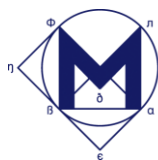




# Calculating of Ripple Effects by 'ITEM' – 'The International Total Effect Model'

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August 2014, Oslo



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Business Economics

# Content

- Basics on Ripple Effects:
  - Basic Concepts
  - Typology for Ripple Effect Analyses
- ‘ITEM’ – ‘International Total Effect Model’:
  - ‘NM’ – ‘Norwegian Module’
  - ‘WM’ – ‘World Module’

# Basics on Ripple Effects: Summary

- An **ripple effect** is an economic effect from an initial state or change in state than can be followed outwards in the economy from the initial shock or state incrementally.
- In the following slides, we will get familiar with the following concepts:
  - We distinguish between four **different kinds of ripple effects** (i.e. direct effects, indirect effects, induced effects and catalytic effects).
  - Ripple effects analyses involve four **different dimensions** (i.e. an industry dimension, a time dimension, a spatial dimension and a capacity dimension).
  - Ripple effects are **typically measured by** direct purchase impulses, employment, value added and tax revenues.
  - Ripple effect models often utilize various **industrial input-output matrixes**.
- Ripple effect analyses varies over the nature of the study and the type of model:
  - We distinguish between **status analyses** and **impulse analyses**.
  - The model **varies along different dimensions** (e.g. employment composition or input-out-based, shock tracking or equilibrium based and gross or net).

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# Basic Concepts:

## Effect Typology and Analysis Dimensions

- We distinguish between four sorts of ripple effects:
  - **Direct effects:** First order effects through purchases or ownership
  - **Indirect effects:** Second and higher order effects higher up in the supply chain
  - **Induced effects:** Multiplication effects and externalities (e.g. consumption, environment and investments)
  - **Catalytic effects:** Effects on structural relationships in the economy (e.g. cluster and macroeconomic dynamics, and adjustments in actors' adaptations due to difference between average effects and marginal effects)
- Ripple effect analyses could be conducted along four dimensions:
  - **Industry dimension:** Industry impact on investments and operations, choices of input-output matrixes and changes in industry structure
  - **Time dimension:** Changes in structural relationships and choice of price measure
  - **Spatial dimension:** Initial shock and geographical spread
  - **Capacity dimension:** Industry and demographic attractiveness and capacity

# Basic Concepts:

## Ripple Effect Measures and Input-Output Matrixes

- Many measures could be used to measure ripple effects, including:
  - **Gross production:** The starting point of a shock analyzed in a ripple effect is typically measured in terms of **revenues**. Due to double counting, one most often just focus on first order revenues, that is intermediates.
  - **Employment:** As a measure of the ripple effects magnitude in terms of involvement, the **number of persons engaged** is the most common choice of measure.
  - **Value creation:** As a measure of the ripple effects magnitude in terms of value generation, **gross value added** is the most common choice of measure.
  - **Tax generation:** To illuminate a study object's impact on public finances, **tax revenues** are sometimes calculated in ripple effect models. Tax generation modelled in ripple effect models normally includes personal income tax, value added tax, corporate internal taxes, employer fees, net production taxes dependent on production volume and net production taxes independent of production volumes.
- Input-output-matrixes constitute a corner stone in many, if not most, ripple effect models:
  - Industry IO-tables **describes the purchase structure for all industries in the economy**, as well as basic production and basic consumption data.
  - Different IO-matrixes are suited to **fulfil different purposes** (e.g. domestic, import, total, product-conversion, emission-conversion and inverse at OECD Stan and Statistics Norway National Accounts).

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# Typology of Ripple Effect Analysis: Nature of the Study and Types of Ripple Effect Models

- Ripple effect analyses divided in line with the nature of the study:
  - **Status analysis:** An analysis that describes the status in the economy.
  - **Impulse analysis:** An analysis that describes changes in the economy. Since changes are dynamic, the time dimension becomes relevant.
- Types of ripple effect models:
  - **Employment composition ripple effect-model:** Takes basis in the statistical employment relation in a study object and the rest of the economy (i.e. models with rough estimates).
  - **Input-output shock-tracking gross ripple effect model:** Takes basis in the input-output-composition without calculating displacement (e.g. ITEM without a displacement feature).
  - **Input-output shock-tracking net ripple effect model:** Takes basis in input-output-composition and calculates displacement (e.g. ITEM with a displacement feature).
  - **A input-output-interaction general equilibria model:** Integrates traditional ripple effect model's input-output feature into a general equilibria framework (e.g. Noreg).



