

Agenda

Advancing economics in business

Putting Geo services on the map: the economic impact of electronic navigation

When was the last time you went to a new place without checking a digital map first? Digital maps and navigation services are having an increasingly wide-reaching impact, affecting how consumers and businesses operate in their day-to-day lives. Oxera, on behalf of Google, has examined and quantified how these services are contributing to the global economy

'Geo services' can be used to define an industry encompassing all interactive digital mapping and location-based services. This definition was developed by Oxera and Google to include all providers of satellite imagery, digital maps, satellite positioning signals and navigation devices. Digital maps are defined to include both online maps and locally stored digital maps (such as satellite navigation systems used in cars). Traditional hard-copy map publishers are not included in the definition, although they may use data from some parts of the Geo services value chain.

People are increasingly using digital mapping and location services, with applications of this technology ranging from electronic maps accessible online and via smartphones, to satellite navigation and imaging, and location-based searching. In the five largest European economies, 50% of Internet users access maps online and 35% of smartphone users do so on their handsets.¹ In addition, a range of systems has been, and is being, designed to put Geo services to use in innovative ways, for example to help coordinators of search-and-rescue operations determine which areas rescue dogs have searched; to log the location of ship crew members who have fallen overboard; to impose directions on a smartphone video stream; to help predict natural disasters; and to provide displays with translucent location guidance.²

One of the more everyday uses for mapping and location-based services is local governments helping residents to find their nearest community services, such as leisure facilities, schools, transport and recycling facilities.³ Spatial information is also increasingly being used to link consumers and businesses through location-based services, which combine geographic data from a mobile device with

maps and other data to link consumers to local services such as dentists, hairdressers and coffee shops. From an economic perspective, these services help businesses and consumers connect with each other more easily, improving welfare for consumers by reducing the cost of searching, and increasing competition and choice in many markets.

Oxera's independent study for Google quantified the impact of Geo services on the world economy and consumer welfare. This impact was divided into three broad categories:

- **direct effects**—the footprint of the Geo services, measured according to the revenue generated by firms developing and providing Geo services and the value they add;
- **consumer effects**—the benefits that accrue to consumers, businesses and government from using Geo services, over and above the value that might be paid for any services (ie, the revenue in addition to that accounted for under the direct effects category); and
- **wider economic effects**—the benefits that accrue from Geo services improving efficiency elsewhere in the economy, by creating new products and services and creating cost savings that cannot be generated by other sectors.

The study used a number of information sources, including financial data and academic articles, to estimate the scale of the global impact of these mechanisms. This involved calculating effects for one or a few countries, and appropriately scaling up the effects to a global value. Estimating global impacts is

This article is based on Oxera (2013), 'What is the Economic Impact of Geo Services?', prepared for Google, January, available at www.oxera.com.

not a precise science, so the estimates are indicative of the likely magnitude of impacts rather than exact quantifications of individual effects. Indeed, it is at least as important to understand the mechanisms through which Geo services affect the economy as it is to obtain the specific estimates themselves.

What are the direct effects of Geo services?

Direct effects refer to the economic presence or footprint of companies directly involved in producing Geo services (eg, those that have some input in their creation, such as Google, Carifact and Garmin) and the value that they create.

These effects can be measured in various ways: by the revenues that are generated; by market capitalisation; by gross value added (GVA); or by the jobs involved in producing the services.

It is estimated that the Geo services sector generates \$150 billion–\$270 billion of revenue globally per year.⁴ This range is based on two forms of calculation that jointly give an indication of the likely order of magnitude rather than a precise value. By way of comparison, this is greater than the \$25 billion of revenues generated by the video games industry,⁵ broadly equivalent to the \$140 billion of revenues from the global security services industry,⁶ or around one-third of the global airline industry's revenues of \$594 billion.⁷

Revenue estimates provide an indication of the size of the transactions that are occurring, but do not capture the full economic contribution of a sector. An alternative method is to look at a sector's GVA, which accounts for the costs of inputs. GVA can be broken down into the profits accruing to Geo services providers and the wages paid to those working in Geo services.

The Geo services sector is estimated to have a global GVA of \$113 billion.⁸ Total global GVA is approximately \$70 trillion,⁹ suggesting that Geo services account for roughly 0.2% of global gross domestic product (GDP). In comparison, the global airline industry has a GVA of around \$221 billion¹⁰ and the global video games industry a GVA of around \$22 billion.¹¹

How do consumers benefit from Geo services?

