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Assessing Economic impact of Equine Activities in Norway and Sweden Using Input-Output Modelling

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Economic Growth Potential in the Norwegian and Swedish Equine Sectors in a National and Regional Perspectives

- Joint research project conducted by a team of researchers from NILF (Norway) and SLU (Sweden),

- The two teams are:
  - NILF: L-J Asheim, A. Hegrenes, A. B. Milford and A. Spissøy
  - SLU: H. Andersson, C. Liljenstolpe, G. Lindberg and Y. Surry

- Expected life of the project : 2009-2013

- Four work packages (see next slide for further details)

- Methods of investigation: economic models, econometric and statistic methods, microeconomic theory and scenario analysis.

- Sources of information: existing literature, macro and meso data, survey data

Work packages (details)

- **WP1: Critical factors for successful developement of horse activities at farm level**

- Analyze the performance of firms involved in horse-related activities (horse boarding and trotting).
- Determine the factors influencing the performance of the above firms
- Analyse and study the factors influencing the prices of equine services charged by some of these firms (horse boarding and trotting).

- **WP2: Market analysis of the demand for for horse-related recreational activities and equine services**

- Study various forms of demand related to equine services.
- Econometric work at the macro (explaining horse numbers in developed economies) and micro (household) levels (riding schools and gambling).

- **WP3: Economic impacts of equine services at national and regional levels**

- Input-output models of both countries with disagregation of horse-related activities
- Models developed at the national and regional levels.

- **WP4: The future of the horse industry in society**

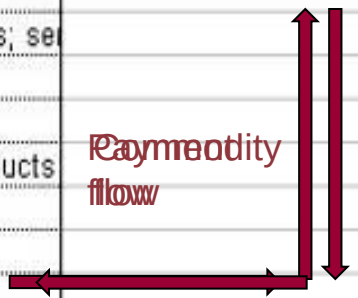
- Future prospects for the industry
- Scenario analysis

An Input-Output Table: What is it?

- Double entry table describing statistically the linkages within an economy at a specific point in time.
- Industry or commodity classification.
- Industries or commodities use intermediate products, capital, labour and imports to produce output.
- Each “sector” produces only one good.
- Output is consumed by other industries, households, government and as exports the table balance.
- All countries produces IO tables and EUROSTAT provides IO data bases

	Purchasing sectors		Final Demand (Y)				Total output
Selling Sectors	Z	Z	C	I	G	E	X
	Z	Z	C	I	G	E	X
Value Added Components	L	L					L
	N	N					N
Imports	I	I					I
Total output/outlays	X	X	C	I	G	E	

Homogeneous units of production / (CPA) PRODUCTS		Agriculture, hunting and related service activities	Forestry, logging and related service activities	Fishing, operating of fish hatcheries and fish farms; service activities incidental to fishing
		C01	C02	C05
C01	Products of agriculture, hunting and r	4 795	30	0
C02	Products of forestry, logging and rela	10	1 193	0
C05	Fish and other fishing products; servi	4	0	0
C10	Coal and lignite; peat	418	0	0
C11	Crude petroleum and natural gas; se	0	0	0
C12	Uranium and thorium ores	0	0	0
C13	Metal ores	58	3	0
C14	Other mining and quarrying products	0	0	0
C15	Food products and beverages	3 407	4	0
C16	Tobacco products	0	0	0
C17	Textiles	7	1	18
C18	Wearing apparel; furs	3	6	0
C19	Leather and leather products	0	0	0
C20	Wood and products of wood and cork	130	197	60
C21	Pulp, paper and paper products	17	45	9
C22	Printed matter and recorded media	57	72	0
C23	Coke, refined petroleum products and	759	291	70
C24	Chemicals, chemical products and m	331	8	6



What is an IO model?

