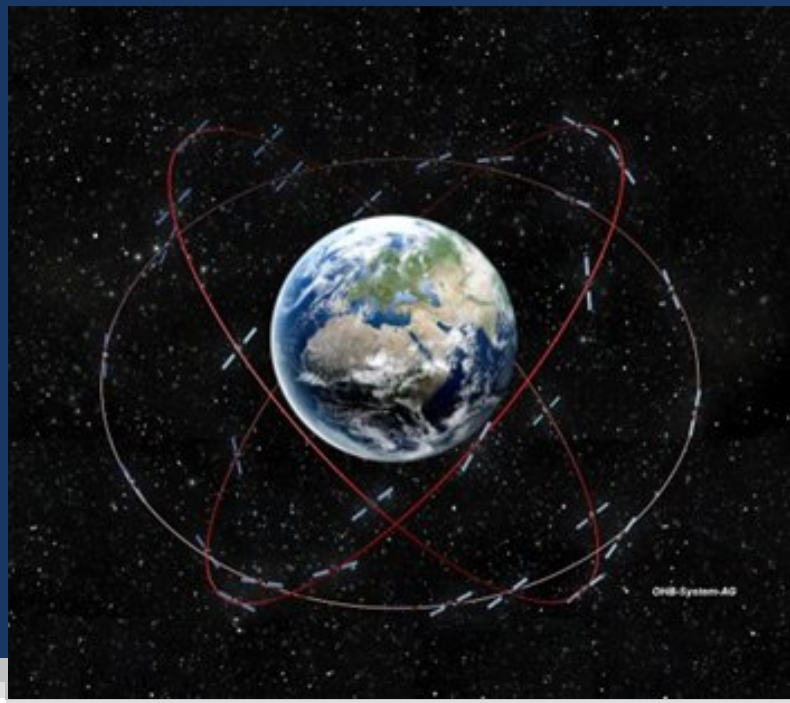
Space Economy: Indicators and Economic studies



IAF Space Economy Technical Committee
Tuesday 19th March
Paris

Greg Sadlier
Associate Director
Head of Aerospace & Satellite technology
London Economics
71-75 Shelton Street, Covent Garden, London, WC2H 9JQ
+44 (0)20 7866 8190
gsadlier@londecon.co.uk

London Economics

About us: London Economics

- One of Europe's leading specialist economic and policy consultancies
- 40 consultants across offices in London (Headquarters), Brussels, Dublin, Cardiff, Budapest, and associate offices in Paris and Valletta
- The only specialised economic consultancy with a **dedicated Aerospace team**, comprising 9 consultants with experience built up over 14 research projects and growing…
- Reputation for independent analysis and client-driven, world-class and academically robust economic research built up over more than 500 projects
- We advise clients in both the public and private sectors on economic and financial analysis, policy development and evaluation, business strategy, and regulatory and competition policy
- Our consultants are highly-qualified economists with experience in applying a wide variety of analytical techniques to assist our work, including
  - Economic and financial modeling, business case evaluation, cost effectiveness and cost-benefit analysis, impact assessment (public utility and spillover effect estimation), sophisticated econometric and statistical analysis, policy design, simulation and appraisal, new technology adoption and market quantification

About me

Greg Sadlier

***Head of Aerospace and Satellite technology* at London Economics**

- Associate Director
- Over 10 years' experience as a professional economist consulting on over 50 research projects
- M.Sc. in Economics, M.A. and B.A. in Economics and Business (University of Dublin, Trinity College, Ireland)
- 100% dedicated to advisory work on space-related issues
- Project Manager and lead modeller on all our space-related research
- Extensive research experience in the economics of space applying the full range of economic analysis techniques to space access, space exploration, satellite systems and their downstream applications
- Security Cleared (UK/EU)

Selected LE Space experience

Partners

SURREY SATELLITE TECHNOLOGY LTD

London Economics

FDC

CST

pwc

RPA

HELIOS

REACTION ENGINES

CGI
Logica is now part of CGI.

