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Madden, Gary G and Savage, Scott J and Simpson, Michael

Curtin University of Technology, School of Economics and Finance, Perth WA 6845, Australia, Curtin University of Technology, School of Economics and Finance, Perth WA 6845, Australia, Curtin University of Technology, School of Economics and Finance, Perth WA 6845, Australia

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INFORMATION INEQUALITY AND BROADBAND NETWORK ACCESS: AN ANALYSIS OF AUSTRALIAN HOUSEHOLD DATA

Gary Madden, Scott Savage and Michael Simpson*

Communications Economics Research Program
Institute for Research into International Competitiveness
Curtin University of Technology

ABSTRACT

There has been considerable debate in Australia concerning the social and economic effects of telecommunication carrier investment in broadband network infrastructure. Whether particular groups within networked communities are unable or unwilling to subscribe to broadband services is an important policy issue. This paper sets out to identify metropolitan households that are less likely to subscribe to services and examines whether there exists a systematic link between subscription interest and measures of social disadvantage. Analysis of stated-preference subscription intentions data, obtained from an Australia-wide survey of seven hundred and fifteen households, shows that there is potential for the new communication technology to create information inequality.

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Mailing address: Gary Madden,
Department of Economics,
Curtin University,
GPO Box U1987
Perth 6001
Western Australia

Telephone: 61-9-351 7763
Facsimile: 61-9-351 2872
E-mail: maddeng@cbs.curtin.edu.au

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1 Introduction

Until recently, telecommunications services were provided by three publicly-owned monopolies: the Overseas Telecommunications Commission (OTC) supplied international services; Telecom provided domestic services; and Aussat operated the domestic satellite system. This mandated supply of services was essentially justified by natural monopoly arguments. The corresponding telecommunications sector regulation was extensive and contained the obligation to provide a basic telephone service to some customers that were not economically viable. In the late 1980s the Australian government began to reform the telecommunications sector. The reform recognised that competition was necessary in the sector, and could be supported by the erosion of natural monoply through rapid technological advance. While it was acknowledged that a competitive market would generate greater economic benefits for the community than that obtained from the regulated monopoly, decisions concerning the liberalisation of telecommunications markets were evaluated partly in terms of their possible impact on social objectives, in particular universal service. Historically, the universal provision of a 'standard telephone service' has been interpreted as meaning that all Australians should have widespread and reasonable access to an affordable voice-grade telephone service. The establishment of universal service as an explicit goal of telecommunications policy achieves two outcomes. First, it brings telecommunications access to users whom otherwise could not afford the service. Second, because universal service increases the size of the telecommunications network, the value of the network to existing subscribers is increased through the enhanced network externality (Rohlfs 1974, Cronin and Hebert 1994).

The Telecommunications Act 1991, was enacted on 1 July 1991 (and subsequently amended on several occasions) and provides the framework for the provision of telecommunications facilities and services in Australia [Bureau of Transport and Communications Economics (BTCE) 1995a]. A primary outcome of the Act is the introduction of competition into the market place. Telecom and OTC merged into a single general carrier, Telstra, while Optus Communications purchased Aussat to create a second general carrier. The Commonwealth government assured Optus that no new general carrier licences will be granted prior to July 1997.[1] The Optus licence requires it to supply fixed domestic long-distance and international telephony services to the entire

[1] Mobile licences were awarded to Optus and Telstra, and to a third private company, Vodafone.

Australian population by December 1997 (BTCE 1995b). Post-1997 arrangements require that general carriers interconnect any other carrier or service provider on request, so long as sufficient capacity is available and the specified interconnection is technically feasible. A secondary outcome of the Act is the reinforcement of Australia's long standing commitment to universal service and the intention that this obligation be fulfilled as efficiently as possible in the competitive market (BTCE 1995b).[2]