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# 'ITEM' – 'International Total Effect Model': Summary

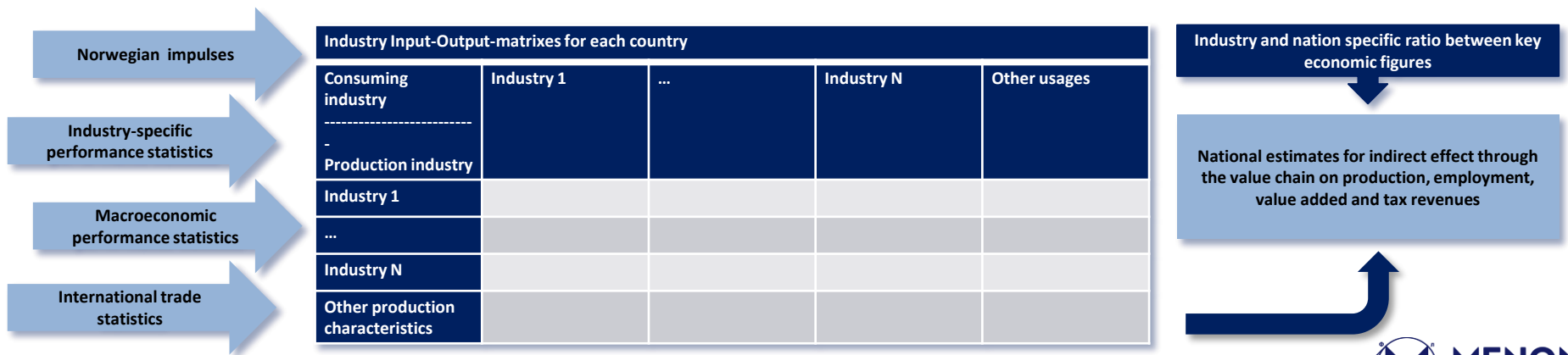
- **The International Total Effect Model**, abbreviated 'ITEM', is divided in to a **Norwegian Module**, 'NM', and a **World Module**, 'WM'.
- ITEM calculates ripple effects measured in **purchases, tax revenue, value added** and **employment** over orders in the supply chain and regions.
- Advantages compared to other ripple effect models:
  - ITEM takes **cluster characteristics** into account.
  - ITEM entails a **geographical feature**, which calculates ripple effect geographically in Norway.
  - ITEM entails an **international module** and a corresponding trade bridge.
  - ITEM is very flexible and **might include analyze-specific features** such as displacement and environmental impacts.
- Compared to general equilibrium ripple effect model, ITEM...:
  - ... **does not have general equilibria properties** and takes basis in today's average effects, ...
  - ... but is more **flexible** and susceptible for model extensions.