BHO LEGAL

NEWTON Launch Systems

Clients

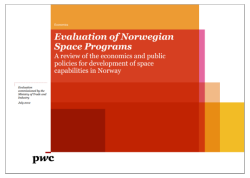
European GNSS Agency

esa

NORWEGIAN MINISTRY OF TRADE AND INDUSTRY

UK SPACE AGENCY

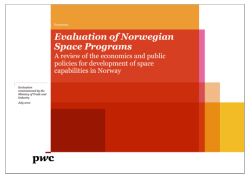
BNSC
BRITISH NATIONAL SPACE CENTRE



Evaluation of Norwegian Space Programs

London Economics

- Socio-Economic Impact assessment (using CBA) of Norway's membership of ESA
  - Cost from the period 2004-2010
  - Benefits from 2007-2013
- Indicators considered:
  - Jobs supported
  - Tax benefits
    - Income tax, Value added tax, Corporation tax
  - Benefits for inhabitants (employees, businesses)
    - Retailer sales value, retained earnings, productivity
  - Attractiveness of careers in Science, Technology, Engineering and Maths
- Underlying data:
  - The Norwegian Space Centre's data on space companies since the 1985
  - Supplementary data from a survey and workshops



Evaluation of Norwegian Space Programs

London Economics

Costs

Norwegian Government's space related spending

Norwegian Space Centre

European Space Agency

Research and development facilitated by NSC

Research leading to an ESA

ESA contracts

ESA programmes

Direct benefits

Norwegian ESA contractors

Innovation facilitated by ESA

Employment increase

Turnover increase

% of inputs from Norwegian suppliers

Salaries

Profit margin

Productivity/skills/ efficiency gains

Norwegian suppliers

Multiplier

Profit

Valued benefits

Employment increase

Turnover increase

Research not leading to an ESA contract

Expenditure increase

Income tax

Value added tax

Retailer sales revenue

Corpo-rate tax

Retained earnings

Income tax

VAT/ Sales revenue

Corporate tax/ Retained earnings

Valued benefits

User benefits

ESA programme outputs

Commercial users

Non-commercial users

Academia

Public bodies

Valued benefits

Indirect benefits

Additional sales of Norwegian ESA contractors and/or NSC funding recipients

Within the space sector

Outside the space sector

Norwegian suppliers

Employment increase

Turnover increase

Employment increase

Turnover increase

Norwegian suppliers

Profits, productivity/skills/efficiency gains, salaries, additional expenditure of salaries

Income tax

Value added tax

Retailer sales revenue

Corporate tax

Retained earnings

Valued benefits

User benefits

Additional sales products/services

Valued benefits

Attractiveness of STEM careers

GSA *GNSS Market Report*

London Economics

- Downstream GNSS Market quantification
  - Shipments, revenue, installed base, GNSS penetration, EGNOS and Galileo
    - Over 50 applications across 9 sectors, quantified globally and 3 regions
    - 'All GNSS' but with a focus on Galileo and EGNOS

- Public Utility estimation
  - Benefits to European users and society from the use of GNSS devices

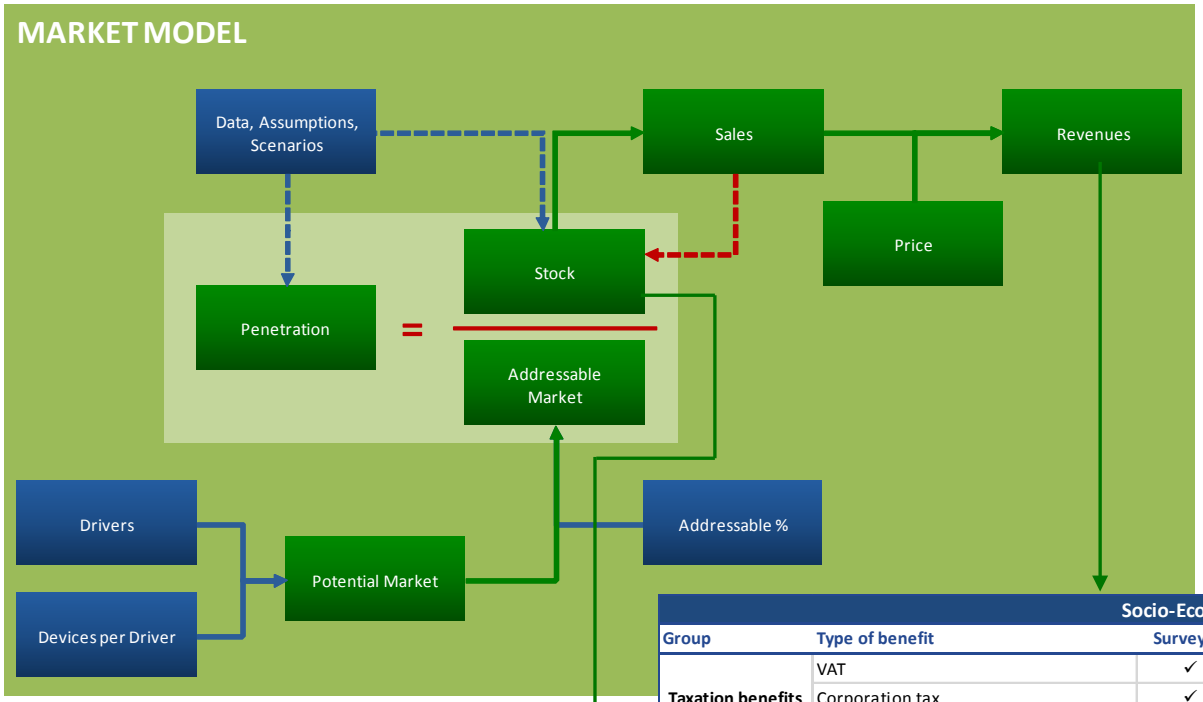
- Socio-Economic Impact estimation
  - Tax flows and employment supported owing to manufacture and sales of GNSS devices in Europe