The provisions of the Telecommunications Act 1991 and the post-1997 arrangements have enduced both Optus and Telstra to undertake separate and significant broadband network roll-out programs. The networks will enable competition in the delivery of a range of telecommunications services, including local and long distance calls, payTV and interactive services. Despite massive investment in the provision of broadband television content and infrastructure, there will, however, be segments of the Australian population unable to access broadband services for some time to come [Broadband Service Expert Group (BSEG) 1994]. Evidence from the United States (US) already indicates that the information age of computers and telecommunications has excluded the sparsely populated rural areas of the US in which it is not profitable to provide telecommunications services (Pressler and Schieffer 1988). Similarly, Doctor (1991) has observed that information technology vendors in the US have demonstrated a pronounced bias towards affluent, urban clients. In Australia, the high cost of network infrastructure and the uncertainty of revenue streams suggest that the roll-out of cable will occur first in more densely populated areas. This strategy could deny regional and remote Australians immediate access to the 'information superhighway', thus creating information inequality on the basis of geographical location. In the short-to-medium term, inner city and urban areas will be well served, with coverage by satellites, microwave technology and at least one of the fibre optic cable networks. The high fixed costs of installing cable infrastructure in regional and remote areas and the potentially small market size, due to sparse population, means that it may not be

[2] Allthough, lower prices are one of the most significant benefits anticipated from competition in the telecommunications sector, there will be some people who, due to an income constraint, will not be able to access a basic telephone service (Panzar and Wildman 1995). However, the changing competitive environment does make it increasingly feasible to try new approaches to delivering universal service. For example, the BTCE (1995b) suggest that competition and new technologies should allow greater scope to more competitive (for example, contract by tender) arrangements that could reduce costs and improve the service. Panzar and Wildman (1995) examine the potential of telecommunications vouchers as a means of supporting universal service in the US.

economically viable for carriers to deploy networks in these areas. Further, the economics of microwave technology suggest that microwave services are unlikely to be provided to towns populated with less than 5000 persons. Thus, few regional and remote areas are likely to receive these services. While the Optus satellite will provide a strong signal to some regions of Australia, most regional and remote areas are unlikely to receive any of the new communications services for may years, if at all. (BTCE 1995b). Consequently, some concerns have been expressed as to whether the 'standard telephone service' definition of universal service is still relevant, with some groups suggesting an upgrade of the current universal service obligation is necessary [BSEG 1994, Department of Communications and the Arts (DoCA) 1994a and 1994b]. For example, during 1992-93 there was increasing pressure, particularly from consumers residing in regional and remote areas, for the definition of universal service to be extended beyond voice-telephony to cover a multitude of new data-transmitted communication services (AUSTEL 1994). These include the internet, and interactive broadband services.[3]

A separate set of concerns considers the question as to whether particular groups within passed communities are unable or unwilling to subscribe to networked services.[4] While telecommunication carriers and policy makers can develop the physical and regulatory infrastructure needed to permit the carriage of networked services it is imperative that there is a corresponding development of human capital to enable the efficient use of the network. That is, for individuals to be willing and effective users of information technologies they require training. When a particular group of the population does not possess the training and skill to use computer and other communication technologies effectively, then the power of those technologies may be denied to them. For example, people outside of the labour market may miss out on ongoing information technology training, which will affect their ability to use networked information. In the information society, access to, and use of, broadband services will become essential to an individual's ability to acquire, develop, and sustain marketable job skills and, indeed, to be an informed, productive participant in society (BTCE 1995a). Because broadband services enhance the ability to generate income streams both directly, and indirectly through education, they have the potential to further skew the income distribution toward the information rich. Of

[3] BTCE (1995b) research suggests that the cost to government of subsidising access to the broadband network for regional and remote Australians could be as much as one billion dollars per year.

particular concern to policy makers then is the potential for the new communication technology to create 'information rich-information poor' social classes, even in communities that have access to the network.

Information inequalities are most often created, reinforced or enhanced when those whom are already information-advantaged adopt technology and use it to further their advantage (Scherer 1989). The possibility that existing information-disadvantaged groups may be further marginalised by the uneven take-up of broadband services is explained by Doctor (1991):

> "As society shifts more toward a market orientation regarding new computer and telecommunications technologies, there is a danger that existing patterns of inequality will be reinforced. Some people will have access to information (and its associated power) more readily and quickly than others. The risk then ... is that we will create a new basis of inequality as the gap widens between the information rich and the information poor".

Further, as an extension of the television and the video cassette recorder, broadband services provide increased flexibility for the user in terms of schedule and content choices. This increased flexibility may exacerbate existing information inequities in at least two ways. First, the information poor may use the network to substitute entertainment for more serious content. Second, the information rich may use it as an additional means of obtaining more value-adding information (Scherer 1989).