Geo services are wide in scope, as reflected in the many different ways that consumers use them. All these uses generate benefits for consumers in different ways, and these benefits are, in turn, partly captured in the revenue impacts illustrated under the direct effects. This shows that consumers are willing to pay to use

these services. Moreover, they derive benefits from services that are not captured via revenues. This is apparent when considering that many Geo services are free at the point of use (such as online Michelin maps).

Geo services are typically an intermediate good—ie, they are not normally valuable in themselves, but help consumers to engage in other activities. Thus, the consumer benefit comes from the value to the consumer of the activities that the Geo services facilitate (eg, visiting a new destination). The following are examples of the consumer welfare benefits that Geo services generate.¹²

- **Journey time and fuel savings from more efficient navigation**—drivers using navigation devices can reduce travel time and fuel consumption on some journeys by optimising their route, reducing the risk of getting lost, and, on occasion, by avoiding congestion. This impact could be worth around \$22 billion per year to consumers.
- **Educational benefit**—Geo services can provide users with an educational value beyond their conventional use in navigation. Geographic information systems can be considered a useful information technology tool for promoting higher-order thinking, decision-making and problem-solving skills.¹³ Geo services can also provide individuals with better access to information about the location of countries, cities and places of interest, leading to a more informed population. This educational impact could be worth around \$12 billion a year.
- **Better emergency response**—since emergency services can use Geo services to locate and reach an emergency, they can typically arrive at the scene more quickly than without Geo services. The impact of this may be vital, since small time savings can make the difference between life and death in some emergency situations. For example, the emergency services treat around 17,900 patients for out-of-hospital cardiac arrest each year in England, and the survival rate is currently around 6%, or 1,075 people.¹⁴ The emergency services involved in these cases are assumed to make use of Geo services. Therefore, taking a conservative approach, and based on the estimated impact of Geo services on response times and the impact of response times on survival rates, the use of Geo services in England may save around 152 lives each year.
- **Reduced search costs**—by using Geo services, consumers are able to locate businesses more effectively than they otherwise would. Consumers derive benefits from reduced search costs in two main ways:

- they are likely to find what they are looking for more quickly—the value of searching using Geo services therefore corresponds to the value of time saved by using Geo services instead of an alternative method;
- by having access to Geo services, consumers may identify services that are otherwise not easy to find. For example, mobile phones with maps apps often provide consumers with options of different services located nearby, some of which could otherwise be found easily, while others are not so obvious. Thus, consumers may derive benefits from finding niche offerings that they would otherwise not discover—in this respect, Geo services complement search engine services, the economic impact of which has been studied elsewhere.¹⁵
- **Increased consumer choice**—in part through the reduction in search costs described above, Geo services help to promote individuals’ awareness of the options available. They provide a channel for consumers to collect and compare information from a variety of online sources at once, offering a broader and more information-rich set of choices in a shorter time than would otherwise be possible.¹⁶ The benefits are in terms of gaining information before making a purchase, both about different providers of the same product/service (eg, hotels in a particular area) and about the range of products/services that are available (eg, finding out that there is a local tennis club).¹⁷

There are further mechanisms through which Geo services benefit consumers, some of which may overlap with those described here, but the above list indicates that the benefits for consumers are substantial and that, when taken together, they are possibly larger than the direct effect.

What are the wider economic effects of Geo services?

Wider economic (or supply-side) effects are the effects on a sector from the use of Geo services in the economy which help to increase overall productivity and potential output. In the short term, the output of an economy can depend on changes on the demand side—ie, the level of goods and services demanded by consumers and businesses. However, in the long term,

the output of an economy—using standard measures of output, such as GVA, or the prosperity of the population (eg, measured by GVA per head)—is determined by the underlying productive potential or supply side of the economy.

Because Geo services facilitate the functioning of businesses, they help to drive efficiency gains throughout the economy. These can be observed in industries such as logistics, where the Global Positioning System (GPS) has been estimated to generate at least \$10 billion in cost savings per year.¹⁸

Geo services also affect the wider economy by helping to change the breadth of markets and thereby promote consumer choice. By reducing transport costs and increasing information to consumers, Geo services can broaden both product and geographic markets. Making markets wider is not typically seen as a goal in itself, but it can help to promote efficiency and cost savings through increased competition in many markets. This ultimately drives prices down towards costs, benefiting consumers.

Some of the wider economic and consumer impacts created by Geo services are summarised in the figure on page 4. The list of effects in the figure is by no means exhaustive, and there will be various interactions between them. Nevertheless, the analysis indicates the magnitude of the value that Geo services create, which is not captured in market and financial transactions.

What is the overall effect of Geo services?

The Geo services industry is growing rapidly—at a rate of 30% per annum globally.¹⁹ Many of the estimates presented here will therefore quickly become underestimates, as Geo services become more widespread.