GNSS Market Report - Issue 3 forthcoming (Nov 2013)

GSA *GNSS Market Report*

London Economics

MARKET MODEL



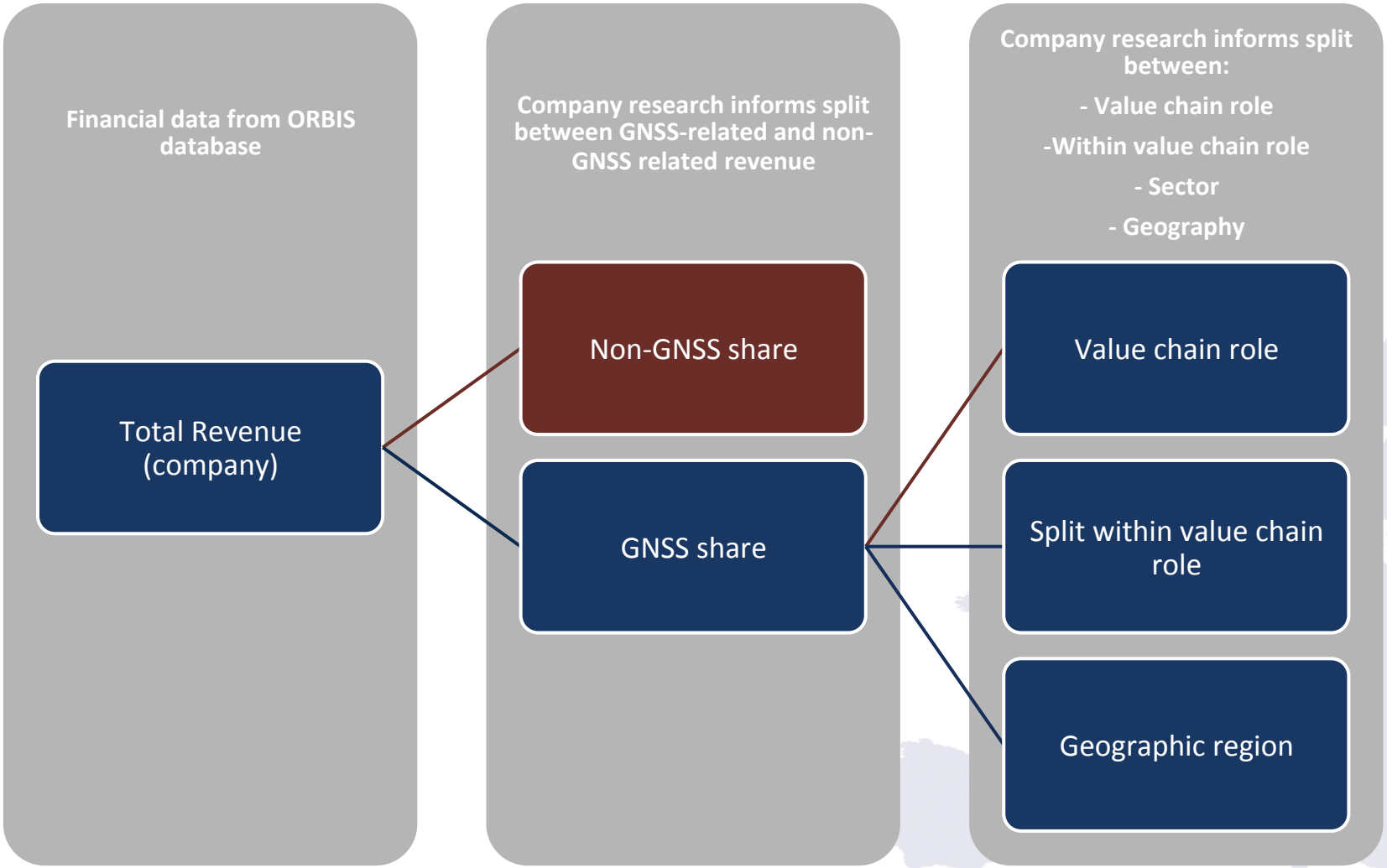
Socio-Economic Impact							
Group	**Type of benefit**	**Surveying**	**Aviation**	**LBS**	**Maritime**	**Agriculture**	**Road**
Taxation benefits	VAT	✓	✓	✓	✓	✓	✓
	Corporation tax	✓	✓	✓	✓	✓	✓
	Income tax	✓	✓	✓	✓	✓	✓
Producer benefits	After-tax profits	✓	✓	✓	✓	✓	✓
Employee benefits	Number of jobs supported by GNSS sales	✓	✓	✓	✓	✓	✓
	Net imployee income	✓	✓	✓	✓	✓	✓
	Multiplier effect on employee spending	✓	✓	✓	✓	✓	✓
Public Utility							
Group	**Type of benefit**	**Surveying**	**Aviation**	**LBS**	**Maritime**	**Agriculture**	**Road**
User benefits	Time savings	✓	✓	✓	×	✓	✓
	Productivity improvements	×	✓	✓	✓	✓	✓
Benefits for society	Environmental externalities	✓	✓	✓	✓	✓	✓
	Lives saved	×	✓	✓	✓	×	✓