Given the important role of universal service in Australian telecommunications policy and the recognition that broadband networked services can provide many benefits to society, recent public debate in Australia has focused on the socioeconomic impacts of broadband services. [5] Reports by the Broadband Services Expert Group (BSEG) (1994), the BTCE (1995b) and the

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[4] While this study concentrates on subscription intentions Madden and Simpson (1995) develop and estimate a model of network subscription demand for the interested sub-population.

[5] The debate is not limited to Australia. South African President Nelson Mandela recently told the 7th Telecom Convention that the information superhighway must not be allowed to divide the world into the information rich and information poor. He called for six principles to allow full participation of developing and developed countries in building a global information society. They include global universal service and global universal access to the information superhighway (Egolf 1995).

National Information Services Council (NISC) indicate that the needs of information disadvantaged groups such as women, remote communities, the elderly, the unemployed and people less well educated are the most pressing from a policy perspective. Further, NISC (1995) suggest that barriers to the delivery of networked services include lack of choice of delivery platforms, lack of untimed access to essential services, data transmission limitations, and affordability factors. The existing debate on universal service obligation and broadband network access is characterised by a paucity of hard data about Australians' familiarity with information technologies, and how this is distributed on key demographic lines (BTCE 1995b). Therefore, a fundamental and essential input into the policy process is the need to associate access disadvantaged groups with commonly accepted measures of social disadvantage. The focus of this paper is to empirically determine whether several measures of social disadvantage significantly deter broadband network subscription. Once significant factors are identified, a deeper understanding of the nature of access disadvantage can be sought, and so enable the development of appropriate policy responses.

The paper is organised as follows. Section 2 defines several measures of social disadvantage which may prevent particular classes of individuals from assessing broadband delivered services. Section 3 provides a brief overview of the experiment and survey procedures used to collect data and to analyse information inequality through broadband network subscription choice. An econometric model is estimated in Section 4 using these survey data. Estimation results are discussed therein. Section 5 presents some concluding remarks.

2 Measures of social disadvantage

Many factors prevent people from accessing and using new communication and information technologies. In Australia, the quality and extent of coverage of new services such as payTV and interactive services will vary markedly by delivery platform and geographical region. Densely populated areas may also be denied access to, and use of, new communication and information technologies. In the US, advanced electronic communication systems are bypassing some

poorer inner city, urban and minority neighbourhoods because they are designated 'bad for business' (Rose 1994). Even when network coverage provides access, there may be some resistance to adoption of the new communication technology and services. The ability to access these services depends not only on network coverage, but individual skill and social organisation. When the social organisation of the user (or user group) does not facilitate effective and timely use, much of the power of the technology may be dissipated (Doctor 1991). For example, in the US, Dillman and Beck (1988) show that rural residents are less likely than urban dwellers to have computer-based and digital telephone technology in their homes. They argue that such differences probably reflect a more developed physical infrastructure in urban areas, but also suggest that there may exist a rural mindset that resists the new 'information culture'.

Accordingly, resistance to new communication and information services generated by the broadband network can be linked to a number of measures of social disadvantage. These include characteristics such as age, education, employment status, racial background and gender. In Australia, approximately 25 percent of the population are aged over 50 years, and about ten percent are aged in excess of 65 years. Further, the proportions of both these sub-populations are increasing. Age is likely to be an indicator of generational differences in attitudes toward new technologies. Younger people tend to view the future more positively, and usually have early experience with video games and computers at school. The elderly, however, may regard new technologies with suspicion. They often find that their inexperience with new technologies and the high demands on technical competence act as a barrier to service adoption. Nevertheless, Bullingen (1996) suggests that studies on social geneontology show that elderly people are able to learn complex technical functions if they are promoted and supported by appropriate training.

Definitions of the information disadvantaged usually include education and income. Lack of higher education may reduce an individual's familiarity with information technology and the awareness of benefits from greater access to information. Several empirical studies show that exposure to, and familiarity with, new information technology improves people's attitudes towards such technology, and they are more likely to use them, regardless of other attitudes.

