



Toolkit

Broadband

Provider & Consumer incentives

What is it and what does it aim to do?

Governments in the UK and elsewhere have used a range of tools to encourage firms and households to take up broadband.

Providers may be incentivised to improve broadband access through direct support (loans, subsidies and tax credits), through measures aimed at cost reduction (e.g. by making rights of way easier to obtain) or through the provision of market information (e.g. on the state of broadband coverage in local areas). Broadband access may also be incentivised by using demand aggregation policies (policies that co-ordinate households and/or firms to buy in bulk) or public sector commitment to takeup of broadband.

Other forms of consumer subsidy include user subsidies such as the UK's SME broadband voucher. Other ways of encouraging consumer take-up are provision of complementary computers or IT training programmes.

How effective are they?

Four out of five studies find positive effects on firm or household adoption for at least one form of provider incentive policy, but there is some variation in success across types of support. Loans have a positive effect in two out of three studies. Administrative simplification has a positive effect in one out of two studies. A study on demand aggregation and a study on public demand both find positive impacts. A study on grants finds no effect. Finally, two studies that look at tax credits and territorial mapping systems find no effects.

Evidence from three studies suggests consumer incentives – in the form of user subsidies, provision of computers and complementary training – have a positive effect on household adoption.

There is a lack of evidence on the effect of incentives on broadband speed and price. One study finds provider incentives lead to an increase in the market share of a faster form of internet (fibre optic) but do not lead to cheaper access (for fibre optic). However, it is not possible to say if these findings would generalise for standard broadband. There is no evidence on the impact of consumer incentives on broadband price or speed.

The limited available evidence suggests that certain forms of provider incentives (loans for provision) may impact positively on some measures of firm performance. One study finds a positive effect on firm revenue of loans. Another study finds positive effects on the number of firms, employees, and payroll, but only for loans with lax requirements and only in metropolitan areas.

How secure is the evidence?

This toolkit summarises the available ex-post (i.e. after introduction) evaluations of the effect of incentives for broadband. The majority of the existing literature uses case study approaches or qualitative interview techniques, often involving small numbers of participants to assess the impacts of policy responses to broadband incentive. This toolkit does not consider this evidence. Instead, we focus on evaluations that identify effects that can be attributed, with some degree of certainty, to the support provided. (More details and discussion of our inclusion criteria are covered in the annex.)

We found 8 evaluations that meet our minimum evidence standards. There are five sub-national studies that examine two different programmes, all in the US. There are three cross-country studies that look at incentives across OECD countries.

No studies evaluating UK policies or support mechanisms met the evidence standards for inclusion in this toolkit.¹

Are incentives cost effective?

Three studies – all of them examining loans and grants – provide information that allows calculation of cost-effectiveness.

One study reports loan amounts of £4,015 (for the pilot) and £3,785 (roll-out) per new firm connection.² These figures are fairly similar, although the pilot may have been more costly to the exchequer due to higher default rates. This study examines outcomes for farm business only so may not be particularly representative. Another study of the same programme finds positive effects for firm outcomes only for the pilot programme and only in metropolitan areas. These effects imply loan amounts of £8,500 to increase payroll by £100, £1,448 per new employee, and £13,042 per new establishment. Note, however, that the pilot programme in non-metropolitan areas and the wider roll-out programme had no significant effect on these outcomes so the programme was not cost effective in those cases.

1 See <https://www.gov.uk/government/news/small-businesses-given-big-boost-through-government-broadband-scheme>. An evaluation of this policy was done, however, it does not meet our minimum requirements for the toolkit. See <https://connectionvouchers.co.uk> for details.

2 All currency converted from USD to GBP at a rate of 1 USD to 0.813 GBP, as reported by the Financial Times for 19/10/2016.

A study of a general telecoms programme (mostly grants and loans) reports costs of between £1161 and £1,355 per additional household broadband subscription. This is a smaller figure than that given above for adoption for farm businesses, suggesting that encouraging adoption may be more costly for firms than for households.

There are no cost effectiveness calculations for any other forms of provider incentive or for any consumer incentive policy.