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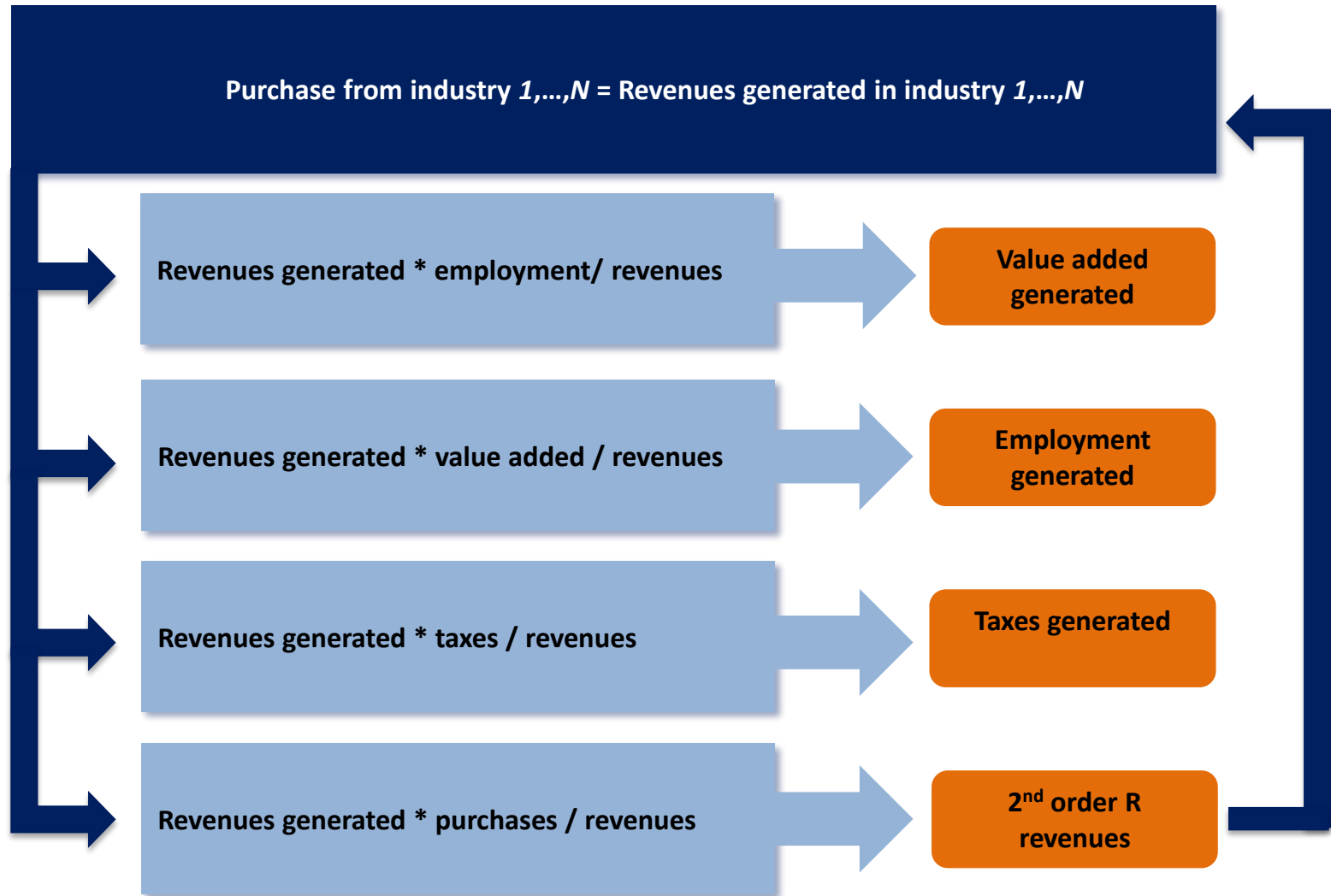
# 'NM' – 'Norwegian Module': Basic Logics of the Norwegian Module

- Norwegian Module, abbreviated NM, calculates Norwegian ripple effects measured in purchases, tax revenue, value added and employment over orders in the supply chain, industries and counties.
- The basis of the calculations are a modified version of Statistic Norway's domestic input-output-matrixes (approximately similar to A64 Revision 2) and key-economic ratios.
- **Taking economic development into account:** Key economic ratios and figures are adjusted according to industry-specific and macroeconomic developments.
- **Purchase and performance data:** ITEM is suited to utilize firm-specific purchase data. Menon activity and accounting database is suited to calculate cluster-specific key ratios.