For example, Rogers (1986) concept of 'technology clusters' suggests that the adoption of one device triggers the adoption of other related innovations, and that familiarity with one technology increases one's understanding of and receptivity toward others. Reese (1988) argues that knowing how technologies such as automatic bank teller machines operate is related to holding more positive attitudes toward other new media. A report by the US Educational Testing Service (1988) also finds that student familiarity and competence with communication and information technologies correlates with the level of parental education. The higher the parents' education the more likely the children were to be currently studying computers in school and to have a computer at home. Level of education is also expected to be positively correlated with income. Low income groups are less likely to purchase broadband services because the price of the service represents a larger proportion of their total budget. The accepted definition of low income households in Australia are those whose income is significantly below the average given the particular needs of their families. The Australian Council of Social Services estimates that approximately one third of Australian households can be characterised as low income.

By virtue of their occupation, many workers will have greater opportunity to take advantage of information society trends and to advance their employment status. Many white collar workers are 'information workers' and are more likely to use computers and other information technologies at their jobs than blue collar workers. In contrast, blue collar workers, the unemployed and the disabled may be disadvantaged because they have limited access to computers and information technologies, commonly available in work situations. White collar workers are more likely to have higher regard for science and technology and in addition to adopting technologies that are functional to their work, they are more likely to use related technologies outside of the workplace.[6] Several studies of new communication technology adoption support this notion. In their study of US residents, LaRose and Mettler (1989) find 'that the proportion of one's labours spent on information tasks was a powerful predictor of use of information technologies and services in the home'. Using a sample of Texas residents, Reese (1988) shows that occupation clearly affects the adoption, use, and attitude toward communication technologies. In particular, white collar managers were

distinguished by their greater tendency to use computers at work and to acquire satellite TV, VCRs, and computers at home.

The adoption of new communication and information technology can also be affected by ethnic background and gender. In Australia, individuals with non-English speaking backgrounds comprise over 20 percent of the population. Interest in the broadband network may be low for these individuals because language and cultural barriers tend to isolate them from mainstream society. However, the network may also provide a means of breaking down social and cultural barriers, as well as providing an opportunity to access international education services and TV. Therefore, generating interest in the broadband network. NISC (1995) suggests that women face a number of barriers to access of new services. These include affordability, lack of familiarity with new technologies and labour market status.

3 Experimental design and survey method

The methodology used to analyse information inequality and broadband network access is based on stated-preference survey data. Stated-preference data are generated from respondents' expressed preferences, or statements about how they would behave, in a set of hypothetical situations provided by a survey. Thes data are particularly useful when examining the demand for new products, such as broadband services, which contain attributes not included in existing products.