Things to consider

- **Should incentives be targeted at consumers or providers?** One study suggests that incentives aimed at consumers increase household broadband adoption more effectively than incentives aimed at providers. This is particularly true in countries with a high level of broadband penetration. The study also finds that demand subsidies are associated with the largest effects on adoption, followed by demand aggregation, loans for provision, and public demand.
- **Which areas should receive incentives aimed at providers?** Evidence suggests that grants are an effective policy tool for both rural and urban areas if the aim is to increase broadband adoption, but only for urban areas if the aim is to impact on economic outcomes such as employment. These differences in impact across areas are consistent with the findings of our broadband evidence review.
- **How tight should loan requirements be for loans programmes?** One study finds that the roll-out version of a loan programme (with tighter requirements) was more cost-effective at increasing adoption than the pilot (with laxer requirements). However, another study of the same programme finds that the roll-out has no effect on firm employment or number of firms. The study finds that only in the pilot, and only in metropolitan areas, did the loan have a positive effect on these outcomes.
- **How can governments increase broadband take-up for households that are not using broadband despite availability of infrastructure and service affordability?** Households in underserved areas may not use broadband even when infrastructure is provided. In this case, government may need to pursue complementary policies that make broadband more appealing if it wants to increase adoption. One study finds that complementary programmes – providing digital literacy programmes or subsidising computers – are more effective than provision programmes alone.

Annex: Evidence on broadband incentives for providers and consumers

Governments in the UK and elsewhere have used a range of tools to encourage firms and households to take up broadband.

Providers may be incentivised to improve broadband access through direct support (loans, subsidies and tax credits), through measures aimed at cost reduction (e.g. by making rights of way easier to obtain) or through the provision of market information (e.g. on the state of broadband coverage in local areas). Broadband access may also be incentivised by using demand aggregation policies (policies that co-ordinate households and/or firms to buy in bulk) or by committing the state as a buyer, raising public demand for broadband.

Consumers may be incentivised via direct support (e.g. with user subsidies such as the SME demand voucher in the UK). Other ways of encouraging consumer take-up are provision of complementary fixed capital (i.e. computers) or complementary training programmes (i.e. in skills that require use of computers and the internet).

We looked for evidence on the effect of incentives on local economic growth outcomes. We included studies that examined the impact of incentives on firm outcomes (e.g. productivity or employees), broadband outcomes (i.e. speed and price), and on the adoption of broadband by firms or households. Evidence from our [Broadband review](#) shows that household adoption may have positive effects on house prices, female labour market participation, employment, firm growth, and economic growth. It has also been shown to be highly correlated with firm adoption.³

We focused on evidence from the OECD, in English. We considered any study that provided before-and-after comparisons or cross-sectional studies that controlled for differences between supported and unsupported areas or firms. We also included more robust studies that compared changes for supported areas or firms with a control group, or that used a source of randomness in broadband provision to estimate a causal effect. [See The Maryland Scientific Methods Scale \(SMS\)](#). In summarising the evidence, we place greater emphasis on studies with stronger methods.

Using these criteria, we found 8 studies that looked at the effects of incentives.

The evidence

Four out of five studies find positive effects on firm or household adoption for at least one form of provider incentive, but there is some variation in success across types of support. Loans have a positive effect in two out of three studies. Administrative simplification has a positive effect in one out of two studies. A study on demand aggregation and a study on public demand both find positive impacts. A study on grants finds no effect. Finally, two studies that look at tax credits and territorial mapping systems find no effects.

Study 308 (SMS 3 – sub-national) evaluates the impact of subsidised broadband provision loans on farm profitability and broadband adoption in the United States. This is the only study to consider adoption by firms rather than households. The policy under consideration entailed government subsidisation of interest on loans provided to private telecoms companies that extended broadband infrastructure to areas with fewer than 20,000 residents. In order to receive the loans, telecoms companies were required to match 15 per cent of the loan value. During the pilot programme a large share (about one quarter) of telecoms companies defaulted on their loans. For this reason, the loan requirements (equity and security) were tightened for the full roll-out of the programme. Using county-level agricultural census data, the study establishes that the pilot programme (i.e. with laxer requirements) increased farm adoption of broadband by 13.2 per cent. The rollout of the programme (i.e. with tighter requirements) increased farm adoption by 14 per cent. The study does not examine any other type of incentive policy.

Study 143 (SMS 3 – cross-country) evaluates the impact of producer incentives (administrative simplification, demand aggregation and public demand) on the share of optical fibre subscribers per overall broadband users. The study considers producer incentives as a whole rather than individual schemes. Fibre optic broadband provides faster internet through the use of fibre optic cables, while DSL makes use of slower copper wires. The study exploits a dataset of 33 OECD countries over time, finding that combined incentives increase the share of fibre optic users by 10 percentage points.

Study 217 (SMS 3 – cross-country) evaluates the impact of provider incentives on the number of broadband subscriptions per one hundred inhabitants. In this study, incentives (provision subsidies, administrative simplification, and territorial mapping) are taken together with government provision (direct provision and PPPs). Using a dataset for OECD countries across time, the study finds that these combined policies do not have a significant impact on broadband penetration. It is not possible to separately identify the effect of incentives.