# 'NM' – 'Norwegian Module':

## Illustration of the Ripple Effect Cycle in ITEM



# 'NM' – 'Norwegian Module': Special Features

- **Initial shocks higher up in the supply chain:** NM is suited to conduct second order shocks, which implies that it can be used to model ownership shocks or correct for internal purchases, when several actors are studied at the same time.
- **Geographical spread:** The Norwegian first order ripple effects through suppliers are geographically distributed according to Menon's estimation of gravity relations, which spreads economic shocks according to the distances to the shock center and industry agglomeration (confer the regional equilibrium model, Noreg).
- **Induced effects:** ITEM is suited to attach modeling of consumer effects (i.e. by consumption multiplier) and external effects (e.g. environmental effects).
- **Catalytic effects:** In the model, changes in industry composition and actors' behavior could be dealt with by making adjustments in key economic ratios or IO-matrix, but this is a complicated task.
- **Displacement:** Net effects and displacement could be calculated by investigating factor unit contributions and employment rate.

Figure 4-5: Value added generated directly or indirectly by Node's activities. Source: Menon (2014)

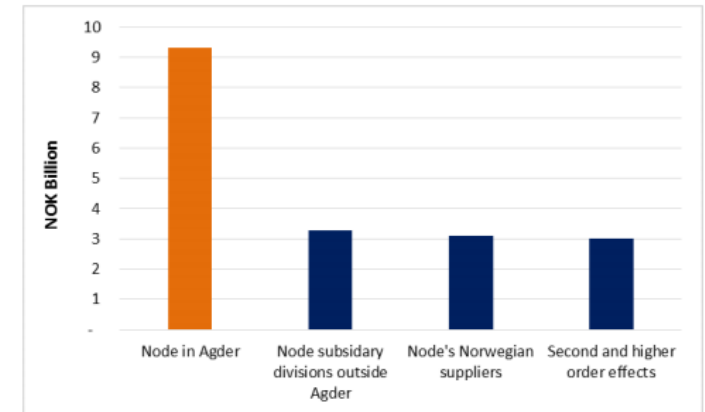
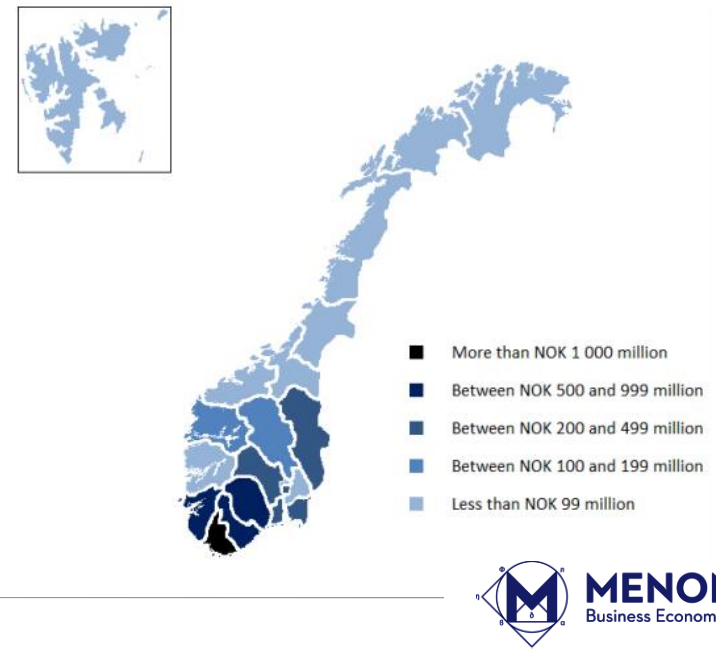


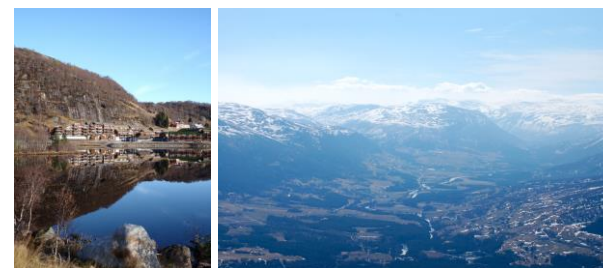
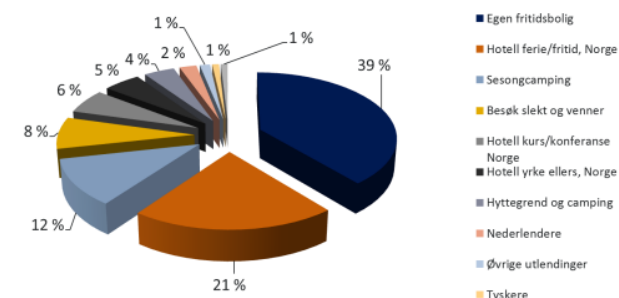
Figure 4-1: Geographic spread of Node's suppliers in Norway. Source: Menon (2014)