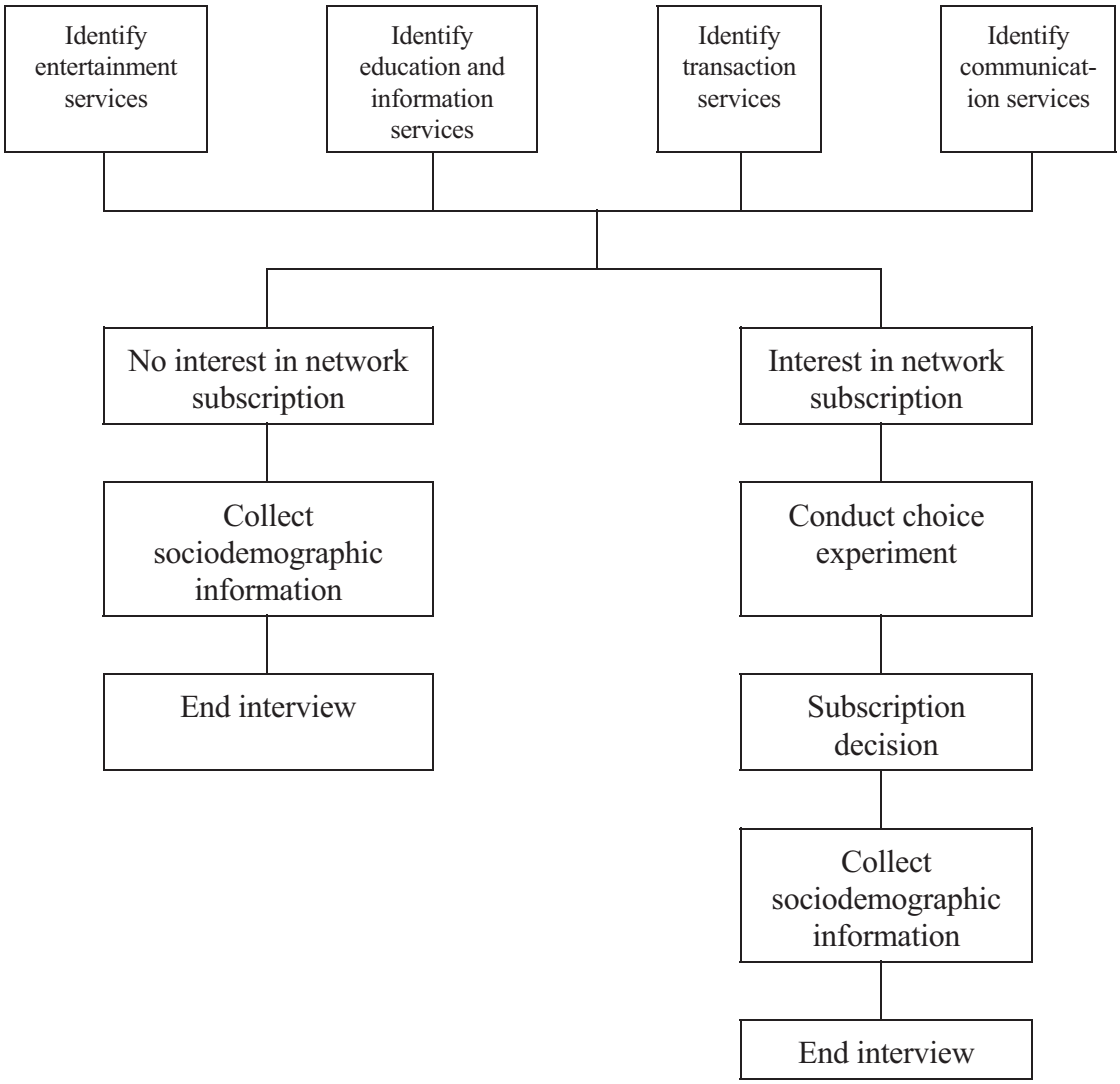
The stated-preference methodology used in this study generates survey questions designed to reflect the household's market decision by presenting hypothetical but realistic choice contexts. The experiment defines discrete broadband subscription alternatives as collections of service attributes. Respondents face a dichotomous decision as to whether the household is interested in considering network subscription after these broadband services are identified. The categories provided are entertainment, information and education, transactions and communications. A household is classified as interested in network subscription when the respondent agrees to

[6] Note that it is possible that workers who feel positively about information technology 'self select' into jobs involving those technologies.

participate in a choice experiment for at least one of the identified services.[7] The survey design is illustrated by Figure 1.

[7] Choice experiment outcomes identify the of conversion from interest to subscription. The choice experiment is structured so that respondents face a discrete choice of either subscribing or not subscribing to individual services. Services are defined by product characteristics, including price. The levels of the characteristics are systematically varied to create different alternatives. Alternatives are placed in choice sets. Choice sets are structured so as to require the respondent to trade-off characteristics when making a choice [see Madden (1995) for a discussion]. When respondents are not interested in the service, no trade-off is made and so no information is conveyed. Respondents not interested in services are therefore identified and excluded from the experiment after their sociodemographic characteristics are recorded.

Figure 1 Household interest and subscription choice



At the end of the interview the respondent is asked to provide important sociodemographic data such as household income, age, gender, household composition, racial background and employment status. This data allows the identification of subscription patterns for various subgroups of the population and allows the generation of household explanatory variables which are used in the empirical analysis in section 4.

A survey of 715 households was conducted on the week-ends and evenings of week days during the period April 1 through April 9, 1995. The survey was distributed to approximately 100 households in each State's capital city and the nation's capital. Almost 80 percent of interviews were undertaken on week-ends between the hours of 10 a.m. and 6 p.m. The remainder were

conducted on week day evenings between the hours of 4 p.m. and 8 p.m. The interviews are conducted by mode of a face-to-face survey instrument. Capital cities are chosen as carrier announcements suggest broadband services are more likely to be available initially in these more densely populated areas. The survey uses cluster probability sampling techniques. That is, given a randomly drawn start point within the sampling area, every household in the sampling frame is given an equal chance of being chosen as a start point. Around each start point, a cluster of five households is interviewed.[1] For a total sample size of 715 interviews, the survey requires 143 randomly generated start points (approximately 20 for each city). Cluster sampling is widely used and has the advantage of substantially reducing the cost per interview.[1] A summary of details concerning the survey administration in each of the capital cities is provided in the Appendix.

