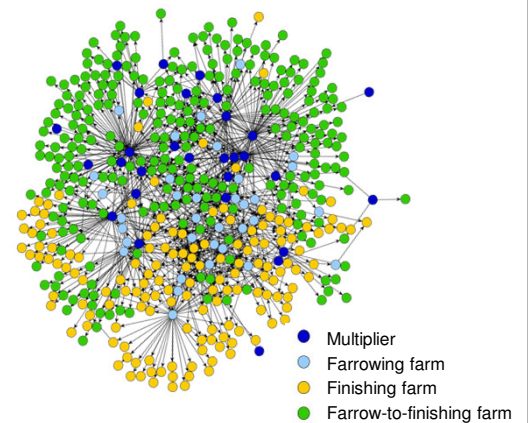
### Static network analysis

#### In-degree and out-degree

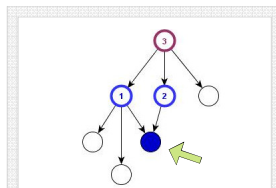
- ◆ Number of **DIRECT** trade partners which deliver (in-degree) animals to or receive (out-degree) animals from a specific holding

#### Predecessors and successors

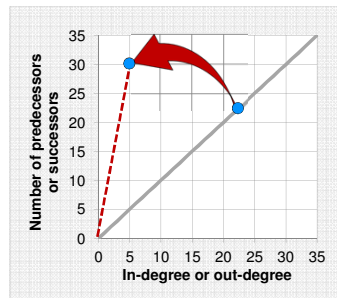
- ◆ Number of **DIRECT** and **INDIRECT** trade partners which deliver (predecessors) animals to or receive (successors) animals from a specific holding



3 direct contacts  
→ **Out-degree = 3**  
3 direct + 3 indirect contacts  
→ **No. of successors = 6**



2 direct contacts  
→ **In-degree = 2**  
2 direct + 1 indirect contacts  
→ **No. of predecessors = 3**



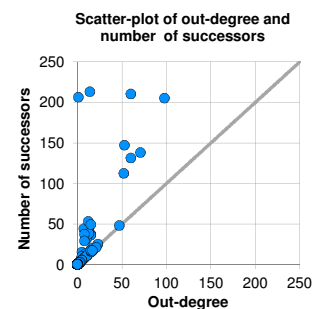
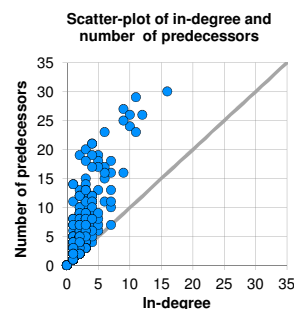
The number of predecessors or successors is at least as high as the in- or out-degree  
→ No possible values under the bisector (grey line)

$\frac{\text{In-degree}}{\text{No. of predecessors}}$  ↓ → Risk of receiving an infection ↑

$\frac{\text{Out-degree}}{\text{No. of successors}}$  ↓ → Risk of spreading an infection ↑

## Results

Premise type	n	In-degree		Predecessors		Out-degree		Successors	
		Median	99 <sup>th</sup> Pctl	Median	99 <sup>th</sup> Pctl	Median	99 <sup>th</sup> Pctl	Median	99 <sup>th</sup> Pctl
Multiplier	29	0	2.2	0	5.2	10	90.4	31	212.2
Farrowing farm	34	2	6.0	3	12.0	3	39.1	3	40.4
Finishing farm	153	2	11.5	6	28.0	0	1.0	0	1.0
Farrow-to-finishing farm	267	1	7.0	2	12.7	0	15.0	0	23.7
<b>Total</b>	<b>483</b>	<b>1</b>	<b>10.0</b>	<b>3</b>	<b>25.2</b>	<b>0</b>	<b>52.2</b>	<b>0</b>	<b>139.6</b>



## Conclusion

- ◆ Due to their position in the trade network different types of premises show a specific combination of in-degree and number of predecessors or out-degree and number of successors
- ◆ In-degree or out-degree are not always consistent with the number of predecessors or successors
- ◆ There are premises with a limited number of direct contacts, but a large number of indirect trade connections
- **In order to predict and finally prevent the disease transmission **DIRECT** and **INDIRECT** trade contacts should be taken into consideration**