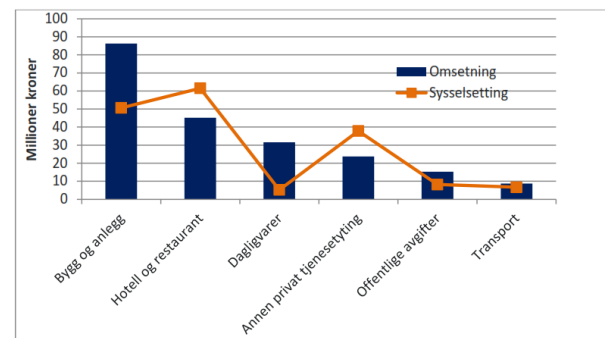
# 'NM' – 'Norwegian Module': Ripple Effects from Tourism

- In ripple effects analyses for the tourism industry, the calculation takes basis in the scope of tourism and the related spending.
- Tourism scope:
  - **Number of guests:** Accommodation form, day visits and overnight stays, travel purpose and nationality
  - **Cabin stock:** Number and size of the existing cabin stock and cabin construction
- Related spending:
  - **Daily tourist consumption:** Accommodation, dining, groceries, activities, transportation and purchases of other goods
  - **Fixed cost for existing and new cabins:** Electricity, insurance, public charges, construction costs and purchases of other goods
- Typical sources include Menon's and TØI's guest surveys, and Statistikknett's and Statistics Norway's accommodation statistics.

Figur 1 Totalt forbruk per segment hele året (2011). Kilde: Menon



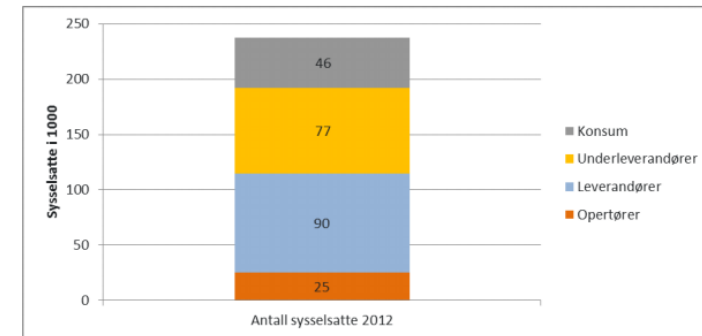
Figur 4-2 – Førsteordens omsetnings- og sysselsettingseffekt reiseliv i Sirdal. Kilde: Menon (2012)



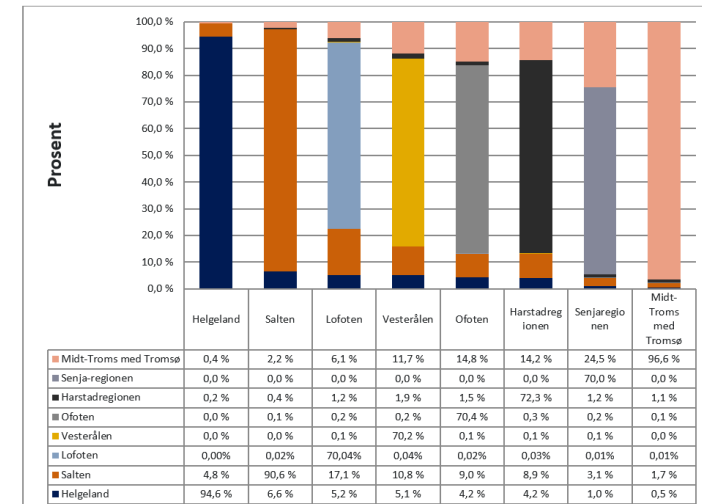
# 'NM' – 'Norwegian Module': Ripple Effects from Offshore Activities