European GNSS Market Share analysis

- Objective
  - Estimate European companies' share of global downstream GNSS market

- Methodology
  - Identify the share of turnover of individual companies related to GNSS
  - Identify the share of that turnover that is strictly GNSS
  - Identify the region in which the company is based
    - Add-up strict GNSS turnover from all companies in each region and identify geographic shares, accounting for parent/subsidiary double-counting risk
  - Identify the share of strict GNSS turnover in each sector (Road, LBS, Aviation, Maritime, Surveying, Agri, Rail, Safety & Security and in each segment of the value chain (Components, Receivers, Integrators, Services)
    - Add-up strict GNSS turnover in each sector from all companies in each region and identify geographic shares of sectoral GNSS market

European GNSS Market Share analysis



FP7 GNSS R&D Impact Assessment

- Objectives
  - To quantify the achievements and return of GNSS R&D projects funded under FP7
  - To provide evidence-based recommendations to shape future EC funding of R&D activities on GNSS applications (e.g. Horizon2020)
- Impacts considered
  - Science and Technology
    - Knowledge creation and knowledge sharing
  - Market
    - Knowledge commercialisation
  - Socio-Economic
    - Core and spin-out employment and revenues, public utility benefits
  - Environmental
    - Pollution, emissions, deforestation, preservation of natural heritage
  - International activities
    - Cooperation with non-EU partners

FP7 Impact Assessment

OUTPUT

Scientific and Technology impacts

- ***Knowledge creation***
  - Product innovations achieved
  - Process innovations achieved
  - Proof of concept achieved
  - Registered designs
  - Successful trials achieved
  - Patents/trademarks registered
  - Patents/trademarks applied for
  - Prototypes achieved
  - Technical standards contributions
- ***Knowledge sharing***
  - Papers in peer reviewed scientific journals
  - Other papers (Conference papers, other publications)
  - Conferences organised/attended
  - Events organised/attended (e.g. workshop, information day)
  - Brochures/Flyers/Leaflets distributed
  - Regularly updated project website
  - E-mail mailing list subscribers
  - Multimedia videos (DVD/online) produced
  - Twitter tweets
  - Facebook likes
  - LinkedIn updates
  - Press release/TV/media briefings
  - Media coverage

