Google Cloud Region: Lifting Productivity

PRELIMINARY ANALYSIS NOTE

AlphaBeta (part of Access Partnership) has been commissioned by Google to develop preliminary estimates of the economic impact from increased adoption of Google's cloud services across a number of economies. These preliminary estimates are based on information available at the time of the analysis, and would be updated in future analyses to take into account the latest information. The information used in this analysis is derived or estimated by AlphaBeta (part of Access Partnership), using publicly available information. No information for this analysis was provided by Google.

Adoption of Google's cloud services by businesses and the public sector will enable cost savings, risk mitigation, and support greater scalability in each of these economies. These effects will help lift productivity, supporting economic growth and job creation, and facilitate more efficient delivery of public services.

	Cumulative contribution to GDP by 2030 (USD millions)	Jobs supported in 2030 (FTE jobs)[1]
Austria	4,401	15,700
Greece	2,161	19,413
Malaysia	3,204	26,500
Mexico	11,158	117,400
New Zealand	2,697	9,700
Norway	2,853	7,800
South Africa	2,648	46,800
Sweden	6,885	20,800
Thailand	4,142	50,300

Private sector productivity gains

The productivity gains from increased adoption of Google's cloud services across the private sector will contribute to economic growth and employment. These effects will benefit both businesses as well as consumers, who will enjoy cost savings and improved quality on products and services, and real wage growth.

Productivity gains allow businesses to free up resources for broader investment. This effect, in addition to real wage growth driving higher consumption, will increase the demand for labour – supporting jobs creation.

Public sector productivity gains

Google Cloud adoption by the public sector will enable more efficient delivery of public services. By reducing costs in the public sector, resources in the economy would be freed up and redeployed for more productive uses. More efficient delivery of public services would also lead to better outcomes for citizens, such as in health and education.

[1] Full-time equivalent.

Methodology

The scope of the economic impact estimates are the catalytic effects of Google Cloud Infrastructure, which are defined to be the impact on GDP due to productivity improvements enabled by the use of Google Cloud Services. It excludes estimates of the economic contribution of building and operating Google Cloud Infrastructure.

The catalytic effects are comprised of economy-wide impacts, with the analysis disaggregating the economy into four sectors. Three are subsectors of the private sector—manufacturing, financial services, and other services—while the fourth is the public sector. The decision to adopt this four-sector disaggregation reflects that the impact of technology adoption on productivity in each of these sectors will differ.

Productivity improvements relate to higher GDP insofar as greater technical efficiency enables private sector firms to produce higher levels of output for the same level of input, and earn higher incomes. On the other hand, public sector productivity is more difficult to measure, as public sector outputs can be intangible and may not have a market value. For the purposes of this analysis, public sector productivity improvements are reflected in a decline in the unit cost of delivering public sector outcomes. That is, should the quality of public sector outcomes remain unchanged, declines in the unit cost of delivering these outcomes reflect greater technical efficiency. The relationship to GDP in the case of public sector productivity improvements reflects an improvement in economy-wide allocative efficiency – resources that would otherwise be deployed in the public sector could otherwise be deployed in the private sector for more productive uses.

Estimating the impact on private sector productivity and jobs

Productivity in the private sector reflects the overall efficiency with which labour and capital inputs are used together in production. It is measured by changes in the amount of outputs for a given amount of inputs. Increases in the quality of inputs as well as changes in the way in which the inputs are combined for production, such as due to improvements in skills and technology, can lead to productivity growth. There have been various studies that have examined the relationship between technology use and productivity. Gal et. al. (2019) assesses how the adoption of a range of digital technologies affects firm-level productivity.[2] The findings of Gal et. al. (2019) provide evidence of a positive relationship.

The private sector productivity gains are estimated for a three sector disaggregation of the economy – manufacturing, financial services, and other services. The distribution of productivity gains by sector is based on an assessment of the workforce automation potential of each sector. This is determined by mapping the degree of automation of the specific activities undertaken by all occupations within the workforce in each industry, based on the US Department of Labor O*Net database.

The relationship between technology use and productivity is applied to projections of cloud adoption by industries into the future, calculated based on IDC forecasts of expenditure, to estimate the productivity growth attributable to the private sector. The contribution of Google Cloud to this estimate is apportioned using a projected market share of Google Cloud.

Estimating the impact on public sector efficiency

Productivity growth in the public sector is typically framed as improvements in the efficiency of delivering public sector outcomes, such as in health, a major area of government expenditure. Improvements in health outcomes in an economy have a relationship with GDP, based on an extensive body of literature. Improvements in health outcomes driven by more efficient public sector delivery are expected to generate productivity gains for the economy, e.g. increased workforce participation, reduced private health spending. Bloom et. al (2009) has also shown through an error-correction model that while a long-run relationship between health and GDP exists, convergence to the equilibrium is gradual in the short term.[3] An econometric analysis has been used to estimate the relationship between the government spending on ICT and the delivery of public health outcomes. This relationship is found to be positive, and applied to projections of public sector expenditure on cloud into the future based on IDC forecasts of expenditure. The increase in health outcomes attributable to future increases in cloud expenditure (a subset of ICT expenditure) is applied to estimates of the short-run relationship between health outcomes and GDP. The contribution of Google Cloud to this estimate is apportioned using the projected market share of Google Cloud. The equivalent health expenditure required to generate a similar improvement in health outcomes is also estimated. Given that this analysis only focuses on productivity gains arising from improvements in health outcomes, this is likely a conservative estimate of the impact of public sector efficiency.

Estimating Google's market share

In the absence of a Cloud Region launch, Google's market share growth is assumed to experience a linear decline (from its historical CAGR) over the next 10 years. This is based on the rationale that market share growth slows as competition dynamic stabilizes in a market.

The launch of a Cloud Region is assumed to lead to an exponential market share growth for Google for the first two years of launch, fuelled by Google's more intensive marketing efforts, allowing it to gain an edge and increase market share rapidly. Following which, Google's market share growth remains the same as pre-launch. This assumes that marketing efforts by Google will become less intense and be on par with competitors after the first two years of launch.

[2] Gal, P., Nicoletti, G., Renault, T., Sorbe, S., & C. Timiliotis (2019), *Digitalisation and productivity: In search of the holy grail Firm-level empirical evidence from European countries*, OECD Working Paper No. 1533.
[3] Bloom, D., Canning, D. and Fink, G, (2009), *Disease and development revisited*. NBER Working Paper No. 15137.