4 Empirical analysis

The empirical analysis focuses on stated subscription interest in a broadband network. A logit model is specified relating the probability of interest in broadband service subscription to a range of household explanatory variables. A dichotomous (0,1) variable is used to classify households as interested (INTEREST = 1) or not interested (INTEREST = 0) in service subscription. The model is of the form:

$$P_i = F(\beta_1 + \beta_2 x_{i2} + ... + \beta_K x_{iK}) = F(\mathbf{x_i}'\boldsymbol{\beta}) \quad (1)$$

where P_i = the probability that household *i* is interested in network subscription

$\mathbf{x_i}$ = observed household *i* sociodemographic characteristics

$\boldsymbol{\beta}$ = parameters on household characteristics

$F(.)$ = the logistic cummulative distribution function.

In the model above the parameters $\boldsymbol{\beta}$ relate changes in the explanatory variables $\mathbf{x}$ to changes in the probability of interest in service subscription. While the parameter signs indicate the nature of the relationship, the parameter value is not directly interpretable as the effect of a

change in an explanatory variable on the expected value of the dependent variable. The results reported here are transformed so that they can be interpreted in this manner.[8]

The household explanatory variables, **x**, are based on the measures of social disadvantage discussed in section two and previous studies of telecommunications network access [in particular Perl (1978 and 1983), Infosino (1980), Brandon (1981), Alleman *et al* (1983), Bodnar *et al* (1988), and Taylor and Kridel (1990)]. The list of explanatory variables developed for inclusion in the econometric model are listed below in Table 2.

[8] The econometric model used is not developed in the usual choice problem context since disinterested households are lexicographic toward broadband services. No trade-off between price and other service characteristics in selecting an optimal bundle occurs. The bundle of services is a corner solution and is unaffected by relative prices. Accordingly household subscription interest and sociodemographic characteristics are linked through a binomial probability rather than a discrete choice model. Previous studies of access to telecommunications networks [for example, Perl (1983), Taylor and Kridel (1990) and Bodnar *et al* (1988)] suggest that household characteristics are the strongest predictors of access by a substantial margin.

Table 2 Explanatory variables

Variable	Description
Social disadvantage variables	
ASIA	= 1, if at least one household member cites their country of origin as China, Japan, Vietnam, India or other Asian country; = 0, otherwise
EUROPE	= 1, if at least one household member cites their country of origin as Italy, Malta, Greece, Cyprus or Yugoslavia; = 0, otherwise
FEMHEAD	= 1, if the household head is female; = 0, otherwise
HH55TO64	= 1, if the respondent is aged 55 through 64 years; = 0, otherwise
HHMORE64	= 1, if the respondent is aged 65 years or over; = 0, otherwise
LOWEDUC	= 1, if the respondent has only primary or some secondary education; = 0, otherwise
NAPENS	= 1, if the respondent is a non-aged pensioner; = 0, otherwise
OCCSTATUS	= 1, if at least one household member is either a student or employed in professional, management, teaching or technical occupations; = 0 otherwise
POVLINE	= 1, if income per household member is below the poverty line[9]; = 0, otherwise
UNEMPLOY	= 1, if the respondent is unemployed; = 0, otherwise
Other variables	
HHSIZE	Number of household members
HHLESS25	= 1, if the respondent is aged less than 25 years; = 0, otherwise
HH25TO34	= 1, if the respondent is aged 25 through 34 years; = 0, otherwise
HH35TO44	= 1, if the respondent is aged 35 through 44 years; = 0, otherwise
KIDS	Number of children under 15 years
PTEMP	= 1, if the respondent is part-time employed; = 0, otherwise
RENT	= 1, if household is renting accommodation; = 0, otherwise
SEMPHH	= 1, if at least one household member is self-employed; = 0, otherwise
TECHLIT	= 1, if the respondent uses a computer at work, school or TAFE, and household owns or rents a computer, a multimedia device and a modem; = 0, otherwise

[9] The poverty variable is derived from the March quarter 1995 estimates of poverty lines in Australia. These estimates for different family types are translated to gross annual earnings estimates and compared with the household income information from the present survey. Where household pre-tax income from all sources is lower than the corresponding poverty level for that household type, the poverty variable takes the value of one.