International activities

- Increasing third (extra-EU) party cooperation
- Contribution to international regulation
- Contribution to EU regulations /directives
- Contribution to development of scientific and technical international cooperation

Market impacts

- ***Knowledge commercialisation***
  - Pre-commercial products/services
  - Commercialised products/services
  - Developed applications
  - Mature concepts with capability to attract private investment
  - Spin-out businesses launched

Economic and Social impacts

- ***Economic***
  - Employment in EU GNSS companies
  - Output (total value-added) of EU GNSS companies
  - Revenue of EU GNSS companies
  - International competitiveness of EU GNSS companies
- ***Social***
  - Improving quality of life
  - Improving safety
  - Improving security
  - Improving public / community access to information and knowledge on GNSS
  - Improving public understanding of GNSS
  - Improving confidence of consumers in GNSS
  - Improving appeal of careers in STEM

Environmental impacts

- Emissions (CO_2, greenhouse gases)
- Non-renewable energy consumption (e.g. fossil fuels)
- Use of natural resources (e.g. deforestation)
- Climate change
- Sustainable development
- Preservation of natural heritage sites

IMPACT

Scientific and Technology

- Develop innovative applications leveraging the comparative advantages of E-GNSS
- Fill gaps in technological capability / knowledge
- Develop EU expertise in GNSS
- Facilitation of research coordination
- Testing, demonstration and proof of E-GNSS
- Facilitate certification of EGNOS for applications
- Facilitate certification of Galileo for applications
- Awareness of E-GNSS and its benefits
- Avail of synergies with existing EC activities (e.g. GMES, EIB)
- Support development of necessary legislative/regulatory environment

Market

- Promote and expedite adoption of EGNOS
- Promote and expedite adoption of Galileo
- Lower the cost of E-GNSS chipsets and receivers
- Bring commercial E-GNSS products/services to the market
- Involve end-users (and their needs) in design process
- Enhance E-GNSS start-ups' ability to raise private finance/VC
- Increase the GNSS market share of European GNSS companies

Socio-Economic

- Exploit E-GNSS infrastructure for social and economic progress in Europe
- Boost economic activity (revenue and employment) of European GNSS companies
- Increase competitiveness and export trade of European GNSS companies
- Improve safety, security and quality of life for European citizens

Environment

- Improve management of the environment
- Reduce negative impacts on the environment

International activities

- Facilitate expansion of EGNOS beyond Europe
- Facilitation of coordination between European and international GNSS organisations

Other space projects

Skylon-based European Launch Service Operator

- Assessment of economic feasibility of a Skylon-based European Launch Service Operator (operating from Kourou)

Cost-analysis of the Skylon launch vehicle

- Break-even analysis and economic Impact Assessment of reusable Skylon launch vehicle to help REL raise public and private investment

Business case for a UK space launch facility

- In partnership with SSTL, CSR, Newton Launch Systems and REL
- Economic feasibility study of the business case for a UK Spaceport

Study on the Options of UK Involvement in Space Exploration

- Contributed to change of strategy & founding of the UK Space Agency
- Business opportunities: Lunar drilling, launch technology, ISRU, Lunar communications & navigation, Robotics, Space medicine

Economic and Governance Evolution of Space in Europe

Looking to the future …

Lower cost of Space access	•Demand-side driven •Supply-side issues: Break from parametric costing •Reusability of launchers •SpaceX game-changer (?)
Commercialisation of Space	•Development costs (and risk) are key •Models of Public-Private Partnership •Regulatory challenges
Terrestrial applications of Space technology	•Downstream and terrestrial applications •Spill-overs
Civilianisation of Space	•Space tourism •Sub-orbital experiments •Advent of Small / Nano / 'Personal' satellites
Robotic space exploration	•An interesting case of capital-labour substitution
Space debris management	•Space debris active removal (in addition to Space Debris mitigation guidelines)

Q&A session …

Greg Sadlier

Associate Director

Head of Aerospace & Satellite technology

London Economics

71-75 Shelton Street, London, WC2H 9JQ, UK

Email: GSadlier@LondEcon.co.uk

Phone: +44 (0)20 7866 8190

Fax: +44 (0)20 7866 8186

Twitter: @LE_Aerospace