1. We can represent the output (row vise) as a series of equations

$$X_1 = Z_{11} + Z_{12} + ... + Z_{1n} + Y_1$$
$$X_2 = Z_{21} + Z_{22} + ... + Z_{2n} + Y_2$$
$$\vdots$$
$$X_n = Z_{n1} + Z_{n2} + ... + Z_{nn} + Y_n$$

2. Technical coefficients show the relative use of a certain input in an industry

$$m_{ij} = Z_{ij} / X_j$$

3. Collecting the technical coefficients in a matrix **M**, allows to express the vector of outputs, **X**, as

$$\mathbf{X} = \mathbf{MX} + \mathbf{Y}$$

What is an IO model?

$$\Delta \mathbf{X} = \left(\mathbf{I} - \mathbf{M}\right)^{-1} \Delta \mathbf{Y}$$

shows how a change in final demand (" **Y**) affects output (" **X**) through backward linkages in the form of multipliers, $(\mathbf{I} - \mathbf{M})^{-1}$

$(\mathbf{I} - \mathbf{M})^{-1}$ is sometimes denoted the Leontief inverse

There are different multipliers, e.g.

- Output multipliers
- Household income multipliers
- Employment multipliers

Implementing an IO table with horse-related industries

- IO national tables are not sufficiently disaggregated to consider horse-related industries as separate activities.

- The same is even more true at the regional level.

- Need to build in IO table horse-related activities with the use of appropriate procedures but also specific micro and survey data.

- The horse-related sectors included in the national IO tables are as follows**: Trainers, Breeders, Boarding and Riding schools and in addition for Norway horse tourism**.

- Once the disaggregation is done, it is then possible to derive multipliers for these horse related activities using the previously defined IO model.

Methods used to develop regional IO tables in Norway and Sweden with horse-related industries

- Use as a starting point each national IO table including horse-related activities.

- Then regionalise the national IO table to the regions under study using appropriate regionalisation procedures (use of localisation coefficients)

- Analyze and validate the resulting regional IO tables
  - Norway: one region Buskerud (near Oslo)
  - Sweden: 21 regions and disaggregation of agriculture

- Derive regional multipliers

Some estimates of output multipliers for Norway and the Buskerud region

Sector	Norway	Buskerud region
Riding schools	1,76	1,22
Breeders	1,91	1,10
Horse Tourism	1,74	1,10
Trainers	2,04	1,19
Boarding	1,46	1,06
Products of agriculture, hunting and related services	1,97	1,18
Products of forestry, logging and related services	1,42	1,10
Fish and other fishing products; aquaculture products; support services to fishing	2,05	1,23
Food products, beverages and tobacco products	2,32	1,23
Textiles, wearing apparel and leather products	1,77	1,18
Scientific research and development services	1,52	1,16
Advertising and market research services	1,95	1,23
Other professional, scientific and technical services; veterinary services	1,60	1,15
Travel agency, tour operator and other reservation services and related services	1,74	1,08
Creative, arts and entertainment services; library, archive, museum and other cultural services; gambling and betting services	1,53	1,14
Sporting services and amusement and recreation services	1,69	1,14

Some estimates of output multipliers for Sweden

Sectors	Gotland	Kronoberg	Stockholm	Västra Götaland
Trainers	1,03	1,12	1,37	1,37
Boarding enterprises	1,02	1,06	1,22	1,23
Breeders	1,04	1,15	1,50	1,48
Riding schools	1,06	1,15	1,54	1,56
Milk	1,03	1,13	1,50	1,42
cattle/dear	1,04	1,08	1,49	1,42
pig	1,03	1,20	1,48	1,44
Poultry/Egg	1,08	1,22	1,47	1,55
Sheep	1,02	1,10	1,42	1,40
Cereals	1,03	1,17	1,42	1,37
Forage	1,06	1,17	1,43	1,38
Other (potato/sugar beets)	1,04	1,15	1,42	1,40
Other animals	1,08	1,19	1,45	1,43
Agricultural services	1,05	1,13	1,39	1,38

Concluding remarks

- Output multipliers for horse-related activities in Norway and Sweden tend to be similar in values and magnitudes to those of other sectors.

- Not surprisingly, these output multipliers at the regional level are lower than their national counterparts.

- These multipliers are also similar in terms of magnitudes to those obtained in other input-output studies conducted in the horse industries in North America and European countries (example of Austria).

- Although not developed in the presentation, other types of multipliers (employment for instance) can be defined and computed.