Results of the estimated logit regression are shown in Table 9. The model appears to fit well. Homoskedasticity of the error process is supported by a likelihood ratio test (χ^2_{calc} = 23.5). Another likelihood ratio test rejects the hypothesis that the set of coefficients are not significantly different from zero at the one percent level (χ^2_{calc} = 178). The goodness of fit measure, proposed by McElvey and Zavoina and (1981) provides an R^2 statistic of 0.511.[10] The model correctly predicts 82.2 percent (530 of 645) of the sample observations. A naive model, which always predicts that interest in subscription is zero, predicts 23.4 percent (151 of 645) of the observations correctly.

The marginal effects associated with the parameter estimates are displayed in Table 3. The estimates measure the partial impact of the corresponding variable on the likelihood of household interest in network subscription, all other factors constant. The asymptotic t-statistics indicate whether a particular parameter estimate is statistically different from zero, that is, the variable has no impact on INTEREST.

The signs and magnitudes for most of the parameter estimates conform to *a priori* expectations. Of the social disadvantage variables, ASIA, EUROPE, FEMHEAD, HH55T064, HHMORE65, LOWEDUC, and OCCSTATUS are significantly different from zero at the five per cent level, while NAPENS is significantly different from zero at the ten per cent level. Broadband service subscription interest is inversely related to age and the probability of no subscription interest is greater for respondents aged 65 years or over, than for respondents aged 55 through 64 years. There is a negative relationship between subscription interest and households where the respondent is either female, a non-aged pensioner (a proxy for people with disabilities), or has a relatively low level of education. The coefficients on the racial background and occupational status variables are positive suggesting that households in which the head is from Asia, Southern Europe, or where at least one occupant is employed in a professional (white-collar) occupation are more likely to be interested in subscription. Of the remaining variables included in the model, KIDS is positive

[10] This measure does not correspond to any R^2 measure in the linear regression model.

Table 3 Estimation results

Variable	Partial effect	Asymptotic t-statistic
Constant	0.281	4.68
Social disadvantage variables		
ASIA	0.212	1.99
EUROPE	0.257	2.15
FEMHEAD	-0.106	-2.22
HH55T064	-0.148	-2.50
HHMORE65	-0.365	-5.47
LOWEDUC	-0.101	-2.80
NAPENS	-0.151	-1.68
OCCSTATUS	0.091	2.17
POVLINE	-0.027	-0.58
UNEMPLOY	-0.096	-1.28
Other variables		
HHSIZE	-0.013	-0.85
HHLESS25	0.111	1.58
HH25T034	0.062	1.06
HH35T044	-0.031	0.60
KIDS	0.082	3.30
PTEMP	-0.083	-1.48
RENT	-0.006	-0.15
SEMPHH	0.012	0.24
TECHLIT	-0.011	0.18

Frequencies of actual and predicted outcomes

	Predicted			
Actual		0	1	TOTAL
	0	65	86	151
	1	29	465	494
	TOTAL	94	551	645

Log-Likelihood	-262.056
R^2	0.511

and significantly different from at the five per cent level. That is, subscription interest increases as the number of children in household under 15 years increases.

The chi-square statistic is applied to test the joint hypothesis that the set of ten social disadvantage variables have no impact on the probability that the households will be more or less interested in network subscription. The reported statistic ($\chi^2_{calc} = 45.8$) clearly rejects the null hypothesis at the one percent level. Finally, parameters are estimated for both a large city subsample (Sydney and Melbourne) and a small city subsample (remaining State capitals and Canberra). A likelihood ratio test indicates that the coefficients are not significantly different at the one percent level. This result is not surprising. A test that would be more interesting from a policy perspective involves the comparison of the estimated coefficients from this study with those derived from a survey of rural and remote areas.

Finally, the predictive ability of the model is examined below by comparing the actual and predicted levels of subscription interest segments of the population. Table 4 shows that these deviations are usually small in absolute value terms.