Study 1150 (SMS 2 – sub-national) evaluates the impact of provider incentives on the number of broadband subscriptions per capita in the United States. The policies considered are administrative simplification programmes, grants and loans aimed at increasing provision in underserved/rural areas, and tax incentives for provision. The individual policy variables are a set of dummies that captures whether a zip code was exposed to the policy in question. The study finds that only administrative simplification programmes (in particular, guaranteed rights of way) have a positive and significant impact on total broadband connections. Administrative simplification is associated with a 0.6 increase in subscriptions per one hundred inhabitants. There are no positive effects on total broadband adoption for grants or loans for provision in underserved areas or rural areas. Finally, tax incentives do not appear to have any impact on the number of broadband subscriptions.

Study 108 (SMS 2 – cross-country) evaluates the impact of individual provider and consumer incentives on the number of broadband subscribers per hundred inhabitants. The provider incentives are loans for provision, tax incentives for provision, territorial mapping systems, administrative simplification, demand aggregation, and public demand. The consumer incentives that are considered are user subsidies and provision of complementary fixed capital (i.e. computers). The study uses country-level data for 30 OECD countries and finds that the policy associated with the highest increase in subscriptions is user subsidies and provision computers (considered together). User subsidies and computers are associated with an increase of 1.059 subscriptions per one hundred inhabitants. The second most effective policy is demand aggregation, which is associated with an increase in 0.993 subscriptions per one hundred inhabitants. Loan policies are the third most effective, correlated with an increase of 0.447 subscriptions per one hundred inhabitants. Finally, public demand policies are correlated with 0.350 more subscriptions per one hundred inhabitants. The remaining policies are found to have no effect on adoption.

Evidence from three studies suggests consumer incentives in the form of user subsidies, provision of computers and complementary training have a positive effect on household adoption.

Study 108, discussed above, finds individual a positive effect on household adoption for user subsidies and provision of computers.

Study 6232 (SMS 3 – sub-national) evaluates the impact of the Community Connect broadband provision programme (PPP and direct provision) on household adoption. Although this was principally a public provision programme, the study evaluates the complementary effect of a public education and digital literacy programmes. The study found greater effects on household broadband adoption when public provision is combined with public education and digital literacy programmes.

Study 420 (SMS 3 – sub-national) evaluates the impact of a provision policy on number of broadband connections in the United States. The Broadband Technology Opportunities Program (BTOP) gave over four billion dollars in 289 grants towards projects that aimed to increase broadband use. These projects were

undertaken by municipalities and private firms, and ranged from directly providing broadband infrastructure, to providing computers, to increasing digital literacy. Since the study evaluates all types of policies in tandem, it is not possible to disentangle the effect of incentives from direct provision. Nonetheless, using county-level data, the study finds that a one per cent increase in total BTOP spending is associated with an increase in 0.027 connections per one hundred households.

There is a lack of evidence on the effect of incentives on broadband speed and price. One study finds provider incentives (taken together) lead to an increase in the market share of a faster form of internet (fibre optic) but do not lead to cheaper access. However, it is not possible to say if these findings would generalise to incentives for standard broadband. There is no evidence on the impact of consumer incentives on broadband price or speed.

Study 143 (SMS 3 – cross-country) evaluates the impact of producer incentives (i.e. administrative simplification, demand aggregation and public demand) on the share of optical fibre subscribers per overall broadband users. Here, the study considers incentives as a whole rather than individual schemes. Fibre optic broadband provides faster internet through the use of fibre optic cables, while DSL makes use of slower copper wires. Adoption of fibre optic is therefore associated with higher internet speeds. The study exploits a dataset of 33 OECD countries over time, finding that combined incentives increase the share of fibre optic users by 10 percentage points. This means that the policy successfully replaced part of the traditional network (i.e. copper lines) with more advanced technology. The study also finds that incentives have no effect on the price of fibre optic broadband.

The limited available evidence suggests that certain forms of provider incentive (loans for provision) may impact positively on some measures of firm performance. One study finds a positive effect on firm revenue of loans. Another study finds positive effects on the number of firms, employees, and payroll, but only for loans with lax requirements and only in metropolitan areas.

Study 308 (SMS 3 – sub-national) evaluates the impact of subsidised broadband provision loans (details discussed above) on farm profitability in the United States. Using county-level agricultural census data, the study establishes that both the pilot programme (lax requirements) and full programme (tight requirements) increased commodity sales (by 6.1 and 6.6 per cent, respectively). Furthermore, the policy's pilot programme increased farm acreage by 3.6 per cent, although the rollout had no effect on farm acreage.