- In ripple effect analyses for the petroleum sector, peculiarities both for petroleum extraction and offshore supply should be accounted for.
- Petroleum extraction:
  - **Forecasts:** Ripple effect analyses for the petroleum sector, must take forecasts for operational and investment cost into account (e.g. IEA and NPD).
  - **Purchasing data:** The nationalities of petroleum extractors' suppliers vary a lot, implying that is particularity important to study firms' purchasing data, when the sample of firm is little.
  - **Geographical spread:** Location of offshore supply industry and geographical proximity could be use to estimate geographical linkages between offshore activities and supply activities.
- Offshore supply:
  - **Distinctive industry characteristics:** One should take into account that the offshore cluster have aberrant key economic ratios across the activity industries in public statistics. Hence, we utilize Menon and IRIS' offshore population.

Figur 4: Sysselsettingseffekt som følge av petroleumsvirksomheten i Norge i 2012. Kilde: Menon (2013)



Figur 12: Krysslleveranser mellom ulike regioner i utredningsområdet





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# 'WM' – 'World Module'

## ITEM's Trade Bridge

- To create a link between NM and WM, Menon has developed a trade bridge.
- The trade bridge starting point is a modified version of Statistic Norway's import matrix, which is linked to NM. From here, we can map which domestic foreign industries (modified version of A64 revision 2) that are imported from.
- Thereafter, we match commodity-country matrixes and services-country-matrixes with the industries in NM (modified version of A64 revision 2).
- At last, we create a transition between the industry division used in NM (modified version of A64 revision 2) and the industry division applied in WM (A38 revision 1). Menon's database is used for this purpose.



# 'WM' – 'World Module': Basic Logics of the World Module

- World Module, abbreviated 'WM', has similar structure and outputs as 'NM', but for others 25 countries and eight World regions. The countries include Norway's most important partners in trade and some geographical rest regions.
- When applying WM in ripple effect analyses, one could either make use of the trade bridge from 'NM' or start a shock in given industries in given countries, or both.
- WM builds on OECD Stan's total industry input-output matrixes (building on A38 revision 1) and utilizes a number of sources about industries (e.g. OECD Stan 3 and 4), macroeconomics (e.g. IMF WEO, World Bank Open), tax rates (e.g. E&Y's Worldwide Corporate Tax Guide and WorldWide Tax) and exchange rates (e.g. Norway's Central Bank and Oanda).
- All key economic figures and ratios are estimated up to today for all countries and regions.

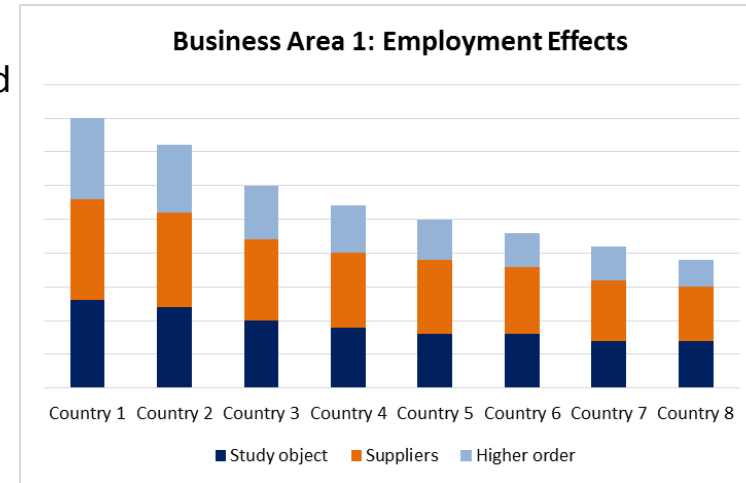


Figure 8: Geographic spread of ripple effects generated by NOV Norway in terms of employment. Source: Menon (2013) and NOV Norway (2013)



# 'WM' – 'World Module':

## Illustration of the Spread of Ripple Effects in ITEM