Table 4 Predictions by age of household head and social disadvantage

	Level of Service Interest		
	Observed	**Predicted**	**Deviation**
Total, all households	76.6	76.6	0.0
Age of household head			
less than 25 years	91.4	91.5	-0.1
25 - 34 years	90.8	90.4	0.4
35 - 44 years	83.1	83.6	-0.5
55 - 64 years	50.8	50.7	0.1
65 years and over	28.2	28.0	0.2
Social disadvantage variables			
ASIA	87.5	88.2	-0.7
EUROPE	90.5	89.7	0.8
FEMHEAD	67.3	67.1	0.2
HH55TO64	50.8	50.7	0.1
HHMORE65	28.2	28.0	0.2
NAPENS	63.6	63.6	0.0
POVLINE	79.6	79.5	0.1
UNEMPLOY	76.7	76.6	0.1

Note. Deviation = Observed - Predicted

Conclusions

It is well recognised that an information rich information poor divide exists. The recent substantial investment in broadband network infrastructure has the potential to produce many economic and social benefits for the community. However, network growth must not be allowed to further marginalise existing information disadvantaged groups. While there has been substantial debate on societal information needs and inequality, the discussion has suffered from the lack of empirical analysis. This study attempts to provide a quantitative footing as a basis for public policy formulation by identifying several measures of social disadvantage and statistically linking them to disinterest in new communications and information technology.

Study results establish that household characteristics, especially measures of social disadvantage, are strong predictors of likely subscription to powerful new information

networks. In particular, the results suggest that females, the disabled and elderly, and the less well educated are less willing to subscribe, even though they reside in covered areas. In fact the study supports the conclusion that information disadvantaged groups 'self select' into further disadvantage. In these circumstances public policy to address disadvantage by direct subsidisation or implicit cross-subsidisation will be unsuccessful without ancillary measures, such as targeted education programs. Mandating some form of universal access to advanced communications and information technologies will also fail. Another implication of the results is that targeted information programs and special technology training are necessary to enhance the use of physically available technology. This means that the concept of universal service should not only apply to the availability of technology but its use.

While the study establishes a statistical link between social disadvantage and information inequality many questions remain unanswered. First, the analysis of why certain groups are less likely to subscribe is imperitive in the design and implementation of policy. Only with this understanding can policy hope to reduce the information gap. Second, the development of an international standard on basic communications covered by universal service obligations is required to allow full participation by all members of the information society. An initial step in this research program is a national information audit by population strata.

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Appendix Field summary

	Sydney	Melbourne	Brisbane	Adelaide	Perth	Hobart	Canberra	Total
Not able to contact								
Vacant[1]	32	10	7	0	2	0	10	61
No access[2]	20	17	32	30	15	5	8	127
Out[3]	458	602	278	324	288	172	228	3039
Total	**510**	**629**	**317**	**354**	**305**	**177**	**246**	**2538**
ontacted								
Refused	207	247	197	92	144	62	148	1097
Busy[4]	52	89	63	51	85	29	64	433
Unsuitable, Terminated, N.E.S.[5]	30	44	9	9	17	3	18	130
Call back[6]	0	4	0	0	0	9	0	13
Number of interviews	*105*	*95*	*117*	*100*	*99*	*100*	*99*	*715*
Total	**394**	**479**	**386**	**252**	**345**	**203**	**329**	**2388**
Total called	**904**	**1108**	**703**	**606**	**650**	**380**	**575**	**4926**
Proportion of interviews to total called	**11.6**	**8.6**	**16.6**	**16.5**	**15.2**	**26.3**	**17.2**	**14.5**

Notes.
1. Vacant refers to a property in which no one is currently living.
2. No access indicates that the interviewer could not gain access to the front door of the residence.
3. Out refers to a household with no suitable member at home at the time of the interview.
4. A person who said they were busy may be prepared to do the interview on another day, but not on the particular interviewing day.
5. Unsuitable refers to households where the respondent is not able to respond to questions in a suitable manner. This includes respondents who are intellectually disabled and those who are under the influence of alcohol. Terminated interviews refer to occasions where the respondent wishes to terminate the interview before it is completed. N.E.S. refers to Non English Speaking.
6. A call back occurs when someone will participate in the survey later the same day.