Overall, the benefits of Geo services are varied—for some consumers, they can literally be life-saving; for others, they simply take away some of the hassles of daily life. In any case, these benefits are real, and their order of magnitude can be estimated. Geo services are making an important contribution to the global economy and to future productivity. The efficiency gains they create are helping to facilitate economic activity and generate additional consumer welfare.

Figure 1 What is the economic impact of Geo services?

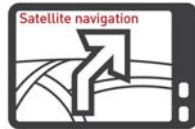
Geo services are:



Satellite receivers and manufacturing



Electronic maps



Satellite navigation



Satellite imagery



Location-based search

Geo services global revenues are \$150-\$270 billion per year

Video games industry \$25 billion

Geo services \$150-\$270 billion

Airline industry \$594 billion

Geo services global added value is around \$100 billion per year



Geo services save:



Geo services save 3.5 billion litres of gasoline per year—approximately 0.1% of the total world production of 5 trillion litres of liquid oil products

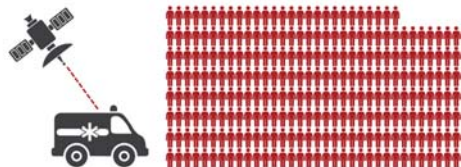
Geo services facilitate competition, leading to savings from reduced prices among infrequently bought goods and services of up to:



Geo services can improve agricultural irrigation, helping to achieve global cost savings per year of:



Geo services aid faster emergency response; for example, in England Geo services may have helped to save at least 152 lives per year



Students educated using Geo services can expect



3%

higher average wages five years after graduation than those who weren't

Source: Oxera (2013), op. cit., p. i, and <http://www.oxera.com/Oxera/media/Oxera/images/Oxera-Geo-Services.jpg>.

- ¹ Comscore (2012), 'EU5 Map Usage via Smartphone Growing 7× Faster than Classic Web', May.
- ² These ideas have all been winners of the European Space Agency's European Satellite Navigation Competition since 2006. See European Satellite Navigation Competition (2011), 'The Results 2011'.
- ³ See, for example, the London Borough of Camden's service finder, available at <http://maps.camden.gov.uk/>.
- ⁴ Oxera (2013), op. cit., p. iv.
- ⁵ Entertainment Software Association (2011), 'Essential Facts about the Computer and Video Game Industry'.
- ⁶ Central Association of Private Security Industry (2011), 'Security Services a Sunrise Industry'.
- ⁷ International Air Transport Association (2011), 'Weak Economy, Weak Profits—2012 Looking Even Tougher', September.
- ⁸ Oxera (2013), op. cit., p. 13.
- ⁹ World Bank Global Development Indicators.
- ¹⁰ Based on International Air Transport Association (2006), 'The Value Added by Airlines', scaled up to the current level by growth in industry revenues as reported in International Air Transport Association (2011), 'The Impact of September 11 2001 on Aviation'.
- ¹¹ Based on Entertainment Software Association (2010), 'Video Games in the 21st Century', scaled up from the US estimate to a global GVA estimate by the ratio of US to global GDP.
- ¹² See Oxera (2013), op. cit.
- ¹³ Yap, L.Y. (2008), 'An Assessment of the Use of Geographical Information Systems (GIS) in Teaching Geography in Singapore Schools', *Journal of Geography*, **107**:2, pp. 52–60.
- ¹⁴ Berdowski, J., Berg, R., Tijssen, J. and Koster, R. (2010), 'Global Incidences of Out-of-hospital Cardiac Arrest and Survival Rates: Systematic Review of 67 Prospective Studies', *Resuscitation*, **81**:11, pp. 1479–87, Epub 2010 September 9th, available at <http://www.ncbi.nlm.nih.gov/pubmed/20828914>.
- ¹⁵ McKinsey & Company (2011), 'The Impact of Internet Technologies: Search', July.
- ¹⁶ Wan, Y., Menon, S. and Ramaprasad, A. (2003), 'How it Happens: A Conceptual Explanation of Choice Overload in Online Decision-Making by Individuals', Ninth Americas Conference on Information Systems.
- ¹⁷ UK Department for Business, Information & Skills and Cabinet Office Behavioural Insights Team (2012), 'Better Choices: Better Deals—Consumers Powering Growth'.
- ¹⁸ ndp consulting (2011), 'The Economic Benefits of Commercial GPS Use in the U.S. and the Costs of Potential Disruption', June.
- ¹⁹ Oxera (2013), op. cit., p. vi.

If you have any questions regarding the issues raised in this article, please contact the editor, Dr Leonardo Mautino: tel +44 (0) 1865 253 000 or email l_mautino@oxera.com

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