Study 340 (SMS 3 – subnational) evaluates the impact of subsidised broadband provision loans on the local economic development of remote rural areas. The loan programme under consideration is the same policy considered in study 308. As noted, the pilot programme has laxer loan requirements and many telecoms firms defaulted on their loans. The rollout, however, had more stringent borrowing requirements, which led to a lower level of defaults. The study uses zip-code level data to conclude that the policies have different impacts depending on the type of policy and treatment area. In metropolitan areas (many of which received support despite the rural focus of the programme), the pilot loan programme significantly increases employment by 7.2 per cent, annual payroll by 5.5 per cent, and number of business establishments by 5.3 per cent, while the roll-out programme has no effect. In counties adjacent to metropolitan areas, neither the pilot nor roll-out programmes have any impact. Finally, in rural areas, the pilot program increases the

number of establishments by 6.8 per cent, decreases employment by 5.9 per cent, and has no impact on annual payroll. The roll-out programme, on the other hand, decreases employment and annual payroll by 4.4 and 2.9 per cent respectively, and has no impact on the number of establishments. The study notes that the policy only has a positive impact in areas with greater population density, pointing to possible agglomeration effects associated with broadband (and possibly, effects of automation in rural areas, leading to lower employment). It also concludes that while there are other compelling reasons to extend broadband access to sparsely populated areas, on the basis of the evaluation of impact of this scheme, economic development is not one of them.

Cost effectiveness

For three studies (308, 340, 1150) we were able to use the reported programme costs and estimated benefits combined with additional information to compute cost effectiveness of the programmes.

Two studies (308, 340) evaluate the same grants/loans programme. During the pilot programme a large share (about one quarter) of telecoms companies defaulted on their loans. For this reason, the loan requirement (equity and security) were tightened for the full roll-out of the programme. The studies themselves report that the main programme disbursed £146 million in loans.⁴ We found further information that showed the pilot programme disbursed around £106m in loans.⁵

Study 308 finds that both the pilot and main programme increase the number of internet connections for farms. The effect sizes and the costs of each programme stage indicate grant amounts of £4,015 per subscription for the pilot programme, and £3,785 for the roll-out programme. These figures are fairly similar, although the pilot may have been more costly to the exchequer due to higher default rates. However, the study examines farm businesses only so may not be representative.

Another study (340) of the same programme finds positive effects for firm outcomes only for the pilot programme and only in metropolitan areas. These effects imply loan amounts of £8,500 to increase payroll by £100, £1,448 per new employee, and £13,042 per new establishment. Note, however, that the pilot programme in non-metropolitan and the wider roll-out programme had no significant effect on these outcomes so the programme was not cost effective in those cases.

Finally, Study 1150, which concludes that the USDA broadband programme itself has no effect on rural broadband adoption finds that expenditure on the USDA general telecoms programme (mostly grants and loans) does impact on rural broadband adoption. They provide a cost effectiveness figure that implies a cost of £1161-£1355 per additional household broadband subscription. This is a smaller figure than that given above for adoption for farm businesses, suggesting that adoption may be more costly for firms than for households.

There is no cost effectiveness calculations for any consumer incentives or any other forms of provider incentive.

4 All currency converted from USD to GBP at a rate of 1 USD to 0.813 GBP, as reported by the Financial Times for 19/10/2016.

5 See: <https://www.fas.org/sgp/crs/misc/RL33816.pdf>

Evidence Reviewed

Ref No	Reference
108	Belloc, F., Nicita, A., & Rossi, M. A. (2011). The Nature, Timing and Impact of Broadband Policies: A Panel Analysis of 30 OECD Countries (No. 615). Department of Economics, University of Siena.
143	Sudtasan, T. (2015). Economic determinants of optical fiber share in total broadband connections in OECD countries. In 26th European Regional ITS Conference, Madrid 2015 (No. 127179). International Telecommunications Society (ITS).
217	Mayer, W. J., Madden, G., Jin, Z., & Tran, T. (2015). Modelling OECD broadband subscriptions in disequilibrium. <i>Technological Forecasting and Social Change</i> , 90, 476-486.
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6232	LaRose, R., Strover, S., Gregg, J. L., & Straubhaar, J. (2011). The impact of rural broadband development: Lessons from a natural field experiment. <i>Government Information Quarterly</i> , 28(1), 91-100.

This work is published by the What Works Centre for Local Economic Growth, which is funded by a grant from the Economic and Social Research Council, the Department for Business, Innovation and Skills and the Department of Communities and Local Government. The support of the Funders is acknowledged. The views expressed are those of the Centre and do not represent the views of the Funders.

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